

The London Engineering Project: long term outcomes

EXECUTIVE SUMMARY

This report looks at staff perceptions of the overall impact of the London Engineering Project in selected project schools. The aim is to identify changes to professional practice resulting from project work and look at whether these may be sustainable in the long term. The study was conducted in July 2009 at the end of the three year pilot. The schools included both primary and secondary schools

The report is based on qualitative research and information obtained through interviews with teachers and teacher managers at selected schools. The schools selected were identified by project organisers and were those they considered had embraced the project most fully.

FINDINGS

Project Achievements

The project was widely viewed as highly successful and well organised. Both practitioners and managers felt it had met expectations. This was reflected in what staff said about pupils' attitudes and engagement, its effect on their school's reputation, the pupils' learning outcomes and their learning about science.

- For teachers one sign of success was the number of pupils the project involved. For some this meant high numbers and regular attendance at after school clubs - in one case a teacher explained the club was so popular he now had a waiting list. Other staff commented on the expansion of project activities to whole class and whole year groups.
- One teacher appreciated the formalities of signing a contract with the project at the outset as a guarantee that his expectations would be fulfilled. This had helped him develop the work further than he had expected initially.
- Staff enthusiastically described how participation in the project had raised the profile of their school, either locally or nationally, through winning awards, participating in competitions or being selected as examples of good practice in teaching by OFSTED or the Royal Society.
- Staff described a wide range of knowledge, skills and abilities they felt had resulted from project activities. This included general engagement with engineering and science issues as well as key skills outcomes and also included knowledge of possible careers plus enjoyment and enthusiasm for science and engineering related activities.

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- All the teachers reported that LEP activities were very popular with pupils. One secondary teacher said pupils viewed LEP activities as 'special'. Teachers also reported that the LEP had enabled students to develop positive attitudes to science in general.
- Staff at one primary school thought the requirements of the national curriculum in science might be realised by cross curricular projects based on the idea of the LEP which would enable staff to readily 'hit targets' and ensure science has a 'rightful place' in the curriculum:

Embedding STEM

Perceptions of STEM outcomes varied. This seemed partly to depend on whether LEP activities had been organized mainly round extra curricular science clubs, whether clubs had been specifically engineering orientated and whether activities had subsequently extended to whole year group activities.

- School profiles for STEM in the school curriculum varied a great deal and were described in a variety of ways. This included outlining how science and engineering generally accord with the school mission; explaining that the focus or priorities for the school are not yet on STEM, or confirming that STEM is a priority because the school has science status.
- Managers commented that their involvement with the project had promoted general reflection on curriculum issues. This has resulted in plans to promote cross curricular work at one primary school, to use project type activities to develop a work related curriculum at one secondary school and to develop more 'hands- on' activity at another.
- The perceived impact of the project on the profile of STEM in the schools varied and was described in different ways. A secondary manager explained she saw the project as part of the process of seeking new initiatives. A primary manager said she saw STEM overall as fighting for space in the curriculum alongside national priorities such as English and maths.
- Some teachers said they thought that STEM as an idea was still a new concept and that teachers generally might not be familiar with it unless they had been directly involved with the project.
- A primary teacher said that as the project was an after school club she did not think it had impacted much on overall staff attitudes to STEM.
- Where project activities had extended to whole class or whole year group activities this had involved a number of non-specialist staff.
- A primary teacher said he had probably not delegated activities to other staff as much as he ought.

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- Teachers felt well supported by their managers in work on the project. Managers expressed support for the project which they saw as well organized and useful in a variety of ways from stimulating pupil engagement and developing work related learning to enabling a better pupil understanding of science.
- Two managers said project activities had been central to their schools being able to recruit to the new engineering diploma.

Sustainability of Project Impact

Staff identified several areas where project activities might continue to inform professional practice. These include continued use of project materials in school clubs and classrooms, continuing project approaches to pupil engagement, parental involvement to support project aims and maintaining school relationships with project partners.

- Teachers were highly positive about the teaching materials supplied by the project and some school staff planned to store and reuse project materials in future years. Others pointed out that some materials were easily replaceable when used up which they planned to do. Overall staff felt materials were high quality and well organized and understood this as a way of making lessons or clubs 'easy' to organize and for helping non-specialist staff to feel confident when teaching science related topics.
- The energy and enthusiasm of fieldworkers were widely acknowledged and were closely linked to pupil engagement as was the 'hands on' aspect of project activity. Some staff identified this as something they wished to retain in future work in their schools though not necessarily relating it specifically to LEP activities. At one secondary school there are plans for future whole year group STEM activities similar to LEP project work with the aim of promoting pupil engagement.
- Staff felt parental involvement had helped to publicize the project within communities local to the schools and has raised awareness among parents at one secondary school about the range of career options available for their children. Staff at another school thought parental involvement had been effective in changing attitudes and had helped recruitment for engineering diplomas. Teachers expressed the hope that parental involvement would continue. One secondary teacher suggested increasing the involvement of parents by enabling them to try club activities for themselves.
- Parental involvement has provided technical expertise for science club activities at one primary school. This is expected to continue.
- Staff described their intentions of maintaining relationships with project partners as a way of continuing the work of the LEP. One manager identified LEP relationships or structures as something that would remain even if individual staff move on.

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- At the two secondary schools which expect to run engineering diplomas designated staff have been assigned responsibility for continuing LEP activity

DISCUSSION

Three general points emerge:

- Practitioners in the classroom tended to be most concerned about immediate practical considerations such as planning and organizing materials, promoting pupil engagement, reusing or replacing resources and making it 'easy' for non specialist teachers to be involved. They also talked about more general teaching aims and outcomes in relation to the project such as enabling children to think creatively, encouraging them to be better scientists and helping them to think about their career possibilities. In their discussions teacher practitioners focused on how the project helped them to teach more effectively. In some cases this has resulted in exemplary practice which has been disseminated regionally or nationally resulting in the enhancement of individual, departmental or school reputations. In one school it has resulted in company sponsorship.
- Teachers who were also managers took a broader view than classroom practitioners and tended to discuss curriculum issues more generally. A primary head-teacher spoke about the possibility of redesigning the whole curriculum at her school and how the experience of the project might be useful in developing cross curricular projects in the future. A secondary head-teacher discussed how the experience of the project has made staff more reflective about curriculum issues generally and how the specific experience of engineering activities has enabled her to look at making the whole curriculum more work related. Through the involvement of this head-teacher the specific experience of engineering related activity was being generalized to feed back into the curriculum as a whole. A work related learning manager in another secondary school followed a similar line of thought when she explained how levels of pupil engagement achieved by the project might in future be maintained by whole year group STEM activities to enable 'hands on' pupil experiences and thinking about future career paths.
- Curriculum discussions from both practitioners and managers were largely about intentions. Evidence of long term commitment, however, was clearer where the project was seen as important to the success of centrally funded courses. Where managers reported the project had been important to recruiting a cohort of pupils to engineering diplomas, members of staff have been assigned specific responsibility for continuing LEP type activities and maintaining links with project partners in the coming year.

CONCLUSION

The longer term impact of the project may be seen in:

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- Improved teaching and learning practices by individual practitioners and dissemination of good practices more widely both regionally and nationally
- A bank of reusable teaching materials and related resources
- Acknowledged reflection on general curriculum issues by managers and conscious application of the experience of the project to planning cross curricular projects in primary schools and to work related learning in secondary schools
- Assignment of specific staff to continuing LEP activities and relationships in schools where the project has been seen as central to recruitment and support for engineering diplomas.

The clearest evidence of sustainability is where project activities are seen as important to supporting mainstream funded initiatives such as the engineering diplomas.

EVALUATION REPORT

THE LONDON ENGINEERING PROJECT: Long Term Outcomes

INTRODUCTION

This report looks at teacher and teacher manager perceptions of the overall impact of the London Engineering Project on selected project schools. The aim is to identify changes to professional practice resulting from project work in schools and to determine whether these may be sustained in the long term. The study was conducted in July 2009 at the end of a three year project pilot. The schools included both primary and secondary schools

METHOD

This report is based on qualitative research and on information obtained through interviews with teachers and teacher managers at selected schools. The schools were selected by the LEP and were deemed to be those which had embraced the project most fully.

A conversational and open approach was taken to interviewing (Kvale 1996). The aim was encourage a reflective overview rather than to iterate the ground covered in previous evaluations. Questions were designed as prompts with this overview in mind. The aim was to provide a context where teachers and teacher managers could look back and discuss their experiences and perceptions of the project and its impact on the curriculum. Conversations were about half an hour long to fit in with the school timetable. Interruptions occurred during some of the interviews when the phone rang or other staff or pupils entered the room with enquiries of various sorts. Conversations with all participants were transcribed in full; codes and categories were subsequently developed. This report is an attempt to summarise and outline the views expressed and the information provided and discuss some possible implications.

PARTICIPANTS

Staff interviewed included both practitioners and teacher managers. The original aim was to seek the views of one teacher and one manager at each of the selected schools. Appointments were arranged with this aim in mind spread over the course of the last two weeks of the summer term. Head teachers at two of the schools (one secondary and one primary) were unable to attend the interviews on the day. The time constraints on the work, however, meant it was not possible to arrange fresh appointments. The findings therefore are based on interviews with two senior managers in secondary schools, a primary head teacher and a secondary head teacher as well as practitioners at each school. At one secondary school the interview

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took the form of a three way discussion between the head teacher, the Aimhigher coordinator and a classroom teacher. At another secondary school the interview was a joint discussion with a senior manager and an administrator/practitioner.

Schools taking part:

Bacon's College

St Saviour's and St Olave's Secondary School

Goodrich Community Primary School

Surrey Square Junior School

Little Ilford Secondary School

FINDINGS

The findings are organised under three headings: project achievements, embedding STEM and sustainability of project. This provides an opportunity to gain an overview of the immediate effect of the project on schools and participants, look at any impact on school STEM issues and identify some longer term developments.

PROJECT ACHIEVEMENTS

The project was widely viewed as highly successful and well organised. This was reflected in how staff spoke about how it met expectations, its effect on school reputation, the perceived learning outcomes and pupils' attitudes and engagement.

EXPECTATIONS

All the teachers interviewed said that the project had fulfilled or 'more than fulfilled' their expectations. Most had expected a modest initiative at the outset involving small numbers of pupils. For teachers one sign of success was the number of pupils it involved. For some this meant high numbers and regular attendance at after school clubs - in one case a teacher explained the club was so popular he now had a waiting list. Other staff commented on the spread of project activities to whole class and whole year groups. One primary teacher described how the project had extended far beyond the work he had originally envisaged:

I've done an awful lot more than I realized to begin with from that initial meeting and I think also the level of the work has gone up an awful lot. So it went from very simple ideas, you know, just basic things of building to quite sophisticated, you know, building an electronic car for example, so it's gone a lot further than I thought it would do.

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In secondary schools the teachers described how the project had extended beyond the initial club to whole class and whole year initiatives:

We started off quite in a small way and over time we've done more and more and more because each time we've found each project has been really successful. The kids have enjoyed it, we've enjoyed doing it and it's incorporated engineering as well as science and all the things that we want it to do and because it's successful we've gone and done more and more and more every year.

When I was approached about running the club and doing work with the students I thought that it was just an afternoon club - that was it. Instead of it just being an afternoon club it became something that was embedded throughout the subjects as well because what we did was, we used to have the engineers come in and do sessions with different groups of students...for example, we had a rockets day where we had the whole of the Year 9 and they basically built rockets and set them off in the playground and they learned about rockets... it became part of the school's programme more or less.

In one school there had been pre-existing links with project partners and LEP project work was seen as extending and building on this:

We did a STEM activity with Arthur Anderson a fair few years ago and that was our first, I think that was before the London Engineering Project became the London Engineering Project, it was the Brightside Trust before they became sort of all kind of together. So that was really successful. With Doris's contacts we've got stuff that then took place in technology; we've got a science club now, which gets funding; we've got the technology club; we've done the STEM days as part of Science Week. So we've gone from little different things to completely across the curriculum.

One teacher made the point that he appreciated the formalities of signing a contract with the project at the outset as a guarantee that his expectations would be fulfilled and he felt that this had helped him develop the work further than he had expected initially:

I think at the beginning, what I think was great was that we met with the Head and ... and ... and we signed a contract. And I think an official start like that is really important and especially for teachers like me to have the assurance that this isn't something that is just going to happen and might disappear but it had some support. So it had the support on the website and it had the support with people and ambassadors and so on so, you know. (I'm) really pleased with how it developed. It developed further than I thought it would and it affected lots of other parts of - because I am the science co-ordinator - it affected lots of other ideas that I did in the school - the latest one being, (I) just re-designed my resources area using those kind of see through boxes that you (LEP) provide.

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SCHOOL REPUTATION

Staff readily and enthusiastically described how participation in the project had raised the profile of their school, either locally or nationally, through winning awards, participating in competitions or being selected as examples of good practice in teaching. One primary school teacher described a number of different awards he had gained through his school's participation in the project:

Through the work I did with the LEP I got to become Science Teacher of the Year. ... I was one of six people nationwide ...and it was all through contacts and through encouragement from the people of the London Engineering Project. In fact, it was one of them who recommended me initially and then the school support and then people came in to observe so (it was) very exciting and then through the club we won the club award one year. I won the club leader award another year...we've had the local press got involved, came in to interview members of the Science Club and take photos of them ... and I've also got in touch with secondary schools in the area as a result.

His head teacher saw this as an opportunity to raise the profile of the school and spread good practice to other schools in the locality:

What I would like to try and do – and I've been chatting R up about this, is enable his work to be spread not just within our own school but also within local schools. And I am encouraging him to apply for Advanced Skills Teacher status. And so we have recently got the forms and the documentation so that actually it will become something that is shared. It's not just about what goes on in his classroom and by being an Advanced Skills Teacher he will support our own staff but also the staff of other local schools in this area.

At one secondary school teachers described how LEP work had contributed to the school being recognized nationally as an example of good practice by OFSTED and also by the Royal Society:

We are, in OFSTED or whatever documentation, held up as good practice and part of that is the work that happens extra curricularly and part of that is the work that London Engineering Project do. Obviously there are other things so a knock on effect is that we are now a Royal Society School for Science... I do believe that because of all the extra curricular stuff that we've done which the LEP has helped us with, I think that's the reason we are now one of those schools.

Another secondary teacher described the experience of being nominated for awards and how this was highly valued and also reported in the school newsletter:

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I think the first year we were running our engineering club with the LEP, they nominated us as the best engineering club in London with the LEP and we represented the LEP or London anyway, at the Young Engineers competition in Greenwich ...we didn't win an award but the very fact that we were nominated and we were one of twelve secondary schools, I believe – no I think it was one of twelve schools, secondary and primary out of the country -and I mean that was a big honour and obviously that is the kind of thing we can put in the newsletter and ... then last year we went to the London Regional final which was at the Royal Academy; although there weren't many schools there, again we got chosen to represent the LEP and London at the Big Bang Festival.

Other secondary staff outlined how they welcomed publicity about their successes and how the LEP had helped them to gain company sponsorship and coverage in their local paper:

Aimhigher Coordinator: Well we are very publicity conscious and we are very much, we promote the school in the community and through the local papers and any opportunity to get something on a website and all of that...we've quite consciously said, look, to all you lot out here we're doing this, we're winning awards.

Teacher: The most recent one was in the *Newham Recorder*, the Year 7 students went up with myself; they built a boat from scratch and they had to race it against all these other students from all over the country at the Portsmouth Naval Base and they... did absolutely outstanding ... and the judges were absolutely shocked to the point that they gave them a special award because these students were just presenting themselves so well. And before that event I'd actually spoken to Ford about sponsoring us and being our sponsor and they chose to go ahead and say yes, we'll sponsor you. So the eventuality of it was Ford's put a write up in the local newspapers ... it went out and was quite big. It was quite a big article ... there's been so much interest.

LEARNING OUTCOMES AND PUPIL ENGAGEMENT

When asked about learning outcomes for pupils, staff described a wide range of knowledge, skills and abilities they felt had resulted from project activities. This included general engagement with engineering and science issues to key skills outcomes and also included knowledge of possible careers, enjoyment and enthusiasm for science related activities. Where science related subject knowledge was described it was in terms of the activities the pupils had engaged in:

For example, we had a rockets day where we had the whole of the Year 9 and they basically built rockets and set them off in the playground and they learned about rockets; they learned about the science behind the science behind the designing of the rockets and so forth.

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Project work was described by a two secondary staff as encapsulating a range of general skills outcomes:

... building the robots, building the super capacitor powered vehicles; you know there was enterprise in there...there was group work, there was team work, there was personal learning and thinking skills, you know, it had everything.

Another outcome mentioned by secondary teachers was related to careers and enabling children to begin to understand different career paths:

It's definitely helped them with their career paths. They know what they want to do and even the ones that went there thinking that's what they wanted to do and realising it's not what they want to do but they want to do a certain field like that, they know that they still need those qualifications to do it.

For one teacher understanding about careers was not seen as related specifically to engineering but was about generally enabling young people to see how the skills they were learning through engineering project work can be applied to different contexts:

We don't want to say you're doing engineering because you're going to become an engineer, we don't want to do that. What we want though to show them is the skills that you have learned in the creative learning, the skills you are learning in science- investigatory skills or the research skills you are learning in history – they can be applied in different contexts. Engineering gives those children a real hard and fast practical context in which they can see the relevance of these skills.

A primary teacher described how she felt that children who had taken part in the science club supported by the LEP had become 'better scientists' because of the freedom to think independently and to explore topics that the club offers:

I think the learning they've done is they've just become better scientists in that they are more willing to actually explore what could happen. And I think that because lots of things they do in the science club aren't things they necessarily do in class because they don't tie into units of work or anything. So I think that, particularly lots of children who are in the science club are very bright scientists ... I think it just makes them more independent as thinkers and learners (ready) to actually find out what does happen and not always knowing the answers (in advance) I think is probably the biggest thing which comes out of it.

Two of the secondary teachers expressed the belief that the learning outcomes from club activities are related to a better general understanding of engineering:

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Rather than the hard-core maths and physics and science it's more about developing a general understanding of the different fields in engineering. Because engineering is a very foreign subject to many Year 7, 8 and 9 students and just to put it in context and show them what opportunities are available to them in engineering, that it's not just about mechanics in overalls working in machine shops, I think that's the most positive thing that these girls are getting out of it.

I'm sure it has an impact on advancing the students' science, technology and engineering because it's conceptualizing it so, on the one hand it's enthusing them because they are seeing how their maths and science is used in the real world. And on the other hand it's just giving them a better understanding because they're seeing it working in real life, you know. You're looking at gear ratios when you're building little Lego cars, for example, you can see in front of you what the effects of different ratios have so that – which is something, in a lesson, you might not have time to. It might not be something they do in lessons, might be something they touch on briefly. So it gives them more time to explore and investigate in their own time rather than in lessons.

Enjoyment of science was cited as an important outcome by a primary teacher who felt hands on activity and a practical outcome are important to achieving that enjoyment:

The learning outcomes have very much been in an oral context, in a practical context. So one of the main messages I would say, from the work I have done with the LEP, is to keep it fun, to keep it practical ... you want it to essentially have all the different parts of the national curriculum for science in – all the skills and concepts but for the children to enjoy it, it needs to have an outcome or an audience... and I think that just the fun aspect, so it's all about making it fun ... so much more exciting than – today we're going to learn about friction and this is an experiment you're going to do ...

A secondary teacher said he believed the project had created real interest and knowledge about engineering among his pupils:

Teacher: Well again this is an anecdotal thing but we were down with Year 7s at South Bank (University) doing the solar cars. The presenter says at the end, who wants to be an engineer and all of the Year 7 girls jumped up and down as if they were answering a question ... but they know better than the average fifteen or sixteen year old what engineering is. They know it's about a process of designing and making and testing and those sorts of things – they know that.

The notion of enjoyment was also identified as significant by one of the secondary managers:

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I'm hoping that there are outcomes but if I talk about outcomes now it would be in very general terms of enjoyment, perhaps growing in confidence in other aspects; giving somebody – perhaps I can think of one girl where home life isn't good, but giving her a real interest ...so it's not always about results...

Enthusiasm was also cited as a learning outcome by another teacher:

Learning outcomes – you know, we've got enthusiasm; we've got good grades.

One secondary teacher summed up the outcomes for her pupils by describing learning outcomes as the practical outcomes of problem solving:

If I give you a quote that one of the young ladies said to me maybe that would explain it a lot. She said ... I didn't think engineering was so interesting and I didn't think I would learn so many different skills ... I think the main thing that all the students, not just the girls, have learned is that they can do just about anything if they were given the opportunity. If they were told how to do it they would take it upon themselves and try ... The only way I could say and the way I measure it is, can they do this if I've said, this is how you go about it, and can they finish it on their own or if I say, here's a puzzle, figure it out... it's giving them the formula and leaving them to make the product; I think that's the only way I can measure what they have gotten out of it – the practical side.

Another teacher from the same school explained that the overall learning outcome staff were aiming for in their work on the project was 'creative learning':

... the other thing that is key about engineering work, which encapsulates what we want to do but it also helps lead the way is, we want creative learning. We don't want didactic learning. I don't want text-book page 36 exercise 42 and then move on to exercise 43. Text books have their place, don't get me wrong, but we are really about creative learning.

A primary teacher discussed how the 'formulaic' requirements of the national curriculum in science might be realised by stimulating cross curricular projects based on the activities offered by LEP which also might enable staff to readily 'hit targets'

Well the tram project, for example, would be because you've got your social side and you've got your DT involved. You've got the literacy side with having to make brochures to sell... so there's lots of cross-curricular things there which would have been used very much in the class. ...I think because they (staff) can get lots of birds with one stone with it and one of the things that we're pressurised is the timing.. If they think they can do a DT and a science and a literacy combination

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and hit targets then they are very happy and the trouble with staff is the time to plan for it. You know, if they've got the time to plan for these projects but the good thing is things like the train and the tram are an example of how you can do that.

The head teacher at the same school was also supportive of the idea of using cross-curricular projects to ensure science has a 'rightful place' in the curriculum:

Such an approach enables pupils to understand science more widely:

I think it has just opened their eyes generally to that science is linked to lots and lots of things and pretty much everything you do in your life will be in some way scientifically linked to something. So it may not be exclusively engineering but I think it's opened their eyes to the fact that in most things you do it will involve some science.

All the teachers reported that LEP activities were highly popular with pupils. One secondary teacher said pupils viewed LEP activities as 'special'

Teacher: if we organise something else, the kids will say is it an LEP thing and I'll say, no, and they're sort of ...oh – and they'll want to go on the LEP events and they'll ask

Interviewer: Because their experience is positive?

Teacher: They have and they will ask, when's the next LEP event – or when is ... coming or when is ... coming – so I think that is very special and it's great.

Teachers also reported that the LEP had enabled students to develop positive attitudes to science in general. A primary teacher described how it had promoted interest in the Science Club:

Teacher: ... when I first started my Science Club I was very nervous about not having much uptake; now, because they're all dying to be in it, you know, there is a huge waiting list.

Interviewer: You say huge – how many?

Teacher: Well out of say eighty five children. I've got fifty children who want to be involved so that's incredible and I can only take twenty five really. Although there's technically twenty eight in the club at the moment so some went away to booster classes and they've come back so, yeah, there's a huge interest in it and it's because it is fun, because they see the fun aspect of it in assemblies and in the newsletters.

A secondary teacher said LEP work had given pupils a better understanding of STEM and the way science and maths connect:

If you're asking what the LEP has done, impacted on STEM I am sure it's definitely giving all the students involved in the activities a better understanding of how science, maths and technology come together in the real world.

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Teachers in general were reluctant to comment on the relationship between project work and attainment. As one pointed out there had been no tracking of pupils through the project so it is difficult to say. But one secondary teacher was prepared to say she thought the impact on the attainment of a group of 'gifted and talented' pupils at her school had been positive:

I'd just say how the engineering project has actually affected attainment. And I've just said that, for my Saturday group of gifted and talented that come, there's about ten of them, that I can put my hand on my heart and say, yes, their grades have either stayed the same or some of them have actually gone higher because of that working and partnership with each other and constantly, every week being there.

SUMMARY

- The project was widely viewed as highly successful and well organised. This was reflected in how staff spoke about how it met expectations, its effect on school reputation, the learning outcomes and pupils' attitudes and engagement.
- For teachers one sign of success was the number of pupils the project involved. For some this meant high numbers and regular attendance at after school clubs - in one case a teacher explained the club was so popular he now had a waiting list. Other staff commented on the spread of project activities to whole class and whole year groups.
- One teacher appreciated the formalities of signing a contract with the project at the outset as a guarantee that his expectations would be fulfilled. This had helped him develop the work further than he had expected initially.
- Staff enthusiastically described how participation in the project had raised the profile of their school, either locally or nationally, through winning awards, participating in competitions or being selected as examples of good practice in teaching by OFSTED or the Royal Society.
- Staff described a wide range of knowledge, skills and abilities they felt had resulted from project activities. This included general engagement with engineering and science issues to key skills outcomes and also included knowledge of possible careers, enjoyment and enthusiasm for science and engineering related activities.
- All the teachers reported that LEP activities were highly popular with pupils. One secondary teacher said pupils viewed LEP activities as 'special'. Teachers also reported that LEP had enabled students to develop positive attitudes to science in general.
- Staff at one primary school thought the requirements of the national curriculum in science might be realised by cross curricular projects based on the idea of the LEP which would enable staff to readily 'hit targets' and ensure science has a 'rightful place' in the curriculum:

EMBEDDING STEM

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Perceptions of STEM and its significance were varied. This seemed partly to depend on whether LEP activities had been organized round extra curricular science clubs, as at two primary schools, or whether the extra curricular club had been specifically engineering orientated as at two of the secondary schools. At one secondary school, for funding reasons, there were two separate clubs: LEP and STEM.

STEM AND THE SCHOOL CURRICULUM

Teachers were asked to describe the role of STEM in their schools, and how it sits with their school mission. They responded in a variety of ways: by describing how science and engineering generally accord with their school mission; explaining that the focus or priorities for the school are not yet on STEM; or confirming that STEM is a priority because the school has science status. A teacher at an Academy with a specialism in digital media explained the breadth of their mission and the place of science in that:

Teacher: ...the mission is to make sure that our students can go out into the workforce, whether it be post 16, ... whether it be after A levels; whether it will be going to university, so we need to provide them with all the skills they need to function in the wider world. And you know we've got a huge range of abilities, huge range of backgrounds for our students and our ethos is to inspire them to go the furthest that they possibly can and for the students that are interested in the fields of engineering and science this (LEP) has been hugely beneficial for them.

Interviewer: So how does science sit in that mission? Is it an important part of that mission do you think or where would you put that?

Teacher: We're in a period of transition really because we used to be a City Technology College where science and technology were our specialism so it was key. We have changed to an Academy and digital media is now our specialism so while it's always been key to our mission it's not where we're driving the agenda these days

Secondary teachers pointed out that STEM as an idea was still a new concept and that teachers who had not been involved with the LEP project might not be familiar with it. One member of staff interviewed asked to be reminded what STEM stood for. A primary teacher explained that it was difficult to give a school profile for STEM as only those who had been in direct contact with the LEP project would know about it:

Interviewer: ...what is the profile of STEM in the school in general?

Teacher: Well, the only people who would know about it would be the people who have come to the assemblies, people who read the newsletters so a lot of parents in the local community will know about what we've been doing, especially in the Science Club and also all the teachers who have had direct involvement with ambassadors or representatives from the LEP. Some teachers have also volunteered to take the groups sometimes for me on a competition and the Head

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and the Deputies are very much involved with it and we've got a science display as well so it is hard to tell how many people would know.

A manager at a secondary school with science status saw STEM as central to the school mission though said its profile needed development:

Interviewer ...so where would STEM sit within the school's mission, roughly?

Teacher: I think pretty centrally because of the science status, really, yeah. What we've got to do is get more students involved perhaps in clubs and more staff involved perhaps.

And another teacher at the same school explained that within the STEM area, LEP work fitted well with the school's agenda for developing engineering diplomas.

Interviewer: So overall would you say it fitted in with the school's agenda or not?

Teacher: Definitely, very much so; over the last couple of years it's really been promoting the new diploma; I don't know actually, I can't remember if it was just coincidence that the engineering diploma was being started when the LEP started but they definitely tied in very nicely.

CURRICULUM

Teachers discussed how the excitement of LEP activities could be used as a way of engaging larger numbers of pupils and extending project outcomes to developing learning required by the curriculum. One secondary teacher described how project field workers had in fact begun this but that to develop the work further might require liaison with other subject areas:

In an ideal world you would try to make sure these activities were available to larger numbers and you'd want to fit it in with the curriculum and what ... from Smallpiece did with the rocket project ... was he tried to make sure that, apart from the making and the exciting letting off of the rockets, he had a session with them in the middle explaining some of the science behind it and each day ... we said to Ahmed, go on, a little bit more of the theory please...when we did it (the Trebuchet) at the Tower of London – it was interesting again – Ahmed was trying to test their knowledge about levers and things and on each occasion it occurred to me, well what a good idea to introduce the theory like that. But do we know what stage the students are at in terms of their learning about those things in maths and science? So in an ideal

One notable outcome of the project was the reflection it had prompted on the school curriculum overall. This was particularly evident among school managers. They spoke about how curriculum changes might be necessary in

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the light of project work. One primary head explained her belief that she needed to make changes to really realize the benefits of the project:

I suppose what we haven't probably done is made any modifications to our curriculum. And so what we do need to do is look at some of the things that we have benefited from as a result of being part of the project, to try and use some of those ideas to become a more real part of our own curriculum. ... we can modify our own curriculum...Some staff have taken risks and run with some of these ideas and it would be great to have from them their feedback about how it's gone so we can actually begin to slot some of these ideas into our new curriculum.

This might involve developing cross curricular work:

What we do want to do in the next year or two is throw everything up in the air, look at it again and pull out the really positive things and most particularly take note of the impact that cross-curricular activities have.

Such changes would have the advantage of enabling better management of the curriculum to ensure that science has 'a rightful place':

You hear people talking a lot about overloaded curriculums and that sort of thing and I suppose, in a sense, it's about how you manage it all. And we're trying to jostle for a place to ensure that science has its rightful place...

A secondary manager explained how initially the success of the project had prompted notions of applying for an engineering specialism for the school.

The ripple effect is huge. At one point you know, it's interesting because you could say actually if we wanted to go the whole hog with engineering, would we make that our specialism? I'm glad we didn't. I'm glad we didn't actually because we're doing it without a specialist title (which) holds lots of constraints in some respects.

Instead, she explained, the way the project provides a way of enabling 'real' hands on experiences for pupils had promoted staff reflection on how their school curriculum generally can be developed and made more relevant and more work-based:

Head teacher: We're into the application of learning skills and engineering is a fantastic method to apply those learning skills because ultimately of all the skills that children learn unless they are given the opportunity to readily apply them and use them they don't understand the context of them. What engineering does is take them to real life experiences, real experience, hands on experiences where they get to apply those skills. We know that's a weakness in our whole curriculum and that's why we're looking at our curriculum at the minute.

Interviewer: So you found it useful for reflecting on your curriculum and developing it?

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Head teacher: Yeah, I think it's one of the things. I mean it's not just the only thing - don't get me wrong - but it's one of the things and we've been having a real push on work-based learning and a big thing for us is all the context of what our children learn, what relevance has it got.

But for one primary teacher the perceived benefits of the project are precisely that the work is 'extra curricular'

I think that a lot of the science taught at primary level is really boring and obviously you have to do it because we are told by the government to teach it but I think that it takes away lots of the exploration for the kids.

For this teacher the project offers pupils the freedom to learn to think independently:

...it's great because they do actually get to explore and they get to do things that are not necessarily related in any way to the curriculum...I think primary science is often quite passive and it's very teacher led and things that the children do are very set up and very organised and very obvious but I think that it is really good for the children to actually get a real chance to explore and to find out and to challenge what they think because often, what they think doesn't always come true ...I think for the children particularly it's just great for them to actually have something that they don't have to worry about their grades... they just get to, almost, do science by playing and exploring which I think is fantastic for them.

CHANGES TO STEM PROFILE

The question of whether the project has contributed to or changed the profile of STEM in the school was met by a variety of responses. A secondary manager explained she saw the project as part of the process of seeking new initiatives:

Interviewer: So has the LEP contributed to the mission, in any way, has it changed the balance in any way ...

Teacher: It's definitely contributed, I don't think it's changed anything because, you know, we were always seeking new initiatives and trying to bring people in from outside so that has continued, they've helped us to continue in that so it's part of that process.

A primary manager explained how in her school STEM work has to compete with the national policy focus on English and maths:

Interviewer: Has this project helped to change the profile of STEM within the school do you think? ...

Shirley: They are more aware ...but he (the science coordinator) does feel like the poor cousin because he doesn't always feel that staff take as much notice about science because of course maths and English

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are the areas that the local authority and the government promote so highly. And so when he's begging staff, please can you let me have your assessments for the children in relation to science sometimes they feel a bit bogged down with other areas and they don't comply as quickly. They're quite happy to do the practical things in the lessons but it's the assessment side of things that we struggle with.

Another primary teacher explained that as the project was an after school club she did not think it had impacted much on overall staff attitudes to STEM:

Interviewer: Okay, do you think it's made any difference to staff attitudes to STEM in general, having this project in the school?
Teacher: No I don't think so, massively. I think because it's an after-school club and ... lots of people just – they kind of know what you're doing; like most people know that our biggest project is building a car but I think ...because it is after school so not many people are around so don't necessarily either see what happens. I think they are aware that there is a science club and they've seen things in assembly but ...I don't think that other staff really kind of think about it, they just call it E's science club.

A secondary manager described how LEP work, the way it engaged pupils and the interest it created in engineering had been central to recruiting a cohort of girls for the engineering diploma:

I think if we hadn't had those activities and activities also during the school time as well as the after-school club, I think it would have been much harder to get the diploma group together so it was very helpful in promoting engineering, getting the girls engaged, getting them interested. ... so I think we've got fifteen, which I thought was a good group, actually, from nothing, you know – not having GCSE engineering or anything like it, I thought that was a good start and I think we've got the same next year as well.

Staff at another secondary school similarly believed that LEP activities had been central to recruitment for diplomas:

Aim Higher Coordinator: Just about all of the students who are involved in more than one engineering project signed up for the engineering diploma when it started.

Interviewer: And so how many are on that Level 2 diploma now?

Teacher: It's about twelve; there's about twelve that I know of.

STEM INVOLVEMENT AND STAFF DEVELOPMENT

There were different levels of general staff engagement with STEM work and the project depending largely on whether project work was an after school club or whether it had extended to work with whole class or whole year groups where more staff were be involved. One secondary teacher described how

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staff at her school became involved in whole year group activities and how this was inspiring for the pupils:

I think when we've had events for the whole year group at one go a lot of members of staff, I think the majority of the members of staff were eager to get involved and that actually boosted the students' confidence as well because the teachers were getting involved and making the little models and so forth. When we had the rocket days last year the teachers that came and actually stood back and watched the rockets going up were like, can we do that, can we do that – so we've had some impact from everyone even it is on a small scale.

At another secondary school a wide range of staff was also involved on whole year group events including sixth formers who volunteered to work with younger pupils:

We have, obviously, the head of science ...we've had ... one of our science teachers who's running the science club; we have M ...in technology who runs the technology club; there's me as the work-related learning co-ordinator who oversees business links and outside agencies coming in and doing that type of organization; we've had S, who's the administrator for all of the work that we do here. Who else has been involved? ... a technology technician. He went with you on the trip; had a fantastic day...We've had sixth formers involved with the younger students.

A primary teacher described how she had involved the D&T teacher at her school to supplement her own expertise:

Teacher: For building the car I'm useless at reading designs and that made no sense to me at all so one of our teachers in Year 3 who's the D&T coordinator, he's taken over the building of the car so we split science club up and he has like six children building the car and I do just general science club engineering projects with the rest of the children so I think, for him, he's really enjoyed having a big D&T project to do because often in school, I think, in his own teaching he just gets to build things that are very kind of organized and child friendly and very kind of easy things that he does every single year so I think he's really enjoying building the car with the kids because ...its like a real-life situation almost rather than just, now we'll stick some things together and we'll do this – so I think he's really enjoyed it.

She explained this had helped to increase her own knowledge, but only 'a bit':

Interviewer: And has it helped you with your knowledge of engineering, being involved in it all?

Teacher: It has been a little bit, yeah, because if the children who I'm taking, if they're just getting on with a project I will often come and just watch what M's doing with the children ...so I did have a few sessions just watching M and he was brilliant 'cause he really likes cars and

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really likes building stuff like that so he's a really good person to watch; just for me to kind of see but yes, still reading the plans, I think, would be my downfall but the kids are actually really good at reading the plans; they're just like, this goes here and that goes there and I am like, excellent – you know much more than me.

However no other teaching staff at the school were involved:

Interviewer: You mentioned yourself and the D&T teacher; have any other staff been involved?

Teacher: No

Interviewer: Any non-teaching staff?

Teacher: No, I mean when we went on the trip two non-teaching staff came but apart from that, no.

Where the project organized whole year group activities in a school or days out of school this often involved non specialist staff. But as one secondary manager explained it was difficult to say whether this had impacted on staff understanding of science issues in any way:

Teacher: On the Tuesday they (LEP) did the whole of Year 7 for a STEM day and then throughout the rest of the week they worked their way through the whole of Year 8 on different days so we had morning session, afternoon session, next day morning session, afternoon session followed by a morning session on Friday so we did STEM activities for the whole of Year 7 and the whole of Year 8 – activities going on throughout our Science Week delivering to all of our students; all of them completely engaged, enjoying themselves, building the robots, building the super capacitor powered vehicles ... was exhausted by the end of the week ... but what an achievement.

Interviewer: And do you think it made any impact on the teachers who don't teach science because all those class teachers were involved, do you think ...

Teacher: They weren't actually involved – in the Year 7 day there were people who weren't science and technology teachers involved and the feedback was really positive and they said how good it was. Whether it's actually made an impact on them I don't know.

Interviewer: On their science thinking?

Teacher: Yeah – whereas for the Year 8 days it was mainly, because it was Science Week, it was the science teachers that were covering the lessons so it kind of wasn't integrated with the other staff.

One teacher explained how he had perhaps not involved other teachers as much as he ought precisely because the project was so exciting and engaging:

Interviewer: ... how was the project in terms of staff development? Was it just for you? Did it just involve you or did other people learn through this?

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Teacher: I probably haven't delegated as much as I should over the last two or three years. I've probably been a little bit selfish. I've got most of the activities. I should have perhaps involved a bit more staff but in the last year we've got quite a few new and enthusiastic maths and science teachers who have been getting involved with activities.

One manager commented that the project contribution to staff development was best described in terms of the enthusiasm and inspiration it provided to staff and also to pupils:

Interviewer: What about staff development? Do you think the project has had any impact on staff development? Has it inspired other people to take an interest, to learn skills, have you learned anything from the project?

Teacher: I think, in terms of the staff involved, I think they have been inspired. I think you (LEP) have got some really good staff who are very enthusiastic so any opportunity they have to get involved with the kids and new projects and engagement activities and enrichment activities, you know, that has really helped them to blossom.

MANAGEMENT ENGAGEMENT WITH STEM

Managers were clearly more distanced from the project than practitioners and commented on the project in terms of pupils and staff engagement or curriculum development rather than speaking about STEM issues specifically. One primary head when asked about her relationship with the project said she had 'been hardly involved at all which is very sad.' At two secondary schools oversight of the project was not with the head but with other SMT members: the deputy head in one case and the work related learning coordinator in the other.

Managers were, however, aware and highly supportive of the project and felt it had contributed to their schools in different ways. One primary head explained she felt the project's success at her school had helped make science more accessible for non specialist teachers:

I feel that it has been of great benefit and it has actually de-mystified some of the difficulties that some staff have around science and the way that they view it because of the practical nature and it feels as though it needs to be specialist. He (the project teacher) makes it feel as though it is do-able.

This head also felt that the project had had 'a big input across the piece.' For other managers too the project's engineering or science initiatives focussed a general light on curriculum issues. One secondary head explained how engineering had highlighted the links that need to be made between school learning and the 'real' world:

We've got really good engagement levels now which we perhaps didn't have five or six years ago; high engagement levels – we've just had a

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fantastic OFSTED but we're still not satisfied because we still think we're not linking the learning and the skills to the real world and engineering is leading the way in that.

Practitioners felt that they were well supported by their managers. A secondary teacher described how he had been given 'free reign' to develop the work:

Interviewer: What has the involvement with senior management been – if any? Have you needed that involvement?

Teacher: I've been very fortunate really; I've been given pretty much a free reign on what we do and what we don't do..., if I say something would be good or be beneficial she (my manager) will say, that's fine, yeah - so lots of support really; can't really fault it.

Similarly a primary teacher described her head as not involved but supportive of project initiatives:

Interviewer: I know your head's not able to talk to us today but what's her involvement been?

Teacher: I think her involvement is that she is very supportive of the project in that she obviously wants the children to be able to do a whole variety of interesting things around the school. ..as far as going on the trips and having people come in and things, she's always been very supportive of – brilliant, the children will learn from this and it's part of the club so – yeah,. (She's) not massively actively involved but I guess kind of, as far as her job goes, very enthusiastic that people are doing extra science in school and just doing extra work.

SUMMARY

- Perceptions of STEM outcomes varied. This seemed partly to depend on whether LEP activities had been organized mainly round extra curricular science clubs or whether clubs had been specifically engineering orientated and activities had then extended to whole year group activities.
- School profiles for STEM in the curriculum varied a great deal and were described in a variety of ways. This included outlining how science and engineering generally accord with the school mission; explaining that the focus or priorities for the school are not yet on STEM, or confirming that STEM is a priority because the school has science status.
- Managers commented that their involvement with the project had promoted general reflection on curriculum issues. This has resulted in plans to promote cross curricular work at one primary school, to use project type activities to develop a work related curriculum at one secondary school and to develop more 'hands- on' activity at another.
- The perceived impact of the project on the profile of STEM in the schools varied and was described in different ways. A secondary manager explained she saw the project as part of the process of seeking new initiatives. A primary manger said she saw STEM overall as fighting for

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space in the curriculum alongside national priorities such as English and maths.

- Some teachers said they thought that STEM as an idea was still a new concept and that teachers generally might not be familiar with it unless they had been directly involved with the project.
- A primary teacher said that as the project was an after school club she did not think it had impacted much on overall staff attitudes to STEM.
- Where project activities had extended to whole class or whole year group activities this had involved a number of non specialist staff.
- A primary teacher said he had probably not delegated activities to other staff as much as he ought.
- Teachers felt well supported by their managers in work on the project. Managers expressed support for the project which they saw as well organized and useful in a variety of ways from stimulating pupil engagement and developing work related learning to enabling a better pupil understanding of science.
- Two managers said project activities had been central to their schools being able to recruit to new diplomas.

SUSTAINABILITY OF PROJECT IMPACT

While the immediate effects of the project can easily be seen in terms of pupil engagement, learning outcomes and staff attitudes, the long term impact is less tangible. There are clear signs, however, that there are a number of longer term outcomes which may be further developed. These occur around project materials and resources, fieldworker enthusiasm and pupil engagement, parental involvement and school relationships with project partners.

RESOURCES

The project resources were much praised. There was an overall impression staff had confidence in the project was because resources were well organized. One teacher described it as a 'package project.' The reliability and quality of project resources made teachers keen to participate

I think the people from the LEP who come in have so much energy and they really prepare well and they have really good resources, you know, good Power Points for the smart boards and so on that they (teachers) know that it 's going to be a package project so teachers are very keen to have people in and they learn from it you know.

Several teachers described how the provision of resources made running project activity 'easy':

Yeah, from my experience it's been fantastic because of the way you get all the resources and stuff makes it very, very easy so that you can just, for some sessions, just literally give them the instructions and just put the things in front of the children so they can actually do lots of exploring of scientific things.

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It was always set up so it was very easy for the person running the club in that you'd get all the resources; you get the instructions and it's just very easy in school and not just in clubs.

One teacher said the resources provided by LEP inspired creative ways of teaching:

And I think going to these LEP events and doing activities that are in the box, it does inspire you, it gives you ideas and there are things that you will then do in your lessons that you've seen at these events – these STEM days because they have creative and engaging ways of teaching science, technology

Another teacher described how the resources helped non specialist teachers to feel confident teaching lessons with a technical content:

Interviewer: And do you think the staff are confident doing this technical stuff on their own?

Teacher: Yes and no – I think you have got some staff who are - but the staff who see it as something fun and if you can give it to them with a box – like in a little box with a list of materials and then I say, just let me know what I need to replenish afterwards, I think they are more likely to try it but some staff are not confident at all, others are and so the more you can give them the better.

Interviewer: The confidence is growing?

Teacher: The confidence is growing but it's a crucial thing. I think they need to be able to see they can get hold of everything but if there are pictures, if there's a Power Point, if there's any kind of materials that support which are clear, easy to use then you are far more likely to get staff ...if it's fun and if the resources are there and they can see they're going to get a bit of support, teachers are far more likely to do it as well as these really exciting projects.

Clearly LEP resources were seen by staff as an effective way of facilitating the teaching of engineering and STEM topics and in particular for enabling non specialists to feel confident about teaching technical topics. As a result staff saw the benefits of storing the materials for future use. Even where teachers felt materials were not entirely appropriate for their pupils they had nevertheless retained the resources with the intention reusing them. As one primary teacher explained:

Overall the materials and the people have been excellent and I think if you come in with quality ideas and materials, you might not do it exactly like it is like the CREST and the materials. I never did it exactly like it was because it was a bit young for the Year 5s and Year 6 ... so you adapt it but you find out what works. And the other thing is to record it to make sure, so I have got a really thick folder of all the stuff

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we've done and you record it so that next time it's all there ... I'd say you have to change things to suit the children that are in the school.

Another primary teacher also said some of the activities needed adapting for younger children:

And initially, when we first got the car, before we realized it was too big and too hard for the younger children so we tried doing that as a whole group...

She made the point, however, that the resources were reusable or easily obtainable which increased the possibility of continuing the work of the project, at least for two years, by reusing materials:

Teacher: I think though that lots of the resources are easily obtainable ...

Interviewer: That's great and the resources you've been given are they re-usable?

Teacher: I think half are; I think half wouldn't be...I think because at the moment we're predominantly ending this year it's mainly 5s and 6s so I think that possibly there's enough in the box to do a two year cycle. So if you were predominantly aiming at Year 5 / 6s then they'd leave before like... so I think that some things we could definitely do again... whereas some it would be much harder for us to do and possibly we wouldn't have a budget for science club as such ...I mean if there was no resources available and things weren't re-usable I would still be doing a science club...I just think it's so good for the children to have that .

EMBEDDING THE INPUT FROM FIELDWORKERS

The energy and enthusiasm of fieldworkers were widely acknowledged. This was seen as promoting pupil engagement and some staff said this was something they wanted to retain in future work.

Teachers said the energy and enthusiasm of fieldworkers was one of the most noteworthy aspects of the project:

Interviewer: What would be the main things you said about the LEP, from your experience of it over the last three years?

Manager: Energy and dynamism and involvement of young people for young people isn't it really? I mean, that's how I see it; that they are incredibly enthusiastic young people who come and help us.

(LEP) have got some really good staff who are very enthusiastic

This enthusiasm inspired not just project staff but non specialist teachers too:

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Teacher: I think the teachers that have had people like ... and ... come in and model lessons, for example, to make the tram or a train project, they've really enjoyed it.

Interviewer: And these aren't science specialists?

Teacher: No these are just the teachers where they've worked and we tend to move around a lot as teachers. So it's lovely to have specialists to come in or if I am able to go into another class to show what I have done because it opens their eyes to the possibilities. So it's been really good and in assemblies, of course, staff have watched children and heard them do it and thought actually, that's something we can do in our project.

Teachers described how the energy and enthusiasm combined with the excellence of project materials promoted pupil engagement and motivation. One secondary school manager said continuing whole year group activities in the style of the LEP would help to maintain that engagement:

Manager: And I think, you know, we are going to aim to do some form of STEM activity for each year group each year based on what we did last year – no obviously, not all in the same week but based on what we've done this year, (which was) hugely beneficial to the students, you know, with their engagement, their motivation and I want that to continue every year, to have something.

Interviewer: So you're thinking of embedding that kind of approach?

Manager: Absolutely.

Teachers also spoke about how engaging large numbers of pupils could be a way of extending project outcomes to developing learning required by the national curriculum. One secondary teacher described how project field workers had begun this but that to develop the work further needed detailed work with other subject areas such as maths:

In an ideal world you would try to make sure these activities were available to larger numbers and you'd want to fit it in with the curriculum. What ... from Smallpiece did with the rocket project ... was he tried to make sure that, apart from the making and the exciting letting off of the rockets, he had a session with them in the middle explaining some of the science behind it and each day ... we said to ..., go on, a little bit more of the theory please...when we did it (the Trebuchet) at the Tower of London – it was interesting - again ... was trying to test their knowledge about levers and things and on each occasion it occurred to me, well what a good idea to introduce the theory like that. But do we know what stage the students are at in terms of their learning about those things in maths and science? So in an ideal world we would be able to measure how much knowledge and understanding they'd got in terms of maths, the physics part of maths and so on.

In that school the link with maths work is being developed next year through the continuation of the project by the maths department. A teacher explained:

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Most of what we've been doing is actually being handed to the maths department as of September ... The only part that we're keeping hold of is the club. The head of maths – he's got an engineering background - (will be responsible).

PARENTAL INVOLVEMENT

Not all schools involved parents in their activities but where they had the outcomes were positive. Teacher said it helped to publicize the project within the local community and raised awareness of parents about the range of career options available to their children. At schools where engineering diplomas were being organized parental involvement was seen as one way of supporting recruitment.

One teacher described how parental involvement help to change perceptions of engineering as an option for girls:

Interviewer: So when you talk to me about parental involvement do you think you've converted any of the parents to the idea that engineering is good for girls?

Teachers: Definitely, definitely

Head teacher: I've seen several parents who are glowing about it.

Teacher: They are, I mean I had a group of parents that they took their students down to Big Bang when we finished off the whole week events they were like, telling everyone and anyone that would listen, send your child to this school, that school has got engineering. Send the girls there because this is what they are doing. They go out into the community and they tell other people.

The head explained how this enabled parents to see beyond pure academic options for girls, something she felt was a significant cultural 'marker':

Head teacher: ... all those girls ...are very academic girls weren't they, so actually this is a bit of a tangible way from just the pure academia... those academic girls would have just been driven into a pure academic route. Pure academic studies instantly but actually this opened the parents' eyes...

Teacher: One of the Year 11 girls was, is our top outstanding driver and her parents are now allowing her to learn how to drive go-carts professionally ...You're talking about a girl who's wearing a headscarf driving a go-cart; you're talking about four girls ... wearing a headscarf driving a go-cart.

Head teacher: Pushing markers out of the way, aren't you?

Not just the parents of girls were affected. A teacher reported how one parent felt the LEP was a reason for keeping his son at the school:

...and they absolutely loved it and their parents have been informed about this and there's one parent who doesn't want to move his son

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because his son has learned so much just since September in coming to the club and working on a Saturday and working after school.

The involvement of parents and their engagement was seen as generating excitement and interest in educational developments in the recruitment of pupils to engineering diplomas:

The recruitment for diplomas generally, it was very oversubscribed because the parents were really excited about it. The diploma evening was absolutely packed and then of course one of the deputies had to select from the applications – which ones could do it.

A teacher outlined how a useful future development will be to increase the involvement of parents by enabling them to take part in activities for themselves, an idea she gained from a teacher in another subject area:

I think if I changed anything it would be trying to get more parents to actually come to club and work with their children. it's the one area we haven't done. We've invited them to events with us and invited them to come in and share their opinion when we're taking the students out and so forth. I think what I'd try to do next step would be get the parents to come on a Saturday morning, sit in on the activity, work through a project with the students. ... one of the other members of staff did a meeting with parents and she had the parents do an activity with the students and I think I'd want that to happen in an engineering context and for the parents to see it's not just about building a machine, it's from something small to growing it even bigger. That's what I would change or add.

A primary teacher who had involved parents by sending out letters and also by word of mouth found they acted as a technical resource adding expertise to science club in eco projects and electronics:

Teacher: I've had lots of parents working with me. I've had a huge group of parents – some of them have been really regular ... I've had a regular five parents in each week at the club and ... there's a lot of eco things that we're involved with and I had a parent who came to take over that. ... I've had a guy in leather jacket who comes in to help with the building of the Green Goblin, who perhaps wouldn't have come in but because it's something that he feels is his expertise – you know he rides motorbikes himself and it was really useful. I had an electrician who puts those lights up ... so some of the parents have been great ... lots more parents than I ever thought have become involved.

The work at this school had also led to involvement of siblings:

... and actually siblings as well – secondary children have come in to help. I've got two regular ones that come in and I sign their kind of work experience cards so it's been nice for them too.

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RELATIONSHIPS

The relationships that developed between project workers, pupils and teachers and between schools and partner organizations were seen as immensely valuable. Staff explained that these were central to the success of the project. Some said they thought that continuing those relationships with project partners might be one way of continuing the work of the project when LEP funding ended.

Some secondary school staff said they feared it would be difficult to sustain initiatives without the LEP which depended on excellent relationships between project staff, pupils and school staff:

Teacher: We have got very good relationships with that team – we're friends now, aren't we?

Head teacher: And that is the consistency – I think the other thing is, some schools might want a quick wham, bam and off they go; if you're looking for sustainability then it's about the relationships; it always isn't it – relationships with people? So if you want sustainability it's for the staff to get to know the visiting staff. It's to get to know the school. It's to get to know the kids and for the children, that familiar face is very, very powerful. So if you want sustainability of something it has to be staying – doing in terms of the same people in working relationships.

These teachers aimed to maintain good working relationships with partner organizations in spite of the change:

Teacher: We've been to see the various partners and they've showed us how they are going to carry on and what they're going to do but we've lost that core of people that we can relate to. We'll now be working with a number of different organizations.

The need for continuing relationships was also highlighted by a secondary manager at a school where LEP activities had been described as central to recruiting for the engineering diploma. She explained that her school was committed to developing LEP activities but that the member of staff who had organised project work to date was leaving and there were difficulties in finding a replacement:

Interviewer: And how do you see it (the project) developing?

Manager: A's leaving, I don't know if he told you ... I think he gave us a year more than he might have done otherwise because he wanted to do the engineering – to start it off. We've not been able to recruit next year. We've had adverts in and we've not been able to recruit.

She described how the school's commitment to maintaining engineering initiatives will be assigned to existing staff until a replacement is recruited:

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We've got two members of staff with engineering backgrounds who've been supporting actually in lessons this year. So they're going to be on the LEP until we advertise again.

A primary manager also focussed on relationships as key to sustainability of project work. When asked whether the project would continue if the teacher running it left she said she thought the project would continue because the structures and relationships which had been developed would still be in place:

Interviewer: Right and do you think if Mr E left there'd be anything left in place?

Manager: I think so, I think he would have left quite a lot of structures in place for somebody to pick up and run with and also the links with yourselves and any other organizations that he's worked with and I think it could be carried on.

Staff at one secondary school were concerned how they might not be able to maintain the services of partner organizations if they had to pay for them. Summer School places at South Bank University were something they particularly wanted to continue and seemed unaware that there is no cost attached to these:

Manager: If we had to pay for those services we would find it difficult to do what we wanted to do. We would manage some activities but that means we would have to curtail activities in different areas and it's a case of balancing the curriculum...It would be a huge loss

Teacher: See, like, obviously with the Summer Schools that the kids go on. We have about three or four students from each year group getting through to the Summer Schools at London South Bank (University) and they love it and ...the parents wouldn't be able to afford for them to go away and for them to actually be able to do this it inspires them so much ... if students had to start paying to go on these sorts of things I think it would limit the students that would be able to go. At the moment it is targeting the right students.

These staff thought the LEP was providing a 'niche' service for pupils from disadvantaged backgrounds enabling them to progress to university by providing services that might otherwise be unaffordable:

Manager: For example, I've had contact with Future Doctors – now they charge £200 to send a kid on a training course - £100 - £200 it depends on the course. If you want to be a doctor you need to go on this course. Our students can't afford to do that; they don't have the parents that can afford to do that and the school can't afford to do that either. That's an example in a niche area that by the LEP providing what they do within schools and working with sixth form and helping them and mentoring them and all of those things, you're providing a similar service but for the students that need to get to university from deprived backgrounds.

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In relation to cost one secondary teacher explained noted that LEP field workers are passionate about their work and explained that he thought passion is a quality that usually comes with projects that are provided free of charge to schools:

Teacher: Well often when I recommend the LEP to people, I mean, the things that sell it are really the fact that you provide activities for free – that's the main thing.

Interviewer: It's off the shelf

Teacher: It's off the shelf and as a member of staff at the school, the LEP will do all the organization so that's how I'd sell it to them but obviously I'd tell them what I've said about the relationship with the fieldworkers have with the kids and how enthusiastic they are and passionate about engineering.

Interviewer: And that's motivating.

Teacher: That's definitely motivating ... I generally find the best things are from the groups that are providing it for free; I don't know why; it's maybe because they are more passionate about it and, I don't know but that's what I found. The LEP has to be the most exciting group to work with that I've worked with in the school.

SUMMARY

- Some project achievements have resulted in longer term changes to professional practice which may be further developed. These occur in the use of project materials, 'hands on activity' and approaches to pupil engagement, parental involvement and school relationships with project partners.
- Some staff planned to store and reuse project teaching materials in future years. Others pointed out that materials were easily replaceable. Overall staff commented materials were high quality and well organized and that this made work 'easy' to organize and had helped develop approaches which enabled non specialist staff to feel confident teaching science related topics.
- The energy and enthusiasm of fieldworkers in promoting 'hands on' activities were widely acknowledged and were closely linked to pupil engagement. Staff said this feature was something they wished to retain. With this in mind staff at one secondary school are planning to continue whole year group STEM activities.
- A secondary teacher said a useful future development will be to increase the involvement of parents by enabling them to try club activities for themselves. Parental involvement has already helped to publicize the project within the community local to the school and has raised awareness among parents about the range of career options available to their children. Parental involvement and awareness was also seen as supporting recruitment for engineering diplomas.
- At one primary school parental involvement had provided technical expertise for club activities and this involvement is expected to continue.
- Relationships that developed between project workers, pupils and teachers and between schools and partner organizations were seen as

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central to project achievements. All staff stated their intention to maintain relationships with project partners as a way of continuing the work of the LEP.

- Maths department staff will be taking on responsibility for continuing LEP activities at one secondary school. Another secondary school is hoping to recruit an engineering specialist with responsibility for continuing the work of the project.

DISCUSSION

Three main points emerge:

- Practitioners tended to be chiefly concerned about immediate practical considerations such as planning and organizing materials, promoting pupil engagement, reusing or replacing resources, making it 'easy' for non specialist teachers to be involved. They also talked about more general teaching aims and outcomes such as enabling children to think creatively, encouraging them to be better scientists, helping them to think about their career possibilities. In the main however teacher concerns appear to be about day to day issues associated with the planning and delivery of their teaching. In their discussions teacher practitioners focus on the practical support the project provides, and how this has helped and enabled them to teach more effectively. In some cases this has resulted in exemplary practice which has been disseminated regionally or nationally resulting in the enhancement of individual, departmental or school reputations. In one school it has resulted in company sponsorship.
- Teacher managers take a broader view and tend to discuss more general curriculum issues in relation to project outcomes. So one primary head discussed the possibility of redesigning the whole curriculum at her school and how the experience of the project might be useful in developing cross curricular projects in the future. A secondary head discussed how the experience of the project has made staff more reflective about curriculum issues generally and how the specific experience of engineering activity has enabled her to look at making the whole curriculum more work related. Despite the possibility building on the success of project outcomes to apply for an engineering specialism, this head has instead made a strategic decision to use the engineering experience to feed back into the curriculum overall. A work related learning manager in another secondary school followed somewhat similar logic when she explained how impressed she had been by levels of pupil engagement in whole year group STEM and engineering based activity organized by the project. Her belief that pupil engagement could be maintained by whole year group STEM activities in the future appears to be about using hands on activity to promote pupil engagement and getting them to think about career paths rather than promoting STEM per se.
- Observations from both practitioners and managers about resources and curriculum were largely about intentions. Practitioners intended to re-use or modify project teaching materials. Managers intended to implement curriculum general or integrated changes. There was evidence of longer term commitment to project practice where project activities had been

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central to supporting the recruitment of a cohort of pupils to engineering diplomas. Here at two secondary schools designated staff have been assigned with specific responsibility for engineering related work to continue LEP activities in the coming year. Where mainstream funding is directly at stake there is a clearer link between ongoing professional practice and project activity.

CONCLUSION

The longer term impact of the project on professional practice in participating schools includes:

- Improved teaching and learning practices among individual practitioners and the dissemination of good practices more widely both regionally and nationally
- Accumulation of reusable teaching materials and related resources at some schools
- Acknowledged reflection on general curriculum issues by managers and conscious application of the experience of the project to planning cross curricular projects in primary schools and to work related learning in secondary schools
- Assignment of specific staff to continuing LEP activities and relationships in schools where the project has been seen as central to recruitment and support for engineering diplomas.

Sustainable impact is clearest where LEP initiatives have supported funded mainstream initiatives such as the development of engineering diplomas.

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Stage 1: Pupils' perceptions of and orientation to Science and Engineering when students first attend clubs/ STEM activity

This report provides a snap shot of school students' orientation to and views about STEM at the onset of the LEP's interventions in their schools. Qualitative data was collected through focus groups held with students from two South London schools. The aim of the report is to provide some insight into students' views about STEM before they have been involved in LEP activities.

Participants

3 focus groups:

Group 1: 1 Yr 11 male, 1 Yr 11 female, 1 Yr 9 male

Group 2: 3 Yr 9 female students

Group 3: 4 Yr 10 female students

9 BME students/ 1 white Polish student.

All students were in the top two sets in Science and Maths

What being a Scientist/ Engineer means to students

The students were largely negative about 'scientists' though three did comment on the academic ability and usefulness of scientists:

Interviewer: So what is a scientist? What is one? What does one do?

Sarah: Make us medicines

...

Meena: Discovers things, chemicals – things like that

Umuofa: A smart person I guess – someone who is creative and has talent

One student seemed concerned about the ethics of being a scientist and commented that the work would be 'stressful'; this perspective was echoed by another student who said that failure could leave you looking like 'a bad person':

Rachel: When you are a scientist you are paid to think about stuff. You discover this and discover that .It's too stressful for me - and they have to work on animals. I couldn't do it

Katy: And yeah, if people are depending on ...and if it goes wrong, ...You can't really predict what is going to happen to chemicals and if they are depending on you and if the thing goes wrong... if an experiment went wrong and people were all depending on it to make it work and it went wrong so he looks like a bad person when it went wrong.

There appeared to be an overwhelming perception, particularly amongst the Year 9 and 10 girls, that scientists not only lacked glamour but, in their descriptions, appeared to represent the antithesis of it:

Sarah: I imagine a scientist in his laboratory – they are mad people with their hair and all – that man out of the TV – long robes and laughing for no reason.

Rachel: A mad person surrounded by chemicals

Katy: ... that makes their hair fall out and they have glasses because glasses make you look kind of smart and they have dirty, white, horrible coats 'cause they have been mixing chemicals that make them dirty and their fingernails are dirty and black

Tara: Big glasses, sticky-up, spiky hair, wore baggy trousers and have long, horrible coat hanger thing and always carrying pens and test tubes, yeah.

Not only were scientists described as 'mad' and 'dirty' but they were also seen to be bored in their work and when they were given a gender it was male:

Shontelle: it's very boring

Katy: I think most scientists are bored 'cause they are thinking about equations and stuff

Emmanuel: He has a lot of time on his hands to just sit there and watch a reaction

Becoming a scientist appeared to be dismissed by one Year 9 girl, specifically because of this negative image:

Tara: No – I probably wouldn't be a scientist. When I think about it I don't want to be seen like that – it's just not my style

However, this negative image did not apply to forensic science, which was viewed more positively:

Meena: Forensics – I wouldn't mind

Engineering fared somewhat better in these students' perceptions. A few of the students were informed about what particular types of engineers do on a daily basis – this information appeared to be acquired through members of students' families.

Sarah: they fix things, like electrical things...they fix fuse boxes and things...my sister's boyfriend is an electrical engineer

Emmanuel described how 'half my family' work with computers; it was his interest in working with computers that had motivated him to start researching appropriate courses post 16:

Emmanuel: - I just mainly thought of computers - after doing research for my application – college application, I realised that engineering is quite broad – there's computer engineering, mechanical engineering and there's engineering on building sites

With the exception of this student, who had carried out his own research, even for the students with an 'insider's' perspective of engineering, the breadth of engineering as careers was not really understood:

Umuofa: I get confused when I hear the word engineer

Interviewer: Do you? Go on – why do you get confused?

Umuofa: I think they fix stuff 'cause my Dad's an engineer and he's not – I don't know how to explain this but he's not exactly putting things together. He fixes stuff instead of putting them together...yeah and also into computers – I think it's more to do with technology

For the majority of the students who had no inside perspective about particular jobs, their knowledge of engineering was very vague and related to 'fixing things'. Some of the students connected engineering to things with engines:

Meena: ...they make aeroplanes

Sarah: cars

Thomas: I think of more mechanical things

Others appeared to relate engineering to electricity and building:

Interviewer: What's an engineer like?

Tara: wires

Rachel: electricity

Katy: You know those yellow hats they wear

Rachel: I think builders wear hats

...

Katy: You have pens – a stock of them

Also mentioned by three students were the financial rewards for engineers. Two of the students that commented on this had engineers in the family:

Umuofa: my Dad's an engineer...he earns a lot

Sarah: ...they make quite a bit of money

Katy: I heard that engineers are rare so they probably get paid a lot if you are an engineer

There was also a perception amongst the female groups that engineering was 'for men':

Tara: I think men not women:

Katy: Yeah men

Meena: they are more men

Two of the students talked about this gender bias and whether they would mind being a woman in such a male dominated industry:

Katy: I'd like to be a woman engineer – make a difference.

Tara: If that was me I would feel an outsider.

Katy: I wouldn't mind – I think I am going to be an engineer. That's a good option.

(Katy then went on to describe how she could unveil her glamorous side after work and impress all her colleagues.)

Interestingly, engineering did not appear to carry, for these students, the negative connotations conveyed by 'scientist':

Sarah: they look like normal people actually

Summary:

Students commented on 'scientists' being 'smart' but the role was viewed as stressful, boring and , most resoundingly, unglamorous. Students' ideas of a scientist seemed to be limited to someone (male) wearing a white coat and working in a laboratory.

Three students were relatively informed about particular roles in engineering because of family connections. However, even these students appeared confused or unaware of the spectrum of jobs available and their view was limited to jobs involving 'fixing stuff'. The other students only had a vague idea about engineering roles. Female students commented on it being a job done by men.

Views of Science and Maths at school

Sarah: I love science

Shontelle: I hate science

Meena: science is okay...some of the things I like but some of the things I don't

Students' responses to being questioned about science at school were very mixed. However, there were clear threads that linked students' accounts of science at school. In terms of what made science enjoyable, the practical and experimental aspects of lessons and the independent learning needed were all mentioned:

Interviewer: Can you talk me through things that are good about your lessons?

Chorus: experiments...chemical reactions...reactions

Katy: You get to learn new stuff in different ways. Practicals make learning easier

Rachel: You can be upbeat – you can do experiments - like in english it's easy to learn and maths is just..... but in science you can do experiments and you get more involved and find out things for yourself and you can see things that you thought that you were never going to see or things happen that weren't supposed to happen and it's fun.

Meena: ...when the teacher makes an experiment in front of the class – she makes one that the class can't do 'cause it's like too dangerous and then there's a big bang or something

Inevitably, teachers were identified by several students as being vital to making the subject interesting:

Umuofa: The science teacher makes it fun...Mr. ... makes it fun – he runs around everywhere ... I think he gets you thinking. He's got so much energy in him. He runs around the whole class and he's constantly going off track and telling us about A levels and then he'll say – I bet you don't want to know that. He starts running around.

Emmanuel: Yeah, 'cause of my teacher – he makes it interesting

Rachel: I was never that interested in science but I think the teachers we have make it easier...

Katy: Yeah, I like my teacher. He makes the lesson more interesting because many teachers, yeah, they just go straight to the point where he gives you - he goes over the things that you already know and that makes it easier for you to understand.

Rachel: He relates things to things that you know or things that have similarities – things that we find funny or amusing – something that will have an emotional impact on us – so that we can understand it and do it ourselves.

The key points to students' accounts of why they like particular teachers appear to be their enthusiasm, their ability to make the work accessible and their ability to make it relevant to students' own lives.

Students' complaints about teachers appeared to be caused by the converse of this; particularly work being inaccessible.

Thomas: it can be boring...there's more dictation than anything

Meena: I find it confusing when the teachers talk – I find it confusing - but when I've got the tests in front of me, I find it easy

Rachel: 'cause most teachers when they explain they use big words and we have no idea what they are saying and they have finished and we are on to the next class and we have no idea what it was about

Sula:...my science teacher is alright – she is friendly – she is to the point but there is too many people in the class. Like she says all the points and you are just missing some of the points that she says and you are quite lost in the lesson so - it's okay but you lose some of the points that she says which is quite important. Everything that she says will go towards exams so – I just don't like it 'cause it's too stuffed up.

Feeling 'confused' about what students had been taught recurred several times in the discussions amongst these groups. Two of the year ten girls discussed finding the maths content of their science courses difficult and, again, 'confusing': students feeling that they do not fully understand seemed, in some instances, to be demotivating; resulting in students responding by saying 'I don't like...'

Meena: I don't like food chains. I don't like balancing equations – when it's got to do with numbers in science – 'cause that's maths – it's not normal for science.

... It's hard and I don't understand it. It's weird...

Interviewer: How about you – how do you find the maths bit of science?

Shontelle: Confusing

This response was also clear from the year 9 and 10 students' discussions about studying maths itself:

Shontelle: it's confusing...it's difficult...I like some of it but when it comes to fractions and percentages, I just give up

Rachel: sometimes maths can be fun but other times it can be boring – the work is too hard...especially equations

However, the students' responses about maths were equally mixed. One student identified herself as being 'alright' at maths but not science:

Sula: maths I'm think I'm alright but in science I'm not.

Some students talked about enjoying the maths aspects of their science course. For some, this enjoyment appeared to stem from feeling successful:

Katy: I like chemical reactions – like hydrochloric acid plus this equals that and equations

Interviewer: Do you like being able to do that?

Katy: Yeah. It's easy

One student seemed to enjoy the 'challenges' posed by her science course and the way it extended her knowledge:

Tara: I think it's interesting but also challenging because there are certain things that you think you know but you don't know as well as you thought you knew it. For example, if you were asked about the human body, you think you know about your body but actually you don't know

This desire to find out about 'things' was clearly motivating for other students in the focus groups:

Katy: I know science hasn't got the answer for everything but it has the answer for most things, yeah – so you know there are some things you would want to find out and science can give you the answers.

Students also talked about being motivated in science, despite finding it 'hard' because it was an important subject to have:

Tara: ... the formulas 'cause it's hard to remember – the main ones and to enter for triple science you have to remember the periodic tables and that stuff. I know that is hard but at the same time I want to do it 'cause it will benefit me and that.

Summary:

All the students interviewed were in the top two sets in maths and science but their response to the subjects were very mixed.

Experiments were commented on as being enjoyable because students were able to learn actively and find things out for themselves. Teachers who were enthusiastic and who were able to make the subject accessible and relevant to students' lives also contributed to students' enjoyment.

Contributing to students' lack of enjoyment of the subject was confusion over what they were learning; several students commented on not being able to follow what they were being taught. Confusion over their learning contributed to students losing motivation.

Students talked about being motivated in science by being successful, finding out about things and by the fact that science is an important subject 'to have'.

Career Planning and knowledge of HE

The students' accounts of their thoughts about their futures revealed, for most of the students interviewed, a fairly fluid approach to career plans:

Rachel: Yeah, when I was little I wanted to be a surgeon and then I changed it to the people that make aeroplanes and...I wanted to make them – I thought that was good 'cause aeroplanes are really big, yeah, and I wondered how they were made and I wanted to be one of the people but then I changed my mind yeah and I wanted to be a doctor and then I wanted to be a lawyer ... I always change it because I haven't really made up my mind – for that reason. I wanted to be a journalist but I think I am going to change it because I haven't really made up my mind yet 'cause I think of different things every day.

They were often contradictory in their accounts. While many seemed highly ambitious and optimistic about what they could achieve in career terms, they often appeared to lack knowledge about particular routes and jobs. Many of the students explained how they wanted to be actresses, singers etc.; especially at a young age. Shontelle talks about how in primary school she wanted to be 'Britney Spears' and of how she wanted to go to Cambridge; there is a lack of informed and connected thinking in this account that is clearly, in part, due to her being young at the time but also due to a lack of information about an education system that she has no familial contact with – Cambridge appears to be as distant and glamorous as being Britney Spears.

Shontelle: I wanted to be a pop star...I just wanted to be Britney Spears

...

Interviewer: so you wanted to be Britney spears –had you thought about university at all?

Shontelle: Yeah – Cambridge

Tara talked about the various jobs she had aspired to throughout her school career. Unlike several other students, Tara had developed a clear focus at a young age on a career in a medical profession.

Tara: I wanted to be a doctor and I wanted to be a nurse and I wanted to be a medic and I wanted to be an actress and I wanted to be a psychologist

However, when we talked about where her career ideas originated she explained that they had all come from watching TV drama:

Tara: I saw it watching T.V.

Interviewer: Go on – what programme?

Tara: Like Casualty and that

What is perhaps of concern here is that this was the only source of information about medical careers that she was able to mention. Her most recent career focus was as a psychologist, though, again, the information available to her about this work appeared to be very limited; she seemed reliant on her own ideas about what the job involved:

Tara: I'm best at what I'd have to do there – listening to people and helping people out

Another student explained how she had decided that she wanted to be a doctor as because of her own illness she has spent a lot of time in hospital and 'I just want to be like one of my doctors'.

This account resonated with another student's explanation of how he had decided that, if he couldn't be a footballer, he would become a lawyer:

Thomas: I still want to become a footballer but I know that there is a high chance that I won't so I picked lawyer 'cause I enjoy helping people....and like family cases 'cause I've been through a lot of family troubles so it would be easy for me to help people

It seems that, from these two students' accounts, career plans have been informed by role models found because they have played a part in resolving and supporting these young people and their families through particular difficulties.

What was striking about students' accounts was, when asked about what was important to them in their choice of career, how many of them talked about helping people. Enjoyment of their work was also mentioned a number of times:

Tara: (psychologist)... listening to people and help people out. ... I don't want to end up thinking that my heart is not in this place – I would be better at doing something I love than doing something I don't like...

Thomas: ...I picked lawyer 'cause I enjoy helping people

Katy: I have to be able to help other people to feel good about myself 'cause ...a job being of benefit to me and not other people then I think what's the point of doing it cause it doesn't make a difference to any other person...you have to help other people

Meena: I still want to be a midwife or a social worker or a youth worker or work with young offenders
...don't overwork. Have time to relax...help other people

Salema: ... I want to do something like help people who have got aids in different countries – stuff like that.

The two Year 11 students were more informed than the younger students about possible routes into careers. Emmanuel had, again, initially been inspired in his interest in computers and technology by watching TV - and playing computer games:

Emmanuel: I used to watch Transformers and other technological cartoons and I had a fascination for technology...I just wanted to play on the computer

However, Emmanuel described how 'half the family' worked in computing. He seemed informed and able to access relevant information about routes available to him. Emmanuel was highly ambitious about the HE institutions he was aiming for:

Emmanuel: Edinburgh, Cambridge and Oxford and the Japanese Institute of Technology.

Interviewer: Do you want to go to Japan?

Emmanuel: Yes. Originally I was going to go to Japan to do my masters and after I did my research I realised ... At Japan Institute of Technology I would have the chance to learn Japanese, learn their culture and also get a high standard of technology ...

Umuofa also appeared to be relatively informed; with a strong familial history of HE participation, all the information she had accessed about HE institutions had come from her family:

Umuofa: My uncle – my uncle works at university – I’ve got to go.

Interviewer: So you’ve got to go.

Umuofa: Yes, I’ve got to – actually to be a qualified midwife.

...

Umuofa: Kings College ... It has to be in London. My Dad says Oxford and Kings - my grandmother says that my grandfather went to Oxford so I have to go there.

As experienced HE students themselves, Umuofa’s family are encouraging her to aim for elite institutions. This appears to be more important a focus than the subject Umuofa is interested in studying – midwifery is not actually offered at Oxford. This may also be due to Umuofa’s uncertainty about this as a career choice ‘...it’s good to be open minded ’cause I have my mind set on being a midwife but I know that it could change’.

This is in contrast to Emmanuel’s approach to HE who identified the institutions he named after research into the ‘best’ places to study IT. Unlike Umuofa, none of Emmanuel’s family have been through the HE system and are unfamiliar with the UK education system - his family lived until recently in Ghana and he was born in Ghana. Emmanuel talks of reaching a ‘moment of decision’ about going to HE. This ‘decision’ was inspired by going on a residential course when he was in Year 8:

Emmanuel: I got the idea in Year eight when I went on a course on Law and Shakespeare for two weeks in uni – having lectures and I fell in love – love at first sight or something. It was a good experience.

Interviewer: So it was really a good experience and had you thought about it before then?

Emmanuel: Never

Emmanuel seemed to be very determined to achieve his ambitions. He described how he had been saving money earned through his part time job to pay for his time at university; this was clearly robustly supported by his mother:

Emmanuel: My Mum said she will come with me on holiday to Japan.

Interviewer: And what about funding going to Japan. How does it compare?

Emmanuel: I'm not allowed to touch my bank account so what I have got in there now should cover it.

Interviewer: Are they your own savings or have you...

Emmanuel: My own savings....part time jobs.

Interviewer: That's very disciplined of you not to touch them. You do a part time job and you never touch your savings?

Emmanuel: I'm not allowed to touch them. If I want the money, I won't tell them I've been paid so...

Other students also mentioned their families as having influenced their decision to go on to HE and their career plans. Thomas explained how his mum had suggested university when he had said he wanted to become a lawyer; she had also talked to him about Oxford and Cambridge.

Thomas: My Mum. When I was thinking of being a lawyer, she told me the best thing to do was to go to uni 'cause uni will help me get on.

Interviewer: And when did she say that? How old were you – do you remember?

Thomas: Thirteen

Rachel explained how her mum had influenced her decision not to become a lawyer:

Rachel: then I wanted to be a lawyer and then my Mum said I shouldn't be a lawyer 'cause there are too many lawyers and I would have to compete with them and it wouldn't be that easy for me to get a good job so I had to change it

Summary:

Most of the students had some ideas about what they wanted to do in the future but these ideas were generally not fixed. Many were ambitious and optimistic about what they could do but lacked specific knowledge about available routes and jobs.

Information about careers came from varied sources; including TV, family and professionals who happened to have worked closely with students and or their families.

Students talked about being motivated in their choice of career by wanting to help people and by wanting to do something they enjoy.

The two Year 11 students talked in some detail about HE: one student with no familial background of HE talked about deciding to go to university after attending a residential course. Families and particularly mothers appeared influential in most of the students' accounts of their decisions to consider HE.

Motivation for joining the YEC

The two focus groups at one school were held on consecutive weeks. The first group included the Year 11 students: the group was, with the exception of Umuofa, all male. The following week a different group of students appeared: 16 Year 9 girls. The girls in the focus group provided a clear explanation of their involvement. They had been to an LEP STEM session and had enjoyed it. They also hoped that they would be able to go on a trip – that was planned for science week:

Kelly: We had engineering in a lesson last week so suddenly you think that could be fun.

Interviewer: So you had engineering in a lesson – what did you do?

Kelly: You had to build bridges.

Interviewer: You had to build bridges and it was fun. Did you all feel that?

All: Yeah.

Katy: When we first started doing it we weren't bothered to do it 'cause it was kind of boring and then when we heard it was a competition and stuff we all got into it.

...We brought some stuff – paper and put holes in it and put them together to make a big bridge ... Our bridge went kind of wrong 'cause it was really nice, it looked nice 'cause it was long and big ... It was still fun 'cause it was worth it.

Kelly: They said there was going to be a trip and we would be competing against two other groups from two other schools and – two groups from each school and you could win £500 for the school and get a goody bag.

Interviewer: So that's what you would both be doing – but you didn't do that.

Katy: We haven't gone on any trips yet. He said it was this week – but it's already Wednesday and he still hasn't told us yet so

Interviewer: So you are hoping that to go and see if you can win.

Kelly: Yeah – make a new one.

Interviewer: So that was fun so it was that for you that made you decide to come along. What about you two. Is that what made you two come along as well?

All: Yeah – ‘cause that time was fun.

The students who came to the first meeting of the club came for different reasons. All three explained how they wanted to find out about engineering or aspects of engineering. Thomas also explained that he had been encouraged by his teacher to come:

Emmanuel: Well I just heard the word engineering and I just came ‘cause I am not quite sure ‘cause I am into computers and it seems a bit complicated – there’s other things like mechanical engineering so I thought I would find out as much as I can.

Thomas: My teacher urged me because basically I wanted to find out what engineering was ‘ cause I wasn’t sure what it was or what this was about so I wanted to come and see what this was about.

Umuofa: I think it is good to explore different career choices ‘cause of the textiles I want to do, I think it would be good – it would start me off on the materials.

Summary

A group of Year 9 girls had decided to join the YEC club as a direct result of enjoying an LEP STEM day. They were also motivated by the promise of a trip out of school.

Other students talked about joining the club to find out more about engineering; one student explained how he had been encouraged to attend by his teacher.

Stage 2 Report: Responses to LEP interventions

Introduction

This report outlines the views expressed by organizers, teachers and school students about LEP interventions in both the primary and secondary sector. This includes STEM days in primary and secondary schools; residential courses with secondary students; clubs with primary and secondary students, events and projects and the deployment of student ambassadors. Qualitative data was collected through focus groups, interviews and observations of events. All interventions were observed and, where possible, focus groups held with young people immediately after interventions in order to provide insight into students' immediate responses to these activities.

STEM days

Fieldworker's perspective: Issues identified

The fieldworker responsible raised a number of issues about STEM days. He identified specific difficulties in persuading schools to be involved; some of these difficulties were linked to the particular contexts of the schools themselves:

In tower hamlets it's difficult to get the schools involved...parents are concerned about safety...

However, the fact that the schools are offered a lot of activities appears to have been problematic for a number of the LEP activities:

schools have so many other activities... it's convincing the right person in school to say yes
...the LEP is not **the** activity in London ...there's so much on offer

The fieldworker also identified that organising trips was time consuming for teachers and that schools were reluctant to allow students out of school too often. These problems had impacted on the LEP plans for National Science Week:

With National Science Week...schools have a problem with coming out that often...they have to cover the curriculum and it's a hassle for teacher to organise

He suggested that working with other LEP fieldworkers and drawing schools into the project through a range of activities helped in recruiting them, he also described how SETNET had helped him to recruit students:

Before the trebuchet challenge I was struggling to get schools to agree but organising that week enabled contact with the schools...since the trebuchet challenge ... have been involved with Young Engineers ...collaboration helps signing schools up

However, he commented on the lack of awareness within the school of the collaboration of different providers within the LEP:

...schools aren't aware of the coordination between partners...

Another issue the fieldworker identified was that the actual teachers involved in organizing activities were often oblivious to the aims of the LEP and insisted on top sets attending STEM days:

...schools often want to only let top classes do STEM days
...teachers need to know more about the aims of the project...coordinators or the head teacher may know but how far down has the message got?

He perceives the lack of coherent links with the curriculum to be problematic, both in terms of engaging the schools in the first instance and in enabling schools to justify trips:

...there are links in terms of team work and creativity but it doesn't fully link to the curriculum...it's engineering related and relates to DT, science and maths but I think it could help more if it was related to the curriculum ...Schools can't justify the amount of days out and especially considering the lack of connection to the curriculum

The fieldworker also expressed some concern over the crossover, in terms of subject matter, between the activities covered by the different partners:

...there is some cross over in terms of the material and subjects covered by the different partners...bridges and towers are done by YE clubs as well...wind turbines are planned for stem days and YE clubs

Another point raised was the need to engage parents with the 'engineering message' so that students' received encouragement in pursuing a career in engineering at home:

There's not enough being done to target parents...we need to get parents to say engineering – Bengali, Pakistani and Indian parents say medicine, law and accountancy
...I suggested at one of the team meetings that we should give a fact sheet out for students to take home with a quiz at the bottom to try to connect with parents

An issue for the fieldworker, in terms of the delivery of STEM days, is that teachers often leave him alone to deal with 50 students. He finds this difficult to manage and suggested it impacts on the students' experience. Teachers had commented on this ratio – one way forward suggested is the engagement of student ambassadors:

...one teacher suggested ambassadors or fewer pupils (50: 1 ratio if teachers don't get involved)

Summary:

The LEP fieldworker identified problems in getting schools on board in the first instance; he felt that collaboration between partner organisations and raising awareness within schools of this collaboration was important in encouraging schools to become involved. The wide range of activities offered to schools by other organisations was also identified as being a barrier to participation with the LEP.

Another problem encountered was persuading schools to allow students out of school. This was partly caused by teachers' reluctance to take on the extra work and responsibility organising a trip entails but also because schools are concerned that pupils are missing work. The fieldworker felt that activities that link directly to the curriculum could encourage schools to allow pupils on trips and may encourage schools to participate in the first instance.

Issues about delivery mentioned were that teachers involved with the STEM days were often oblivious to the aims of the LEP; some encouraged only top set students to participate in STEM days. There is also some crossover between the activities offered by the different partners. The fieldworker himself also felt that his delivering the days to 50 pupils, often completely on his own was undermining the student experience. The additional presence of student ambassadors was identified as one solution to this.

Students' Views

Contributors

2 focus groups – 7 Yr 10 BME girls; one group was mixed ability and the other G&T

Motivation

I observed two STEM day sessions at LSBU. The students were motivated and focused on the task of constructing a wind turbine. During the focus groups, students talked about what motivated them about the task. An obvious incentive mentioned was the prizes:

I like being in this one. We've got to win prizes.

Interviewer: *Prizes – is that important?*

Yeah 'cause it shows our enterprise...

We should have got more prizes – better ones. I've got a mug at home. I don't really need another one. I've got about thirty mugs.

Another student mentioned how she understood what was expected of her so was able to get on with the work:

You know what to do – the instructions are clear

An aspect of the activity that students also discussed as motivating, was the competitive nature of the challenge:

...it's hard though, like, 'cause girls keep looking over towards us and then they get the same design as us and everyone has got our design so we keep trying to change it and then it won't work

Students talked about the challenge posed by the activity. In many respects this was clearly a positive challenge that contributed to their focus and motivation in completing the task:

I think it's quite good, quite challenging. It's a new experience

The turbine - 'cause it was a challenge and I like a challenge.

Interviewer: *So like, the actual construction of it.*

Yeah.

It's a challenge – you've got to prove to yourself that you can do it 'cause if you can't then you just flop – like if you can't do it, don't do it then everything just falls on top of you – not literally (laughs)

Learning and enjoyment

Perhaps partly because the activity was part of a day focusing on Citizenship at the school, the students at one school focused on how they had learnt to work as a group:

Interviewer: *So if I said what have you learnt?*

About nuts and bolts and how to cooperate in a group

What I learnt was don't try to take charge because it's not going to work (laughter)

It's difficult you know, but if you work as a group...It's not like one brain – you've got five other brains working together.

However, students in the other group also commented on learning about working in a group as being significant to them:

You can show off your skills as working in a team ...working together and building it

Several students commented that 'working as a team' was an enjoyable aspect of the session.

Students were less clear about what they felt they had learnt specifically about engineering or about the school curriculum; only one student commented on this:

I've learned about climate change but we already knew that. You know – like, science – you get a lot from science.

Another student said that she had learnt how important it was to use her time effectively:

Time – that time can be your worst enemy – 'cause you don't have enough time to do something – to finish.

The video that was shown at the start of the session was commented on:

...the video – the video was quite umm, 'cause obviously we know what's happening, we see people and we know how the nuclear energy – how it affected people – like some people had like? - I can't describe it

The video clips made me want to cry actually

Several students talked about enjoying the practical and active nature of the activities:

it's active – you get to make something

Interviewer: *So would you be interested in doing more stuff like this?*

Yeah – I liked construction.

I wouldn't mind. It's a good practice.

One student talked about enjoying proving that girls are good at construction and feeling a sense of achievement because of this:

Girls can build stuff – girls actually have the experience to build stuff as well - engineering – it's great actually, it's a good feeling

The students at one school had worked with student ambassadors. They talked positively about the role that the ambassadors had had in supporting them and in developing their confidence in their ability to succeed in the construction – this seemed to be important in enabling the students to get started:

When you've got good ambassadors – like our ambassador is really helpful – he just seems – he tries to make us do good – first we thought like, we can't do this and we were just sat there and he says – yeah we can and he helped us and that's why we got all our work ready.

Ours has been really helpful... - like we were focussed from the beginning like – 'cause I started doing things – I don't know 'cause I always start being the bossy one and everyone thinks that is okay and they let me be the bossy person but he helped start us off.

However, one student talked less positively about her ambassador who seemed to have been less outgoing in his approach:

Our ambassador has been letting us just sit there and talk all girly stuff and he has not been saying nothing – it's weird that he just keeps so quiet.

Present during this activity were three male ambassadors and one female who was again quite quiet and reserved in her interactions with younger students.

Wind Turbines: Students' Engagement with the Environment

Students' responses to environmental issues were interesting. While they accepted the importance of environmental issues, it did not appear to be a topic they had ever fully engaged with:

I've learnt a lot about wind turbines – I didn't know they even existed

Interviewer: *Are you interested in environmental issues? Is that something that...*

Yeah it's like something that's going to affect you – I don't quite know.

While one student talked about how she tried to do 'stuff that we can do' she did not seem to view herself as someone who was empowered enough to have an impact on what happened in the future:

I don't want our future generations to be destroyed because of us so I try hard to do right, like cycle and that sort of stuff that we can do, I try to do.

Interviewer: *So is that something you ever think you'd like to – you know jobs and career*

It seem too environmental to me – I can't stand it like – it annoys me. I'd try to make future generations better but I couldn't stand it – I couldn't do it every day – that would annoy me – seeing rubbish on the floor and seeing people not doing this – it would start annoying me after a while.

Interviewer: *Yeah – I see what you mean – so you think it's better not to get involved.*

Just do our bit... I just don't want to do it every day. I just want to do my part.

Another student talked about how she felt she had to take some responsibility but her acceptance of this was reluctant:

I would have liked to say that – I don't care – I don't even think about it - but like you have to think about it 'cause you know it's going to affect you as well.

However, while these students were prepared to accept responsibility for their own behaviour they seemed defeatist about the possibility of changing other people's behaviour:

Student 1: Now you've got kids that don't care and you've adults that don't care – no one cares any more.

Student 2 Some of us do care but it's just too late.

Student 1: It's too late. Even if you started making a change now – it's everything has changed already so like, we should have started making a change before...

Yeah – we have got used to our life styles. Changing now is not going to help.

Impact on orientation to engineering

While students did not make any negative comments about the activities – they were all engaged, focused and positive – it is interesting to note that despite this, the lasting impact may not have been so beneficial in terms of encouraging students to develop a positive orientation towards engineering.

Student 1: I wouldn't want to make wind turbines when I am older 'cause they are so hard.

Student 2: (laughs) Exactly, hard work and just think about it – now they are making us do this, this year – imagine what they are going to make us

do when we are older. Now it is just wind turbines it is going to be something even, I don't know – more difficult.

Entrenched antipathy to aspects of school science also appeared to impact on students' lack of confidence in approaching the task and their experience of the construction task itself had done nothing to alleviate this:

Interviewer: *What do you think about wind turbines now that you are in the stages of building?*

Student 1: They're confusing (laughs)

Student 2: I hate anything to do with electricity - I don't get it

Student 3: I don't understand it – anything to do with electricity and we've been told to make that and that product and that produces electric and I just don't have a clue what...

I had to go and look for an example and get some idea but I just didn't get it in my head. In school it's things like woodwork – it's not like electricity.

Student 1: I don't see the point of any of it 'cause it's so confusing like I think we should just leave the job to the scientists 'cause it doesn't look like we are going to get very far with our little ones. (laughs)

One girl commented 'engineering's a boys' subject'.
(These students were in the top two sets for maths and science)

Summary

Students said that they were motivated by the prizes; the accessibility of the task; the competition and the challenge posed.

Learning about and enjoying working as a team was discussed by most of the students in the focus groups. Only one student commented on learning about science, though several talked about their enjoyment of the practical nature of the activity. They also talked very positively about the student ambassadors; particularly in relation to how ambassadors had developed their confidence in approaching the task.

The students engaged with the task of building wind turbines were engaged with the issue of climate change but only to a limited extent: they seemed to feel disempowered and did not believe that they could make a difference though they were prepared to moderate their own behaviour.

While students were positive about the challenge posed by the task in terms of motivating them during the session, the construction task, if anything, only seemed to have entrenched their view that engineering and science was too difficult for them and that they should 'leave the job to the scientists'.

Teachers' Views

Contributors

Teachers involved in the STEM days in 3 different South and East London schools were interviewed about their experiences of STEM days: 1 chemistry teacher, 1 DT teacher and 1 head of citizenship.

The teachers echoed almost exactly what the students themselves said about what made the day successful, what motivated the students and what they enjoyed.

Motivation

Like the students themselves, teachers talked about the 'challenge' of the activity and how this motivated the students:

...it's a challenge to make a strong structure and they realized that they could do it

...the girls loved doing it and the challenge of it

Also mentioned was the competitive nature of the task and how this focused students:

...it was highly competitive.....the competitiveness kept them on task...they were really engaged

One teacher commented that this would have been even more effective if other schools had been involved:

– it's good to have different schools so they are competing against other schools – it brings their competitive edge out

Learning and enjoyment

The teachers talked about the practical focus of the activity being key to making it enjoyable for the students and in motivating them to work.

...the girls are really enjoying it...I like the fact that they are practically heavy – without that the girls wouldn't enjoy it so much: the girls love it – they love the practical side of it

They also talked about how important this practical focus of the task was to the students' learning; how it developed their ability to problem solve and to work independently:

...it's practical – using problem solving skills.....they were learning through doing

...it was really good to hear them taking the time to plan...developing independent ideas about things

...they were using a side which is more creative and we don't do enough of it...here they were following a plan – imagine what they could do on their own

One teacher commented on how much more focused and alert the students are outside the classroom:

...being out of school helps a lot ...they are more alert out of the classroom

One teacher, talked about the careers day to which a fieldworker had contributed and the benefit to students of having access to people with specialist knowledge:

...it's useful for me to get specialists in their areas and sharing their knowledge with the kids

She also talked about how it is important for students take on a new role by, for example, using props and dressing up:

...it's good if they bring things in ...the army bring in hats etc. so kids can get out of role of being a child in a classroom...and it's fun for them

Teachers talked about how the work contributed to students' communication skills and to their being able to work in a team as well as how the activities facilitated achievement for all groups; regardless of their ability:

...they develop their communication skills and the ability to work with other people and different tools

...it was pitched at the right level – every group created something and get a sense of achievement out of it

Teachers also commented on how the session will benefit the students because there are curriculum links – though teachers' discussion of these links was not specific:

...it links with DT – they'll all bring ideas back, which will crop up somewhere

...it's useful for them to have extracurricular activities that will link up to the curriculum – it enhances and enriches their learning

The video was also commented on as being powerful:

...the video clip was good...it makes you think 'oh my God – this is what is actually happening in the world

Organisation and presentation

Teachers were very positive about the way the day was organised:

...it's well resourced

...the day's outstanding – it's well run and well resourced

They also commented on how effective the presentation was and on the way the fieldworker engaged with students:

...he has a very good approach with the kids...he was very clear about what he wanted them to do

...it was fab...it was really good...very engaging.....he was very encouraging and calm

One teacher was appreciative of the connection he had established with the fieldworkers and how he was kept informed:

...I'm in constant touch with the fieldworkers

Who attended the sessions?

The two schools had different approaches to selecting students to come on the STEM day. One teacher talked about how he deliberately selected G&T (Gifted and Talented) students:

...I started by picking gifted and talented girls who like DT – there are always classes for the less able but I sometimes think the G & T students aren't pushed enough

A teacher from another school had slightly different criteria:

...the group were just the first to get their slips back – they have to have some interest in science but they're not necessarily the high flyers

Teachers' Motivation for getting involved

These two teachers also had some quite different motives for their own involvement. One discussed the problematic nature of organising trips and how many teachers do not want to take the extra work on or the responsibility for the children while they are out of school:

...there's a lot of organisation I have to do – lots of teachers don't want to organise trips - they don't want to have the responsibility

He talked of his own enjoyment of the days and of the importance of 'giving the girls different experiences' as contributing to his decision to organise trips. He also talked about how his involvement with the LEP had been good for the school in terms of publicity:

...I was given a phone number and a link name...I found the number in my pigeon hole and I rang it...the school is very happy as long as it doesn't impact on teaching...it's good Q Dos for the school – there was a double page spread in the Design and Technology Association with pictures of the girls in it

This teacher has been working with the LEP for some time and is keen to become more involved. However, there seem to be particular issues affecting organizing a club for the girls at his school – parents do not like their children to stay late at school when it is dark in the evening:

...I plan to run a YEC but parents didn't want girls to stay behind after dark so I'm waiting til after Easter and after SATS – I can focus on the girls who have chosen the subject but the club will be open to anyone who wants to get involved (not just Year 9) ...then I'll start it again in September...but it's just the way it is at the school – parents won't let them stay late

The other teacher had had less contact with the LEP. It seemed to be the particular focus of the activity that had appealed to her:

...it's relevant to what's going on – global warming is currently in the news ...this is something I want to be involved with – I want to make a difference

I'm motivated by my personal feelings – the importance of the environment – they're going to inherit control of the planet

She also discussed some of the factors that made organising trips easier: having 'enough notice' (approximately 1 month); the trip is for groups of thirty so that a whole class can attend; the subject matter matches the curriculum.

Summary

Teachers echoed students' own accounts of what motivated them and what they enjoyed and learnt during the session. Teachers felt that students were motivated by the competitive nature of the task and the challenge posed. They commented that the active and practical nature of the task made it both more enjoyable and promoted problem solving skills and independent learning. Also talked about was how students learnt to work in a team and how the tasks allowed all students in the groups to achieve. One teacher commented on how useful it was for students to take on different roles to that of pupil in the classroom. The video clip was also commented on as contextualizing the work in a powerful way.

Teachers were very positive about the way the day was organised and resourced and about the fieldworkers own manner and presentation skills. Also commented on was the valuable connection one teacher had with the fieldworkers at the LEP offices.

The reasons given for the teachers' decision to organise the trip were very different. One teacher was motivated by her personal values – she felt it was important for students to learn more about environmental issues. Another teacher talked more generally about the importance for pupils of going on trips and having 'different experiences'. One teacher had selected only G&T students while the other allowed open access to all students.

The Residential Courses

Students' views

Contributors

Yr 9 - 2 BME girls (Turkish - top set Science and Maths/ Ugandan – middle set Science/ Bottom set Maths)

Motivation

Both of the students interviewed said that they had been approached by a teacher about going on the trip; both girls are interested in and enjoy science and see themselves as successful in science at school.

It is also interesting to note that the students expressed some misgivings about going on the trip: they both particularly mentioned feeling concerned about meeting new people:

Amina: At first I wasn't sure because some of us – I had never been out of London and university just being too much – too big. There were different people of our age and we were going to meet them and we don't know how they are – are they going to be good to us – bad to us – arguments but it was more than good.

Janine: I felt nervous – ‘cause I just thought it was people from my school so I felt alright but when I went there and I saw these people and I thought all these people – what are they doing here so....

Enjoyment and learning

While both students clearly thoroughly enjoyed the residential course, both discussed finding the planning exercise on the first day less enjoyable than the activities on the following days; this appeared to be largely due to their being allocated to new groups consisting of other young people who they did not know. Both girls discussed finding this difficult initially though, certainly for Janine, the group quite quickly became familiar when they started working on the task:

Janine: The global warming – Iceland part was boring. I probably think, like, because they just gave it to us, like - they weren't really assertive when they gave it to us, they just said like here – read it and we all just read it and everyone just looking around the room and then until they actually gave us a proper task to do then people started talking and getting more comfortable and, yeah, people weren't shy any more but I'm lucky I'm not shy and I can talk to people.

The social aspects of the trip were clearly important to both students. Janine commented that a lot of her peers viewed the trip as essentially an opportunity to socialize and have fun and were initially unimpressed by the work focus:

Janine: After the presentation and working, kind of thing, most of the people kind of were, not bored but they were kind of tired – we went on the trip to work actually but people thought it was just to have fun and so - we had a bowling night and we went on the coach to the bowling centre and then we just mixed with everyone and that's how we got to know each other.

The disco was criticised because of the music that was played; it was not the sort of music that students listen to themselves so they were unwilling to dance – however, it was still described as ‘fun’:

Janine: I think that was the worst night that – it was fun but... I wanted like something that you could really dance to

Janine talked very enthusiastically about the formal dinner. It is interesting to note that she actually had not taken formal clothes with her because she had not viewed this as important or something that she wanted to be part of. She appeared to be impressed by the dinner and genuinely surprised by her enjoyment of it:

Janine: The dinner was actually cool. I thought that was really, really good. I was like Wow – there was like waitresses and stuff and it was a three course dinner but there was one person who was stubborn and wanted corn flakes and he ate corn flakes but after that... he nearly spoilt the day but other than that ... and everyone dressed up to the nines and

... Everyone dressed nice. I could have cried 'cause I, stupid me, you know it said you had to have formal clothes for the do. I thought why should I bother – nobody is gonna – like look at it - and people came in dresses – all dressed up nice and in suits and I'm thinking oh, Janine you've done it haven't you – but luckily there was something there for me and in the end it was really good.

... it was so posh like – wow – seeing everybody dressed up like that and we had fruit for starters then we had the main thing and then we had dessert and the way it was served was really nice - I thought it was really nice. I don't know what it was about I but I thought it was really cool.

Meeting new people appeared to be an aspect of the trip that both girls enjoyed but both commented on the propensity of some students to mix exclusively with others from their own schools. This was seen as a drawback by both; Janine commented on the fact that only a small number of girls attended from her own school and so, at times, she felt a little excluded:

Janine: Some people did stick with their schools but some people did split up as well – which I think was better...

Well, you could see these big groups of girls there whereas I thought – oh I'm stuck with (laughter) No not like that exactly but you know – people that you don't even speak to you in school – like me and Amina, we're cool but we don't hang around with each other in school and like, the other schools, they had their friends with them so they were stuck together and you just look and people don't really speak to you and you feel really left out 'cause they're stuck in a big group as well.

Janine also talked about the way that the house design and building task was organised and how she enjoyed 'specialising' in a particular area; she also seemed to view having these different roles positively because they facilitated good teamwork:

Janine... that was really good because different people specialised in different things so that one person was doing interior, one person was doing exterior, one person was doing where it was going to be and why we chose that area so people did different things so that once we put the plans together it was go. (Inaudible) how it should be, like, and then we designed it.

How to work in a team and finding a role within her team was also commented on as a useful learning experience by Amina. Amina's group had clearly been less motivated and she had had to take on a lead role which she had found challenging:

Amina: I actually learned how to be a leader. In our group we had to choose a leader and everyone chose me and I was a leader for the first time in my life and because they wouldn't do anything I kind of had to sacrifice myself for them and do something so I was the leader. It was actually hard to be in the team – work with others – you don't know them and to pass your ideas around and try to persuade the other person to consider the same point as you and sometimes they're like – no my view's right and yours is wrong.

Janine's team had actually won the competition to design and build the best house. It was evident from her account that she was very proud of winning and this had contributed to her enjoyment. It was also evident that she had really engaged with the concepts involved; she talks about the groups' decision to choose geothermal energy and to use wood in the construction:

Janine: I think the day when we presented our work to the judges. I think that was the bit that was ...and like we saw everybody's work put together and you'd be amazed at how many people put their effort into it and how people could work together to present such a piece of work and the days when we actually learned who won and what prizes we got – that was really good.

...Yeah, I was proud – someone finally told us something – we had not actually made a mistake but somebody told us that we were going to win anyway because they really liked our work and because ours was like a wood house and the trees – like a proper house made out of wood and it was up in the Rockies and we had geothermal energy for the house and it was really cosy – it was a modern family and they had a child and they were professionals and yeah, but we thought that something – 'cause other people had these high tech things and one group made it of glass so if it was summer in a hot country then it would be too hot 'cause glass does attract heat a bit and you couldn't have no privacy in that home and ours was three levels 'cause - we were gonna have a basement as well but that was too long- so we had just three levels and it was really good.

However, while useful learning was clearly taking place, neither student could articulate how this learning related to their work at school:

Interviewer: What about in terms of science – did you learn anything in terms of science?

Janine: Yeah about houses having to be built – you have to think about weather ...

Amina: Yeah about location and the climate – the materials used – the shape and height of the house.

Interviewer: Do you see how that fits into your science classes or

Janine: Biology – I would say. Like if we produce global warming or – actually if I did geography it probably had a lot to do with geography – a lot – I think people who do geography should do that trip but for science I think that maybe if we were to do something on global warming, you could see that what some – actually I don't know.

The trip seemed to provide both girls with a useful insight into the reality of being away from home at university. Neither girl had ever stayed away from home in a room on their own before, and both seemed to find this experience daunting but it was also one that they enjoyed and were challenged by:

Amina: It's hard – being away from my family and thinking about them – being in your room -looking around the wall and having nothing to do – just working. It's quiet – like no one's there and you have responsibility and you're by yourself and you have to be mature in what to do.

Juliana: Well first of all I thought it was the biz 'cause whenever there's a school trip – you're with school for a couple of days – you're always sharing a room with somebody and like, this time I was by myself and I got really scared 'cause I don't like sleeping by myself in a foreign place or a place where I have never been before so yeah but I thought it was really good ... and on top of the bed where I was sleeping was a calendar of when they have to pay their bills and what's happening. It seems fun but it also seems hard at the same time.

Students' Responses to Environmental issues

It is interesting to note the two students' attitudes to the environment. Amine, whose family are professional and HE educated, was engaged with the issues and seemed interested in having a role in making positive changes:

Interviewer: By the way, is that global warming issue – how do you feel about that - is that something that is important to you?

Amine: It is very important... I don't think people understand the importance of it because our environment is about us living and the animals – the climate changing and then all the reasons for this. We have to come up with reasons to prevent it...

Janine's response was far more ambivalent. She accepted the importance of the issues but, as with the students on the STEM day, seemed to feel disempowered by it:

Janine: It is actually but it doesn't appeal to me. It is important but ...

...I think it is more to do with population like there are more people in the world – like people are producing more children and unless – they need more areas to build farms and stuff like that so that once a farmer is finished with that place then it won't turn into a desert or something and then you know, they move onto the next place – like deforestation and stuff.

...

Interviewer: Is this what you said to me was important about a job? So is it something you would be interested in because you didn't sound so

Janine: Yeah, alright but like where we are living - in the flats everybody motors there but nobody is bothered about it so if they're not bothered why should I be bothered?

In contrast to Amina's parents, Janine's family are in a lower socio-economic group; the following exchange between the two girls illustrates how differently they appeared to feel in terms of their ability to have an impact on such a global issue:

Amina: Yeah if you'd be bothered then things could change and you could be the one. If you don't be bothered, if I don't be bothered then everything is going to be worse.

Interviewer: So you just feel like you can't change it?

Janine: No I don't think I could - get one person – 'cause you see so many people- even the prime minister -in government, like, and they are trying so hard and it's not working – they're trying to make new solutions but they're just – it's not doing anything.

Amina: They should work harder then.

Summary

Both students had attended the residential course because they had been approached by a teacher. Both students were also concerned about being somewhere with a lot of other people they did not know.

The students thoroughly enjoyed the trip; part of this enjoyment stemmed from meeting new people though, at times, both girls described feeling excluded as they were in a small group compared to groups from other schools. The formal dinner was especially commented on as being a memorable occasion – the disco was viewed less positively because of the choice of music.

The house design and building task was viewed very positively. Both students commented on how it had helped them learn about teamwork and there was evidence from the discussion that they had also absorbed important concepts related to the project. However, they were unable to make links between what they had learnt and their work at school.

There was a marked difference in the attitudes of the two girls towards issues related to the environment. It is interesting to note that the student from a professional background felt much more empowered than her counterpart from a lower socio-economic group.

YEC

Fieldworker's perspective: issues raised

The importance of the YECs and the need for them to be constant in schools is an evident part of the LEP plan. The LEP coordinator expressed some concern over whether this was actually the case in some of the schools; she identified a school where the YEC had stopped because the teacher no longer wanted to run it. She explained how she felt this to be a key commitment on behalf of the school and something that needed to be monitored.

The coordinator identified one problem as being the lack of a clear contact within the school:

...in some of the schools we're not working with aimhigher anymore but having someone with time is important...where there's none with time it's problematic

She also identified the need for the subject matter covered in the clubs to link to the national curriculum.

The fieldworker responsible for the YECs described how vital the club leader was to the effectiveness of the club:

...the club leader makes the club...some push kids to come along but if they're laid back and don't push them...kids tend to forget and get distracted...

He also described how important it was for him to 'build a relationship with club leaders'. He commented that some teachers had approached him about being paid; he felt that this was contrary to the spirit of the club:

A few of them have asked for money...if they're not doing it out of the love of doing it, I don't want them as my club leaders

The coordinator identified the need for some incentive to encourage teachers to commit to running the clubs.

Summary

The LEP coordinator talked about need for careful monitoring of the clubs. Both the fieldworker and another contact within the school were identified as being important in this.

An energetic and committed club leader who can motivate pupils was identified as being vital to the success of the clubs. A number of club leaders had approached the fieldworker about payment and the coordinator acknowledged the need for an incentive for teachers to run the clubs.

Students' Views

Contributors

Focus groups were held in 2 South London Schools: 2 Yr 8 boys (1 in set 1 for maths and science and 1 in set 3) and 3 Yr 9 girls (all in sets 1&2 in science and maths). All 5 were BME students: 1 Albanian white male; 1 black British male; 1 Moroccan female; 2 Nigerian females

The average weekly attendance in one school was between 10-15 and in the other 3-10.

Career planning

One student had, from a very young age, identified engineering and science as a career path. His mother and father both qualified as engineers in Albania; his grandfather was also an engineer. His career plans linked very closely to their roles in the army during the war:

Greg: Yeah, my Dad he was a former army engineer. Do you know the battle between Kosovo and Serbia he was an engineer for Kosovo. My Mum's Dad was the same when he was in the army – my Grandad - my

Dad's Dad – same but my Grandad died unfortunately in the war because everyone had to go – age fifteen – everyone had to go

Greg: I want to mix science and engineering together sort of like an astronaut or something like that just to show how brave I am and so one day I could join the navy and do something for them and help my country or something like that

He also discussed being motivated in his choice of engineering and science as a career by a particular activity he had been involved with during Science Week during both primary and secondary school. Each year there had been a competition to build a rocket:

Greg: When we first started in year three - and then we progressed to making by wood. Then year five – iron and then year six – aluminium and in year six and in year seven that we just did we did how high it could go with pressure with the heaviest equipment that we've got

There were various threads to his clear engagement with this activity. One was the competitive element:

Greg: I won two years - I lost when it came to the aluminium.

Clearly success and winning contributed to his enjoyment of this activity. He also talked about working in a group; his account of taking the lead in his group also seemed to provide him with a sense of achievement:

Greg: ...we had a group of three people...they were saying – oh what shall we do – 'cause they panic too much and I just stood up a rocket, a water bottle with some strips or triangle and then we put it on the floor like that and we progressed from that...

It is interesting that Greg was able to recall close details of this activity even as far back as when he was in Year 5 at primary school.

Several of the girls interviewed during stage 1 of the project talked about wanting a career in medicine or a related field; Tarok talked about this as well as other popular careers – she herself was aware of their popularity:

Tarok: ...I decided to be what most people said they would be and hopefully I will be it – a doctor or a lawyer or business woman

During the students' accounts of what motivates them in deciding on a career, money was discussed; particularly by the two boys:

Greg: I want a very good paying job. Astronauts get paid like a hundred

Daniel: Or two hundred or a hundred and fifty

Greg: No two hundred per hour because ... Astronauts get paid two hundred a day or an hour.

Daniel: Well paid

The female students also talked about money but their accounts did not suggest that this was their primary consideration:

Salama: at first I wanted to be an artist – then I realized that it was a rubbish job and I wouldn't get any money

Hadara: ... I know you have to practise them to become good at it and it's not like you can become good straight away and being an interior designer – it sounds like a long time ago now that I wanted to be that – I can't really draw things and I didn't have a passion for it – I thought let me think of something else that I enjoy that I would be good at and would make money.

Hadara: It was my parents that said that (writer/ interior designer) won't get you far or won't make you any money

Students' accounts suggested that their motivation for choosing a particular career was multifaceted. Salama talked about the importance of her religion:

Salama: ...like in my religion you can't listen to music so I couldn't be something for example – if I wanted to be a DJ I couldn't be that...like a police woman, if I arrest the wrong person...

Glen talked about wanting excitement:

Glen: It's the excitement you're supposed to have – no just locked up in an office. I need the excitement and I need the exercise 'cause I'm a kind of hyper person.

Tarok talked about wanting to find a career that she felt she was able to do; that she would be good at as well as one that allowed her to become independent:

Tarok: Not really – as long as I enjoy it, have fun and just do my best at – the job is what I can do best at so as long as I enjoy it ,earn enough money and can cope on my own then I'll be alright

These students were already in the process of dismissing possible futures; one talked about how she had decided against aiming for a career as an architect because she felt that she was not good enough at maths to be successful:

Hadara: I used to think that being an architect wasn't that bad as well but there is a lot of maths involved and you have to be really good at the subject 'cause when people struggle a bit it's a lot harder to achieve that dream.

Helping people, as found in the accounts of the girls interviewed during stage 1, again featured strongly. For Salama and Tarok this desire to help is more general, whilst Hadara's focus is to support her mother:

Salama: Well you know I want to be a journalist – well I don't want to stories on gossip and stuff, I want to something that is practical and for example, poverty – to make people pay money to projects – something that will get people involved and help other people

Hadara: My Mum – she makes really good food and then my uncle and my aunty and my sister tell her how she should she should be practising – like going to night school, getting a degree in cooking or something so she could be, like, a chef ... and I want to do little things for her that make it easier for her to become a proper cook

Tarok: Just like I want to help people, care for them and make sure everyone is well

Salama again, talked about how her religion influenced her desire to help others in her choice of career:

Salama: With me it's more to do with religion because I believe in heaven and hell, kind of thing and I believe that life is basically a test from God so I am just trying to fulfil what God has basically told me from the Koran, the holy book so that is like my guide book to life and I want to help people...

What was particularly interesting in these students' accounts was their descriptions of how the process of immigration had impacted on their outlook. Salama talked about how her mother's qualifications from Morocco were not transferable to the UK:

Salama: It's kind of like my Mum, she doesn't have like a good job... my Mum works as a cashier in a shop ... but the fact is she could have worked at something good but because she did all her degrees in Morocco where she comes from originally – it is all in French and everything but she's got a diploma and stuff but here I think they do it differently so it doesn't count.

Hadara's account revealed her mother's struggle to qualify as a carer whilst working as a cleaner and looking after her children and how she had not been able to meet her dream of becoming a lawyer:

Hadara: Yeah, my Mum wanted to be a lawyer when she was younger. She is really good at arguing cases and getting people to her point but it's always the degree again – the degree (Mum Nigerian)...she came here when she was about ten – she worked as a cleaner... from a cleaner she started doing a degree in caring and she would go really early in the morning and my older sister – she was like three or four then and my Dad was working as a cleaner and they would have to take it in turns to look after my little sister and she got a degree in caring

It was clear that these students' experiences of watching their parents' struggle, had impacted on their own ambitions and hopes for the future:

Hadara: I've always wanted job security and arguing cases and stuff – I found that interesting

Salama: Do you know what I really want? I want to grow up one day and a teacher that teaches me here – when I am grown up will say – oh I remember teaching her like – they know me as I am famous- oh not famous like everyone knows me but I want someone to see that I have achieved something. I don't want them to see me – working as a cashier – sorry Mum

However, as with the groups interviewed during Stage 1, it was also very clear how reliant these students are on the media for information about particular careers. It was interesting how the girls' choices of careers seemed to all be those with high TV profiles:

Salama: I want to be a journalist – like work in the media

Hadara: I want to be a chef and I also thought of being a fashion designer as well

Hadara: most of the time I watch CSI and then I was thinking maybe I should be a forensic scientist and then I decided that there's too much like seeing dead people or being shot and then seeing things that they go through and I thought I don't like it

However, while these students seemed quite reliant on the TV for sources of information about possible careers, they were also aware that what they see on TV and the reality of jobs were likely to be very different:

Salama: Also characters on T.V. impact on what you want to be like – when I was really young, about five or four, I used to like Ginger a lot and she was a cleaner so I wanted to be one of the dustbin ladies – yeah

Salama: The media impacts on what you want to be. You see it as fun - they don't show the bad bits to it – they might show a few but it is always sold like that so people just think it's going to be like that...

Tarok: And the ones they do on T.V. aren't the what they do in real life 'cause T.V.– they just make it up ... like some cases are still going on now but on TV somebody's diagnosed ...but really they still haven't picked it up but you wouldn't think thatIt's definitely different from T.V. to real life.

As could be seen in Emmanuel's account in stage 1, many of these students' parents are very supportive of their progressing to HE. In Greg's case, this is apparent with his mother already attempting to save to enable him to go:

Greg: Yeah. My Mum has already started saving seven hundred or something pounds

Greg was also aware of particular HE institutions, though his knowledge was very localised and he could not yet differentiate between HE and FE institutions:

Greg: Lambeth College and South Bank University is right outside my door.

Interviewer: Have you heard of any other universities?

Greg: Yeah - I have heard of a place called South Thames

Greg talked about his mother's achievements at university; this seems to relate to Greg's motivation to study. However, her knowledge of a different system clearly does not provide her with the experience and knowledge of the UK system necessary to provide her son with an informed perspective about different institutions:

Greg: My Mum did – she studied engineering just like my Dad. She was the top of her class. Five years.

Interviewer: Where did she do that?

Greg: In Albania – University of Albania in Tirana.

Scientists and Engineers

As with the students interviewed during stage 1, these students' descriptions of scientists were very stereotypical and, again, distinctly lacking in glamour. However, Hadara's perspective is slightly different; she talks about how much money they earn:

Salama: Big glasses, white coat.

Tarok: Laboratory, white coats, does experiments.

Hadara: And a lot of money.

Having described a stereotypical scientist – ‘geeky’, ‘white coat’, ‘standing up hair’ – Greg then goes on to say that he would like to be one:

Interviewer: Would you see yourself as one of those (scientist) – geeky with black standing up hair?

Greg: Yeah.

Greg again described a stereotypical engineer and, again, identified himself as one:

Greg: An engineer is a person that’s filthy, greasy ... One that does most of the work and the one that designs most of the stuff and makes them himself. A person that practically owns his own business – like me. He started off with tiny bits of money and he makes it huge – filthy rich.

Whilst Greg’s self alignment with engineering and science is not surprising, given his family history and his own long held ambition, it is interesting to note that the other students I spoke to, whilst by no means focusing on engineering as a clear ambition, seemed more positive about considering engineering as a possibility for the future than the students interviewed during stage 1:

Daniel: I wouldn’t mind being an engineer

Interviewer: What is it about engineering that’s more appealing?

Daniel: It’s fixing

Salama: My brother – he’s not my brother but like my Mum’s brother’s son – ‘cause he’s really close – but anyway – he wants to be an engineer – he’s training for it and everything but if I learned this I could show off to him and say to him – oh yeah, you need to do this and that and help him out and stuff.

Interviewer: So you like the idea but you wouldn’t want to be an engineer?

Salama: Not so much. It could be like a back up job – a second job – a backup. ‘Cause I can’t just focus on that...

Tarok: Yeah, if you don’t achieve it (dream job) what else are you going to fall back on? It’s useful to have different types of degrees.

One student, who had no family background or connection with engineering, seemed to be quite aware that there are a range of jobs in engineering:

Tarok: When I think of science or engineering, I think of mechanical stuff or electrical stuff – like electrical engineers or chemical ones.

Motivation for joining the club

Students' motivation for joining the club varied. Greg was actually so keen on engineering that he had asked his teacher to set up an engineering club even before the LEP initiative started.

Interviewer: *Why, what made you want to come? (Pause) You asked sir to start a club?*

Greg: It's not only for my own benefit but also for others – for their own future.

Greg also described how he had been attracted by the slogan used in relation to the club:

Greg: There is a slogan...Come to the engineering club and your future is bright.

... If you don't – get lost. No - if you don't the world is no better.

Interviewer: And what was it about that that made you think – yeah, I'll come.

Greg: It was just that the future's bright. When there is a word bright not dark – like? I just came.

Daniel, the other Year 8 student, explained very simply that he had joined the club '...cause I like to make things... I like to build things for myself'

Daniel: I like using the tools

Both these students had been to and seemed committed to attending the club for the foreseeable future:

Greg: No not all year – 'cause it continues through to year nine as well – all through.

Interviewer: So you want to go all the way through. And what about you - will you go next year?

Daniel: Yeah.

The three girls had heard a presentation made by members of the LEP team during assembly. They talked about being motivated to join because they were told the clubs would include help them with other subjects:

Tarok: Three people came from South Bank University and talked to us about engineering, in assembly and so I found it interesting and the thing is, they said that it includes science, technology and maths - and I thought if I knew all of them together it could help me.

From Salma and Tarok's accounts it seemed that their decision to attend was a result of a combination of hopes about what the club would offer. As with the students interviewed during Stage 1, they both liked the idea of going on trips.

The promise that it would help them with their science, maths and technology was also valued, as was the idea that it would help them in a more interesting way than a straightforward revision lesson:

Salama: I'll be honest yeah – the thing that made me join it – it was like stuff in that could help you with maths and science and stuff like that so I was thinking that was a good tuition lesson – two in one and then I heard about the trips and then I thought – that's it definitely – I'm going.

Tarok: And with me, my science teacher was saying that actually there was the science revision club and they said that would be there but ... but I didn't want to kind of be repeating ...that level of work that I understand so I thought this was really good ... get to understand the work and there might be some trips involved – combine maths and science.

Salama: Combine subjects.

What students say they enjoy and learn

All the students were unanimously positive about what they did in the clubs. They described all the activities positively:

Interviewer: So, what do you think then about what you've been doing in the club- what were the best things – what things have you really liked?

Greg: Everything.

The two boys particularly mentioned as enjoyable the competitions. Daniel talked at various points in the interview about a car he built during one of the club sessions:

Daniel: Ones where we did competitions...

When my car was so wobbly ...My wheels were so well placed - they were wobbly...: I almost won. – I was really close to winning

...that car I made it was almost beating the girls. That's why it came second place.

Greg: True.

Daniel: People wanted to beat me but no one did.

Daniel is not as academically high achieving as the other students interviewed, and it is evident how important to him this particular success was – perhaps such a success is a rare experience for him during his school day.

Greg also talked about a particular competition when he had been successful – though from both students' accounts it was clear that the winners of every competition was the group of girls in the club:

Greg: There was another favourite bit last week. With the equipment that we had we had to make a high standing thing to hold a ball and the girls

beat us again. Mine came up to there and the girls came up to there – they put wood on wood on wood – they cut it into tiny bits but I just put a nail on wood and paper and then put another nail on and had a tiny bit of wood left over. The girls made a holder but I forgot to make that so –mine stood but it almost broke down didn't it? ...

Greg: I can't believe the girls always beat us

Daniel: What about the time we were trying to make radio controlled cars?

Greg: Yeah, yeah...we only had wood. Again the girls won.

Daniel: I think they were cheating.

When asked about what else they would like to do in the clubs, the two boys talked about quintessentially boys' preoccupations – building a car and building a rocket:

Interviewer: And is there anything that you would like to do that you haven't done?

Greg: Yes – cut down a real car – just strip it and put it back together.

Daniel: Build a rocket

The three girls talked particularly about building a bridge. Salama talked about how much more memorable and enjoyable it was to be actively involved in building than being told about a subject during a lesson:

Salama: This kind of makes learning fun – a bit – because you don't want to sit there playing – watch a board or a teacher saying something on and on and you just don't get it – you do practical. You'd remember it – like, for example, the bridge thing – I remember from making the bridge – if someone had told me that – I don't think I would remember it to this day.

From these students' accounts it was interesting to note that they had drawn their own conclusions about what skills were needed in engineering from this activity – though they had not been asked specifically about this:

Salama: It makes you think and lets you visualise and stuff like – you've got to be practical 'cause we learned that when we were doing the bridge ... you've got to do it exact accurate ... not even one centimetre out of place 'cause then you've fallen down the bridge – you're dead. You've got to be practical and it makes you think more – it's not straightforward – oh, I'll just build a bridge – I'll just follow instructions – you've got to add your bit to it.

Tarok: I think you've got to have a bit of imagination as well 'cause you need creativity to build things but then of course then the hard work has got to come in – all the measuring, all the nuts – make sure everything is okay.

Hadara: Make sure everything is okay – ‘cause if you don’t think of something ... everything could go wrong.

It seemed that by attempting to build the bridge these students had identified the need to measure very carefully and work through solutions; the task set, had motivated them to do this and they understood what they were doing and why. Salama talked about how useful she felt these skills would be for life generally and not just for ‘maths and science’ – a statement which in itself suggests how disconnected these subjects are from real life for this student:

Salama: And also I liked the fact that it will help you throughout life to learn stuff like – as in the bridge thing obviously, - it makes you learn stuff – you don’t need to learn it for maths and science, for example, it could help you just know it as a fact for life ...

Greg suggested that he felt like a real engineer or at least was being given an insight into what they do:

Greg: We get the experience of how real professionals do it.

Greg also talked about how he had tried to use his knowledge from his science lesson in one of his constructions at a YEC session:

Greg: Yeah, I used science to do a hot air balloon ‘cause we had finished a project early and I had to make a balloon. So I thought of the gravity – Einstein’s law of gravity. There was three laws of gravity – one - how high it can go, two - how fast it can drop and three – I’ve forgotten that one. I thought about it and that’s what gave me the first - ‘cause no one ever thought of Einstein when we came in and Einstein is law.

Interviewer: So you are thinking of that when you are making stuff.

Greg: Yeah.

Summary

Students’ parents, activities at school, the media and, particularly for the girls, the desire to help people had all impacted on these students’ career aspirations. The boys identified money as being important but all the students in the focus groups were aware of the benefits of a good income. The stories some of the students told of their parents’ struggles after immigration had clearly impacted on their outlooks. All these students were attempting to make plans but seemed to lack accurate and detailed knowledge about particular jobs. Students’ accounts

revealed that parents were supportive of their progressing to HE but not in a position to provide practical guidance and support.

Students' ideas about scientists were, as with stage 1, stereotypical. However, these students seemed more positive than the students in stage 1 about engineering as a potential job, though this was only a clear ambition for one student.

Students' motivation for joining the clubs varied: one student plans to become an engineer himself; one talked about being motivated because he likes 'making things'; a group of girls were motivated by the prospect of trips and the promise that the clubs would help with science, maths and technology.

The students were unanimously positive about the activities done in the clubs. The competitive nature of tasks was identified as enjoyable - particularly by the boys. The active nature of the activities and learning through practical work was discussed by all the students. Also mentioned was the insight gained into engineering as a profession.

Teachers' Views

Contributors

Club leaders from 3 South London schools.

NC links and the challenge posed by activities

Teachers had different views about the appropriateness of the challenge posed by activities. One club leader talked about how he felt the material was not sufficiently challenging for KS3 work:

YEC falls into KS2 level...that's about it...I'd like to see something a bit more challenging
 ...KS2 is quite demanding...we need to progress the children through KS2 to KS3

However, this view was not held by all the club leaders. One commented that he felt it was 'appropriate for KS3'. Another felt that the challenge was appropriate for the students though activities could be made more challenging as the year progressed:

...the activities are fine for this level of student...as you go through the year and they develop the skills you could make it more challenging

This club leader also felt comfortable with identifying links with the NC and explaining them to the students himself when appropriate. This confidence may, in part, be due to the fact that his own background is in science and engineering:

... not all activities link – some of them are linked – and it says in the booklet how it links to the curriculum area...sometimes the students don't see it immediately and I need to point it out and help the students to link the activities to the curriculum...
...I print out the sheets for each activity and give them to the students

Another club leader commented that he would like to see clearer curriculum links:

...it would be good if activities could be linked to KS activities done in class – so that they can build on and develop their knowledge

Also commented on was the need for more material in the activity boxes:

there's a need for more for the whole year...we've gone through all the activities except one and we're only just over half way through the year

What students enjoy and learn and ideas for improvements

Teachers all commented that the activity boxes provided were 'a very useful resource'. Various benefits to the students were commented on. The benefits in terms of facilitating team working skills were discussed:

...it gives them the opportunity to do activities in a team and to develop their team working skills

Another benefit of the activities discussed, as commented on by the students, is their difference from activities done in the classroom during lesson time:

...the activities are not normally done in a classroom setting – they find it fun...it also requires that they develop the skills of working with limited resources

One teacher talked about the benefit of being in a particular role and learning actively about how something is done:

I gave them examples of bridges over the Thames and told them that they were in that position and that they had to build a bridge...it's active learning – they can see how it's done – they are in the position of someone who did that work

Other teachers also commented on the fact that the activities linked to the real world of engineering:

...and gives them exposure to what goes on in an engineering setting

...it's getting them to know what engineering is about

However, one club leader said that did not plan to use all the activities and that, while he valued the material provided, he often supplemented the activities to make them 'more interesting':

...there's some stuff from the YE activity box that I don't do

...the kits are well thought about – nothing is ever missing but I diverge to make it more interesting...remote controlled cars...but I need more material and I'm running out of ideas...there's only so much I can do

When we discussed what would improve the activities, there were various suggestions. One idea was to produce video footage to make the link with the real world of engineering more explicit:

...access to video resources to show what happens in the engineering industry would be useful – building a bridge in a real life setting – a sorting machine in a factory – so that the students can see the real life application

Another suggestion, that would benefit students in a similar way, was to organise trips to industrial settings:

...it would be useful to bring people in to do activities ...to organise a visit to industry to see the processes that take place – that enables students to better understand what's going on

Attendance and who comes to clubs

The clubs vary in size and how established they are. Both schools have well established clubs. The school with the largest number of regular attendees has 15 students attending, though the club leader decided to recruit Year 8 pupils rather than Year 9. The club at another school has a smaller and more fluctuating membership with between 3-10 girls regularly attending; some students were asked by teachers to attend other revision/ sports clubs:

...the students are all middle to high achievers – some students now have to go to SATS booster classes – so the numbers in the club fluctuate from week to week

The club at the third school was, during the times of my visits, only just starting and had totally different students attending during the first two weeks.

Teachers, like the students, commented that students were attracted to join the clubs because of the promise of school trips and that the promise of trips affected the number of students attending:

...initially a lot of students came because they wanted to go on the trips – every time a trip is mentioned they come back because they want to go

Two of the club leaders said that they felt it would be useful to target other years with the clubs:

...the activities that the fieldworker sent ...– it's appropriate for KS3 but I would like material for KS4 and for 6th formers

One teacher commented on how useful the types of activities done in the clubs would be for Year 10 students; he also said that Year 10 would be an easier year to target, as there are fewer clubs for them at the school:

...there is a new curriculum for Year 10 that involves a lot of applications to everyday life/ industry – the curriculum has changed drastically and it would be good for them to see...

...if it was Year 10 I'd have a bigger group – Year 9s have a lot of other clubs

The club leader at one school talked about how difficult it was to persuade girls to attend. This also seemed to be true of one of the other schools as in the first week only one girl came but in the second week, after a STEM session for the year group, 13 girls arrived and no boys.

Teachers' involvement and motivation

This view held by the fieldworker and coordinator about the importance of the club leaders was echoed by one of the teachers running a club:

...their enjoyment all depends on the teacher...if the teacher puts their heart into the introduction it will work

All the club leaders were clearly motivated by the pupils themselves, the benefits they could see for those young people and the desire to encourage more young people into engineering:

...I love training kids – I enjoy working with them...seeing a log of girls coming in today – I'm over the moon for them...they are learning about mathematics as well

...I want to get students into that field – the country is not producing enough scientists and engineers

One club leader described how he had worked with G&T students in the past on practical engineering type activities and how pleased he was to discover the YEC:

...when I came to the school last year I worked with the gifted and talented students – I decided to use my engineering skills...I got an electronic kit and got a year 8 group to put a circuit together...when I heard about the YEC I was very happy – somebody else was getting students interested

However, there were differences between the club leaders in terms of what they said had motivated them or would motivate them. One had been asked to run the club by the deputy head teacher; the other two seemed to have been motivated by the fact that they had studied engineering themselves. Indeed one teacher seemed to be partly motivated by the fact that he was considering moving into engineering himself:

...I have a lot of friends who are engineers – I am interested in engineering –it's never too late for me to get into engineering

One club leader talked about his own enjoyment of building; his desire to work on a racing car with his group seemed to be, in part, motivated by this enjoyment:

...I enjoy building things – getting involved with computers
...I talked to David about the racing car – all the kids would like to play a part

The input from the LEP team was also valued by the teachers:

...the fieldworkers gave a lot of support initially and keep in contact – that support is important because you know that you're not alone

However, two of the teachers talked about how they would like some more specific personal benefit – financial and/or a time allowance:

...money would help ...if you told me that there's money involved

...I'd like to give this a lot of time and thought but I'm too heavily timetabled... I have to focus on the GCSEs ...

...I'd love to take the time to work with the LEP to work on projects...but I need a management point – time out ...at the moment I'm only free one period a day

One teacher suggested INSET for teachers as being useful:

...to get teacher involved you should send them on an INSET to learn about interesting projects ...how to have fun...be gender free

From my discussions with teachers it was clear that while they were motivated to run the clubs by a variety of factors, none prioritized the clubs above other work and if other work demanded it teachers were stopping clubs in order to deal with other issues. This did appear to be contributing to small numbers attending or, at least, for numbers to fluctuate week by week. I happened to attend clubs at all three schools when the previous week a club had not run; the week I attended there were only 2 or 3 students in attendance at each club. At one school the club stopped running early in the summer term; the reasons given were that the club leader had 'run out of material' and that he needed to 'focus on GCSEs'.

Summary

Teachers' views over the appropriateness of the challenge of YEC activities varied: one commented that he felt the material was not challenging enough for KS3, while another felt the challenge was appropriate but suggested that tasks could increase in difficulty over the year. One club leader also felt that it would be useful if clear curriculum links were made, while another club leader was happy to make these links himself. It was felt by two of the club leaders that there was a need for more activities in the box to last the year.

The teachers echoed the students' own views in what they identified that students enjoyed and what they felt that they learnt. Teamwork, active work and taking on the role of an engineer were all discussed as useful. The difference between YEC activities to the sort of work done in the classroom were identified as important to students' enjoyment. Suggestions were made to make the link between activities and the real world of engineering more explicit, such as through video footage.

The attendance at clubs does seem to fluctuate. The reasons for this appeared to be multifaceted. Two of the club leaders said that they felt it would be useful to target other years, particularly KS4 - one teacher identified the change in the curriculum focus, to applications to life and industry in Year 10, as making this an important year to target.

The club leaders talked about being motivated by their enjoyment of working with the students and the desire to increase the number of scientists and engineers. Two of the club leaders had studied engineering themselves and were interested in the subject. One teacher had been asked directly by the deputy head to run

the club. The input from the LEP team was also valued by club leaders. However it was clear that none of the teachers prioritized the YEC over other work and clubs were regularly postponed or stopped running altogether if other demands on teachers' time were too strong. Two of the club leaders talked about wanting some personal benefit for running the club: time or financial. One teacher also suggested INSET for teachers would be useful.

SETNET: Primary Days

Fieldworkers' perspectives: issues raised

The fieldworkers felt that teachers were receptive to the days because of links with the curriculum:

... makes sure it fits in with the QCA scheme of work...didn't seem as important from an LEP point of view but ...teachers see their time as very precious ... it's three days within term time and they need to know if it's going to be beneficial...they are more welcoming if it fits in with the QCA scheme of work...teachers are under pressure to cover the curriculum...

Both fieldworkers qualified as primary school teachers and both seem very conscious of the demands teachers are under to cover the curriculum in the primary context:

teachers are under pressure to cover the curriculum...
they want to know what is it going to do for year six – how will it benefit the children?

Like other fieldworkers, they identified that there are a lot of activities on offer to schools; they saw the direct curriculum links as being vital in ensuring the appeal of projects to schools:

...one head teacher said, we have a lot of projects from outside but we need to sift through to see

Teachers' Views (and comments from pupils)

Contributors

2 teachers in 1 South London primary school: 1 Yr 6 teacher and 1 science coordinator

Learning and enjoyment

Both teachers felt that the day was a very positive experience for the students and that they were motivated by the tasks. The pupils' class teacher said that she was surprised at how the pupils responded to, what she felt to be, quite challenging tasks

...the tasks are challenging...they are thinking around what they are doing – testing their ideas.....the kids are really motivated and really enthusiastic...I thought some of the activities were really quite challenging but they are fine with them

She particularly commented on how beneficial she felt working together in mixed ability groups was for the pupils and how useful she felt it was for students to have to work together to overcome the difficulties that they encountered – this happened without any intervention by the teacher herself:

everyone has different skills and they can bring them together as a team...
...they are working as a team...they are working together - and it starts to break down...it's good for them to see that they've got to work together

Also commented on were the opportunities for pupils to 'learn new skills' such as 'using the glue gun'. Their class teacher felt that the practical focus of the day was particularly beneficial. This was partly because it contrasted with the teaching approaches used during the day with the pupils because of their forthcoming SATS tests:

...in Year 6 we do work them really hard – there's lots of teacher input – it's nice for them to let their hair down – work in groups and do practical activities

This view was echoed by the children themselves. One said to me during the day '...you get to make things –it's better than doing literacy and maths all day'. Another pupil commented particularly on her enjoyment of being allowed to work without the constant input of her teachers:

the teachers aren't telling us what to do – it's like free Science time

However, she also commented on how useful it was in supporting the pupils' learning for their SATS tests:

the girls encourage them to use the correct vocabulary – they can retain that for their SATS
...forces – links well to the curriculum – in all SATs questions they are asked a lot to design their own experiments so all investigative stuff is really good for them

She felt that the practical approach was beneficial because it facilitated mixed ability group work:

...and they can all access it – it's not just for the brighter ones –

Another reason she was so positive about the active nature of the day was that she felt it would be more memorable for pupils and that they were likely to retain information learnt as well as because she was aware of how much they enjoyed it:

...it's all practical and they'll retain so much of it...they learn more from this than anything else – learning through doing - testing

It's practical – these kids don't do much at home – they don't get taken out so to do something like this is lovely for them

This enjoyment of the practical was echoed by the children themselves who talked about enjoying the opportunity to work independently of their teachers and to escape from their normal school subjects:

'you get to make things – it's better than doing literacy and maths all day'

'the teachers aren't telling us what to do – it's like free Science time'

Who participates?

The pupils all appeared to be involved in the session – '...the girls are as motivated as the boys' -though it was interesting to note their roles: in the group designing a bridge the class teacher noted that it was the boys who were making the columns to support it while the girls were cutting out decorative arches 'making it pretty '. She felt it was 'good to have two women leading the session'

as they provide positive 'role models' to the female students. She also commented that her initial impression had been that the day was 'a bit male in focus', however she went on to say how involved the girls were:

...but the girls have really got involved...children don't have inhibitions so they are not so worried about doing things wrong...they don't have the perception 'I'm not good at this' (schools are now a much more positive environment than they were when I was young)
...they go through primary viewing science as experimental

Summary

The fieldworkers discussed the amount of activities available to schools; they identified the explicit links between the primary days and the QCA scheme of work as being vital in ensuring the appeal of the days to schools.

The teacher commented on the appropriateness of the challenge posed by tasks. The active nature of the tasks were commented on as being valuable as it contrasts to the more didactic approach taken with Year 6 because of their SATS tests. This view was echoed by the children themselves. The active nature of the tasks were also identified as being valuable in enabling mixed ability groups to work effectively together and in making activities more memorable for pupils. Learning 'new skills' was described as beneficial as were the clear links to the curriculum and focus on 'correct vocabulary'.

The class teacher commented on the benefit of having two young women leading the session as they provide the girls in the class with positive 'role models'. The class teacher described how she had initially felt the tasks were 'male in focus' but that when doing the tasks, the girls were 'as motivated as the boys'.

Primary Clubs

Fieldworkers' perspectives: issues raised

One issue identified was that the fieldworkers had not been able to set up the clubs in time to meet their targets. The reason for this appeared to be, initially the time needed to develop the YEC material and subsequently the development of the Crest Star Investigator material and the time that this had taken. The BA fieldworker identified some problems in organising the clubs: it is time consuming contacting the schools and GSK (one of the funders) do not like clubs to run in school time, whilst for the LEP this is not a concern. She also described how the decision had been made not to build activities into the curriculum as the curriculum will change.

However, the BA fieldworker felt that the teachers were very positive about the clubs and that they 'really like the resources and 'being given the equipment'. She also identified the 'focus on doing rather than writing' as being a real strength of the clubs and that this enabled students who may struggle with literacy to 'explore scientific ideas'. She provided accounts of how pupils with 'behavioral problems' were improving their behavior in school because they are so keen to be allowed to continue coming to the clubs

Teachers' views

Contributors

science co-coordinators in 2 South London schools

Learning and enjoyment

Both teachers were very positive about the clubs. It was felt that the material provided for the club was useful in promoting the children's learning in a number of ways. One comment was how the clubs usefully connected DT and science which tend to be taught and viewed separately:

...it's nice having a mix between science and engineering...in schools DT and science are taught separately ...there are so many ways it can lead off

Some of the activities linked to what was being covered within the curriculum; both teachers mentioned the rocket activity as being useful for teaching about forces. One of the science co-ordinators said that the clubs had been incorporated into the main curriculum in order to improve 'investigative skills'; an area where pupils at the school had previously not performed well:

...kids are ok on knowledge questions but fall down on the investigative

She seemed positive about this decision; saying that the children were enjoying it and also that she hoped the SATS results would improve. Both teachers commented particularly on the active nature of the tasks, how beneficial they felt

these to be and how there had been limited opportunity for these sorts of tasks within the school day. These activities were described as memorable for the children and as enabling children to relate to the science more effectively:

...it's hard in Year 6 to get any practical activities – it's nice for them to do some exploring

The kids love them – boat/ marbles/ in the water making the best raft...it's the practical experience – they remember it

...they are developing they're making skills...they forget how to do cutting and making...in early years they are good at it but they lose those skills

...kids like hands on practical – it has relevance for them – they can relate to it – it makes things real for them (enjoyed the raft and toothpaste)

...there are so many different topics – and they appeal to different students...the toothpaste testing – they were convinced that the brand name would be best...it relates to real life for them

Another point that was commented on by both teachers was how the activities were appropriate for mixed groups and that they could even be made relevant for younger pupils:

...a nice thing about the activities is that they are simple and easy to resource and you could differentiate them in a number of ways – not just for Year 6

...in the science club there is also a KS1 element – it's nice to do that every once a half term to focus on these activities

Issues for teachers

The resources were praised by both teachers; particularly the plans:

...it's fantastic...the plans are great – teachers can copy them and they are really helpful as well...children like having their own sheets

However, while one of the teachers was happy to make curriculum links himself – 'the NC links are not on the plans but you can see them...as a teacher you can take it in any direction you want to explore' – the other felt that it would be more beneficial if these links were made explicit. She identified a problem being that teachers lack confidence in science:

...it would be easier if it did link to the curriculum ...some of it does (e.g. the rocket linked to forces) teachers extend activities so it does fit in...it would be easier as there is a framework to follow...teachers aren't that confident about teaching science and investigative skills...it's easier to get your head around it if it fits into the curriculum...we don't have the time to think how to link it all in (to the curriculum) there is just no time

In the school where the club had not been incorporated into the curriculum the science co-ordinator said that he planned to target a different year group the following year as he felt Year 6 had too much to do:

...next year I want to get a Year 5 teacher to do it...there's a lot of pressure for Year 6 with their SATS –it's difficult for them...

Summary

The fieldworkers identified some delay in meeting targets for the number of primary schools due to time taken developing materials. However, it was felt that clubs were very successful and that pupils were enjoying and motivated by the practical nature of activities. These activities were identified as enabling pupils who may not achieve so highly because of issues with literacy, to explore scientific ideas. To link activities too closely to the curriculum was viewed as problematic because of likely future changes.

Teachers identified the clubs as promoting learning in a number of ways: clubs were viewed as connecting DT and science; some activities usefully connect to curriculum topics and clubs promote investigative skills which pupils are tested on in science. The active nature of the tasks were particularly commented on; teachers described how they felt active tasks were more memorable for children and enabled them to relate to science more effectively. Also commented on was how active tasks facilitated learning in mixed ability groups.

Teachers praised the resources and plans provided. One teacher commented that explicit links with the curriculum would be beneficial; particularly as teachers are often not very confident about teaching Science. One teacher also commented that it might be better to target Year 5 as they have less demands made on their time than Year 6 who are very busy preparing for SATs tests.

Student ambassadors/ events and projects

Fieldworkers' perspectives

Fieldworkers identified particular problems in recruiting and utilizing ambassadors. Recruiting ambassadors in the first instance had been problematic. While 30 ambassadors had been recruited by WP from the faculty of engineering at LSBU, only 12 have come to training to become LEP ambassadors (5 more have agreed to train). Greenwich and Kings have also been approached but responses from the engineering faculties have been slow. The fieldworker responsible for ambassadors is meeting with a member of staff to discuss the possibility of recruiting student ambassadors from UCL. The fieldworker responsible for events identified a further problem as being the budget constraints imposed by individual partners. She commented that the STEM days and the YEC 'should have ambassadors' but that some of the fieldworkers 'don't have the budget for it':

It's a shame because the ambassadors do all the things fieldworkers can't do – they really increase the quality of the event – they can sit with the kids and talk to them...

Where the ambassadors have been used on STEM days, fieldworkers both felt they had been very effective. The fieldworker responsible for ambassadors has also made placing ambassadors in YEC in September a priority. Ambassadors have also been utilized in drop in study support sessions in Science and Maths for Year 11 students at St Martins in the Field; the teacher there is now keen to repeat this with Year 10 students. Ambassadors have also been utilized as role models during the Engineering Master classes with post 16 students; the ambassadors discussed their choice of engineering with the younger students. The LEP fieldworker is keen to repeat this with younger students; such as during careers week for Year 8.

The LEP has encountered difficulties in involving academics in events – ‘hardly any of the academics wanted to be involved...the ones we have are through W.P.’ The academics that have been involved were from electrical engineering and food technology; the fieldworker felt that days where academics were involved were very useful. Her response to this problem has been to ‘pretty much do what ... does and deliver my own STEM days’ whilst attempting to build relationships with academics. Like other fieldworkers, she commented on the difficulty in recruiting schools to be involved with the project. She also commented that teachers tend to only involve academically successful students on the days and events; the only way she has found to prevent this is to provide sessions for whole year groups.

Summary

Recruiting student ambassadors to the project has been slow. However, when students have been utilized to support STEM days, drop in sessions and master classes they have been seen to be very effective (see STEM days in this report). There is a problem that not all individual partners are prepared to provide the budget for ambassadors.

There has been some difficulty in establishing links with academics and involving them in events. The fieldworker has compensated for this by running events herself. Where academics have been involved, the fieldworker has felt the days have been very successful and she is attempting to develop relationships with other academics at LSBU. The problem of engaging schools with the LEP was again discussed.

Stage 3 Report: An exploration of the project impact on secondary school students

Introduction

This report outlines school students' orientation to and views about STEM and explores the impact of the LEP at the end of the first academic year that the project has run in schools. Qualitative data was collected through focus groups and in depth interviews held with students from five South London schools; students had predominantly been involved in more than one LEP activity. The report is organised into three parts: part 1 explores these students' accounts of their career planning; part 2 is an exploration of their attitudes to STEM subjects and orientation to engineering and part 3 is an exploration of their responses to LEP activities as well as the views of teachers organizing activities. The aim of this report is to provide some insight into if and to what extent their involvement with LEP activities has affected students' learning about, orientation to and engagement with STEM subjects and their interest in engineering as a possible career. It also provides some insights into emerging issues and possible areas of development as the project continues into the next academic year.

Contributors

Background

The students I spoke to were predominantly members of the YECs and virtually all were in one of the top two sets for science and most were in the top two sets for maths. It did not seem appropriate to ask all the students about their parents' occupations – especially when they were in groups interviewed with other students who were not close friends. From those who provided this information, it was evident that several students were from professional middle class backgrounds: their parents included a doctor, a barrister, an accountant, an IT consultant, a computer engineer and a manager of a charity for children with learning difficulties. However, not all came from middle class backgrounds; two students interviewed said that her parent(s) did not work (Lilly and Henry) and others had parent(s) who worked as: a coach, a nurse, and doing secretarial work.

School 1: (6 YEC members of Yr 9 students)
(2 individual interviews)

- (re. YEC/ Portsmouth/ Residential)
- *Lilly (Yr 9 Irish/Algerian)*
- *Femi (Yr 9 West African female student)*

School 2: (6 YEC members of Yr 9 students)
(1 paired & 1 individual interview)
(re. YEC)

- *John & Campbell (white male students)*

- *Henry (white male student)*

School 3:

(3 focus groups, 1 paired interview)

- (re. STEM days/ Residential – Yr 10 students)
Fiona, Joanna, Sarah (West African female students)
- (re. YEC approx. 14 members – Yrs 7,8 & 9)
Hannah, Theresa, Vanesha (Yr 9 Caribbean female students)
- (re. YEC)
Rebecca (Yr 7 West African female student) & Sam (Yr7 white female student)

School 4: (club not running regularly – when run 4-15 members)

(1 focus group)

- (re. YEC, Residential, STEM)
Shanida (Yr 10 West African female student) & Daniel (Yr 10 West African female student)
- 2 latecomers – Olu & Ganya (West African male & female student)

School 5: (YEC club 0-6 members)

(1 paired interview)

- (re. YEC, Trebuchet, Androids advanced competition)
Sasha (Yr 9 Pakistani student) & Martha (Yr 9 Bangladeshi student)
- 20 members of the YEC from two different schools commented on a posters and activities designed for the YEC (2 club sessions)

Part 1

Career planning

The varied age groups of the students interviewed impacted on the extent to which some of the students were thinking ahead. Several girls talked about wanting to be actresses and boys, of wanting to be footballers while at primary school; most, though not all, had left these dreams behind by the time they reached secondary school. However, few had clear ideas about their futures and amongst the overwhelming majority of the students spoken to there was a sense of fluidity in their plans:

Lilly: at primary school I wanted to be a doctor or forensic scientist ... (secondary) but then again I thought back on forensic scientist and then I thought – which is better but I didn't know 'cause both of them still come in my life so

Yeah but also it came into my head that I wanted to be a – like a little teacher – like for little nursery children and help them...

...I'm not quite sure you know – 'cause like there's loads of jobs. I wanted to be an accountant...Dentist

(Yr 9, Algerian/ English female student)

Henry: in primary school I wanted to be an author ...I'm still a bit on the author idea – or something around football – either a player or a coach – I'm interested in engineering
(Yr 9, white British male student)

At times, students' ideas about their possible futures appeared to be so fluid that they even changed during the course of the interview:

Shanida: *(while talking about the residential trip)* ... If I get to be a scientist I might get to work on global warming but if I get to be an engineer I might just – I would like to work in a company that kind of recycles or reuses stuff and has the planet in mind when it is doing stuff and how they can reduce carbon emissions...

Interviewer: *So enjoyment, pay – anything else – 'cause you just talked about global warming being important to you – you said you wanted to be a forensic scientist – do those two connect?*

Sahnida: No it doesn't but I'm still not sure – I still haven't made up my mind
(Yr 10, West African female student)

There was also some confusion about what jobs entailed and a lack of knowledge about different jobs generally:

Interviewer: *So you want to design buildings in the Caribbean. What made you think that?*

Hannah: I want to be an architect ... I want to own my own hotels around the Caribbean.

Interviewer: *So you are going to build your own hotel and then run it or build lots of different hotels?*

Hannah: No I want to run it as well.

Interviewer: *So do you want to be an architect or a business woman and run the hotel?*

Hannah: Both
(Yr 9 Caribbean female student)

However, clear threads that ran through many of these students' accounts were interests in particular subject areas, established very early on, which impacted on the focus of their ideas about possible careers.

Interviewer: So that came into your head in Year seven so you were already interested in that sort of science area?

Lilly: Yeah I really liked those sort of things. I found them really interesting.
(Yr 9, Algerian/ English female student)

Shanida: ... at first I wanted to be a hairdresser, for obvious reasons, then I wanted to be a doctor then kept on changing ... It has changed 'cause I am kind of leaning a bit towards forensic science – I don't really know.
(Yr 10, West African female student)

Campbell: something involving maths (primary)
(secondary) fitness coach ... design roller coasters ... An entrepreneur ...
...fitness trainer...I wouldn't mind maths and engineering combined
(Yr 9, white British male student)

Unsurprisingly, for the majority of these students, an interest in Science and, in some cases Maths was evident in their accounts. There seemed to be a number of careers in these subject areas that students particularly mentioned: forensic science, accountancy and doctors were all mentioned several times as possible options. It was interesting to note that in several cases, engineer was added to this during the course of the conversation though it was not always an option mentioned initially; it was evident from these discussions, that the LEP had raised the profile of engineering for these students sufficiently for them to discuss it as a possibility.

It is worth noting that the students from backgrounds with professional, HE educated parents seemed more likely to talk about wanting to keep their options open than their counterparts with lower socio-economic group backgrounds. Lilly, whose parents do not work, seemed anxious to identify a job that she could do; the idea of having to study for an extended time seemed to be very daunting to her. This seemed to be a reason for her considering becoming a nursery nurse instead of focusing on other, science related careers. Her concern about money was also evident as she discussed her anxiety to find part time work as soon as she was sixteen 'working in Tesco's or something'.

It is interesting to note that a number of the students interviewed talked about wanting to remain in London to stay with what is known and familiar to them:

Femi: I know people who say I want to go round the world but I hate stuff like that – I don't like boats or anything – just scared – I'm happy here. If I am in one place I like to stay in that place for a while. I am not that kind of person who likes to go or see different places because I like to stay somewhere that is familiar to me.

Interviewer: *And is that the job – you like to be somewhere that is familiar. Would you like a job in London?*

Femi: Yeah, I want to stay in London
(Yr 9, West African female student)

Sources of Information

Students discussed a range of sources of information although information available to them about careers appeared to be somewhat limited. Television was frequently mentioned as a source of information and inspiration for particular jobs; as during other stages of the project, forensic science featured frequently in students' accounts.

Lilly: ...The reason I wanted to be a forensic scientist was because I normally like to do with, umm, DNA and stuff like – you know those channels like CSI and things like that.
 ... Mum watched it ... 'cause I seen adverts and little films of how they do like – they find DNA of people and their prints on computers, and stuff like that. I find that really interesting and then I wanted to be a doctor.
 ...NCIS – that's really good. I watch that...It's another one for CSI – but not scary – it's just to find people who murdered people that never found them and they just find fingerprints and how they do it on the computer – how they find people's hair prints – their hair, their foot – it's really good
 (Yr 9, Algerian/ English female student)

The Apprentice has also impacted on students' ideas and was again mentioned several times as a source of inspiration.

Martha: Yeah, I was watching The Apprentice and it looked fun because they were running around losing money, gaining money ... going into business could be exciting but that you could be rich one day but bankrupt the other.
 (Yr 9 Bangladeshi female student)

Casualty was mentioned; though in this instance it had contributed to this student's dismissal of a career in medicine:

Femi: being a doctor it takes a lot out of you – I don't know how it is to be a doctor but on the TV shows, like Casualty, they have to do night shift and things like that. You don't get any time off – you have to work in summer – obviously hospitals don't close in summer but they don't close at Christmas – but I don't celebrate Christmas anyway but still I still have a Christmas holiday – and they don't close at Easter – they never close
 (Yr 9, West African female student)

Pupils' own experiences impacted on their ideas about possible jobs. John talked about how visits to Alton Towers with his cousin had led to him wanting to become a roller coaster designer. Lilly talked about how trips to the doctor and the dentist had led to her considering those careers:

Lilly: I want to be also a dental person.
 Interviewer: A dentist – Okay - and where did that come from?
Lilly: I had to go to the dentist to have braces.

...Yeah – I liked all the equipment they have.
(Yr 9, Algerian/ English female student)

Becoming a teacher was discussed as a possibility and dismissed by one student because of her own experience of being in a classroom:

Femi: ... Actually teaching - but I don't think I would have the patience or tolerance for children in that I am one 'cause I know how it is and I know that I am a coward and I know how much grief we cause for the teacher. I don't think I could take being a teacher 'cause now – when I am older I would be just like – oh I can't take this off children and stuff
(Yr 9, West African female student)

Another important source of information about possible jobs were parents and family. Parents were cited as both a source of information and a source of advice about possible futures:

Campbell: I always thought I would get involved in some kind of fitness 'cause I've always wanted to go to the gym...my Dad was very into fitness. He used to be a pro boxer for a while but he stopped that after a while. He got too old for it – so he's very involved in fitness as well.
(Yr 9, white British male student)

Shanida: ... doctor came from our parents 'cause they think it is a good job to have.
(Yr 10, West African female student)

Femi's Dad's career as a computer engineer had provided her with a detailed knowledge of computers, and a reluctance to follow her father and her two brothers into this area of work:

Femi: Even though I am quite good with computers I don't want anything to do with computers. No not anything obviously I have to use a computer when I am older. I like computers but I don't like working with them – to do a job – to do work. I don't like going on a computer just to do work. I like ICT 'cause you actually have to do stuff on computers for computers but I wouldn't want to further my education in ICT because my two brothers are doing IT – computers
(Yr 9, West African female student)

Siblings and cousins provided pupils with useful up to date knowledge about HE courses and possible routes into particular jobs:

Fiona: Accountancy ...because my sister is doing it at university and because she worked with figures
(Yr 10 West African female student)

Martha: I was like thinking of becoming something like an architect - something to do with buildings ... I think it was from my cousin. She told me about all the different things you can be 'cause she took design and drawing at university and she told me about all the different stuff you can do – like different kinds of design – you can just sit in offices and design whatever they want
(Yr 9 Bangladeshi female student)

Perhaps because of the motivated and hard working approach of this particular cohort of students, there were also several accounts, amongst the female students, of their accessing information on the Internet and accessing other WP initiatives:

Interviewer: *How did you find out that forensic science was seven years?*

Lilly: I looked on the computer...Ask.com

Interviewer: So what did you put in – just forensic science and it tells you how to do it. Did you put doctor in?

Lilly: Yeah. ... 'cause I was doing a homework on it.
(Yr 9, Algerian/ English female student)

Shanida: Going to the forensic science I just kept watching CSI and Miami and that kind of thing. It did look interesting and I just looked it up on the Internet and it just looked kind of something new and I thought that looks interesting but I haven't really – I am going on summer school and it's on forensic science so I might get to see what it's like.
(Yr 10, West African female student)

As a number of these students have parents who are professional and HE educated themselves, there was also evidence in their accounts of their being able to draw on the social networks available to them through their parents and families:

Vanessa: Yeah – I told Mum about it and other people were talking about it...My Mum's - where my Mum's doing her degree them people she still talks to and some of them are into that thing so I was asking them about it.
(Yr 9 Caribbean female student)

Hannah: I wanted to do business administration....it's like in the media...You design web sites and things like that...You handle money – you handle designing – a mixture of things. You might do a business and IT course... It is 'cause my Mum knows someone in the business and answered questions about it – I investigated what it's all about - what I would need to do to get there.
(Yr 9 Caribbean female student)

John: Yeah, My Grandad's son's girlfriend's cousin
...he works at a City Bank – he's co-chairman – I do know him pretty well.
(Yr 9, white British male student)

Motivation

A source of motivation for particular careers most frequently commented on by students was their experience of particular subjects at school. Being 'good at' subjects and 'enjoying' them were often given as reasons for considering particular careers:

Joanne: I wanted to be a doctor ...I liked Maths as well and I enjoyed it and I like Science – I like the experiments and stuff
(Yr10 West African female student)

Campbell: I never had a good understanding of a lot of jobs but I thought I wanted to do something involving maths because I was always very good at maths
(Yr 9, white British male student)

Daniel: I knew I was good at science from primary school 'cause I didn't really like science – I was still well in it so it came as a surprise to me so when I got to year seven I decided I might as well go for a job in science and I know that doctors get well paid
(Yr 10 West African male student)

Theresa: When I came to secondary school I really enjoyed drama a lot more because it was like a lot more lessons of drama so I wanted to be an actress
(Yr 9 Caribbean female student)

Interviewer: *So you are thinking at the moment something in design.*

Vanessa: Yeah because I really like graphic products. I really like Photoshop...I might design something – I might be in the Internet one day and design for companies – I don't know
(Yr 9 Caribbean female student)

As with other female students interviewed during stages 1 and 2 of the project, a desire to help people was again mentioned as motivating:

Lilly: I wanted to be a doctor and I still want to be a doctor... when I was in Year seven... because I wanted to work with people and help people ... I could be like a little teacher – like for little nursery children and help them
(Yr 9, Algerian/ English female student)

Again, as found in stage two, students frequently talked about money as being motivating in their choice of career; while mentioned by several students, this was a particular focus for some of the male students:

Interviewer: *So what is it about a job that is important to you?*

Campbell & John: The money (laughter)
(Yr 9, white British male students)

Campbell: They say that money doesn't bring happiness but it brings it's own rewards. You can use money to have a lot of fun.

How well paid engineering is was also a point of contention between these two boys:

Campbell: Better than engineering – you're crazy. If you design something quality you'd be a billionaire. Look at Bill Gates – he designed computers. He's rich. He's got more money than everyone in the whole world. He's the biggest trillionaire in the world. No one has more money than him...

John: Look how many people are engineers. When we went to the BP thing there were like fifty engineers to recruit.

Campbell: The pay is like between £1,000 and £2,000 a week.

John: They will probably be paid £500 a week.

However money was not their only focus; Campbell and John went on to discuss how important money actually is in relation to whether jobs are enjoyable.

Campbell: Yeah I've learned from experience from my Mum. She said - she has a decently paid job – she works for MTV – but she doesn't enjoy it as much as she would like to enjoy her job, so you have to enjoy your job. That's why she's leaving. She's going to ... So she says you've got to enjoy your job. You spend a lot of your time doing your job. Yeah, she says otherwise you'd be there unhappy for the rest of your life.

Finding a job that was enjoyable was a key motivating factor for many students; Femi talked in detail about what this actually meant:

Femi: Obviously to enjoy your job firstly because if you are doing a job every day of your life – not every day but most of your life, then and you don't enjoy it then your whole life....

... – like in a day – nine in the morning till five in the evening and that's most of your day gone while you are awake and it's just like if you come home you are all unhappy for that time which makes your quality of life down and another thing that should be in a job is – if you are in a workplace and there is not equality ... 'cause in the workplace it's like a

community of people so it should be equal – you are all there for the same reason so it should be equal in that sense ...you should feel comfortable in the environment that you are in and that you should feel not pressured and you should feel that you can work at your own pace.

(Yr 9, West African female student)

Another student talked about how she felt it was important to be in a job where her opinion was taken seriously; where she had some influence and for her work to be a source of pride for her mother:

Rebecca: If I can use my career to change things in the world – ‘cause if I am doing like a low class job, people might not be able to hear my voice and would think – oh that’s not important ... I do want to be somewhere where people would take notice of me... I want my mum to be able to show me off saying my daughter’s this and my daughter’s that. I want a career.

(Yr 7 West African female student)

Actually having some first hand experience in a particular field was clearly very influential. In the following extract a student describes how voluntary work in a hospital had led her to reconsider her long-standing ambition to become a doctor. Contributing to this was also her comparison of this experience to her experiences with the LEP:

Joanna: Well I did some voluntary work at King’s College – that’s when I started getting confused cause I really wanted to do medicine (re. medicine) but when I do other courses like engineering courses, I think it is more interesting...I thought that maybe I could take engineering – I could be an engineer

(Yr 10 West African female student)

One student talked specifically about being motivated by seeing black women represented in a film as successful career women:

Vanessa: A film – I got my idea from a DVD – It’s a DVD about women - about black women and they were very successful – young black women - and they had good- but you know when you are very ambitious – it was just showing like – because you are a woman you don’t have to get a rubbish job so I thought yeah, that’s a nice job and everything.

(Yr 9 Caribbean female student)

This is worth noting, as it seems to reflect an uncertainty amongst some of the girls about their position as women in relation to careers. Femi’s family appear to have very traditional roles, with her mother never having worked and her own outlook was very traditional. This ‘traditional’ outlook was reflected in the accounts of a few of the other BME girls:

Femi: there was this question and it said do you think society could ever be equal and I said no because and I said that it shouldn't as well ... 'cause the mum is the one who gave birth to the children so the mum should be the one who is more nurturing ... I am just saying from the children's point of view, they share a special connection with their mum so if a mum goes out ... if a mum goes out ... children would kind of feel an empty space. I'm not saying in all cases, just in my point of view – this is my opinion
(Yr 9, West African female student)

Orientation to HE

Almost all the students interviewed planned to go to university; the two that were not definite about their plans were certainly considering it. In some ways these student' accounts were akin to those of those of a 'traditional student' accessing the British HE system. One student discussed how most of their family had been to university:

Interviewer: *Yeah, and do you know anyone who is there already or been there? Your Mum?*

Vanessa: Yeah, my Mum, my aunty, my cousins, my uncle
(Yr 9 Caribbean female student)

A few students interviewed talked about how much they wanted to move away to university:

Joanne: I have thought of four so far – Cambridge, Oxford, Nottingham or Lancaster ... they are all outside of London

Interviewer: *Is that why you picked them? You want to get out of London*

Joanne: Yes as far away as possible
(Yr10 West African female student)

Florence: As long as they are outside of London I don't mind ... Essex, Hertfordshire – Leeds up north
(Yr 10 West African female student)

Another student explained how she knew about different institutions through her mother's social networks:

Joanne: ... Nottingham – my Mum's friend's daughter goes to Nottingham and Cambridge – I think one of my Mum's friend's son goes there and Oxford – my Mum's co worker – his daughter is going there – directing films and then

Interviewer: *What course is she doing?*

Joanne: Film Directing and then Winchester – I’ve got a brother who goes to that one and Lancaster – I know someone who goes there but I am not sure who it is – it’s one of my Mum’s friend’s children.
(Yr 10 West African female student)

The sources of information most relied on about HE were predominantly not parents but siblings and cousins:

Martha: I have yes because I was telling you about my cousin who went to university and she was telling me how it was a really good place to go and you like learn so much.

Interviewer: *which University did she go to? Is she finished now?*

Martha: Yeah - it was somewhere in Manchester.
(Yr 9 Bangladeshi female student)

It was also institutions where siblings and cousins studied, that students were able to name:

Hannah: my sister and my cousins...my sister’s doing teacher training ...at Harper Adams university ...
(Yr 9 Caribbean female student)

Sarah: Roehampton, Kent, Sheffield (sisters at these institutions)

Femi: My brothers are going to university – two of my brothers go. I think one of my brothers goes to Southbank University
(Yr 9, West African female student)

A few students talked about their parents or other relatives having been to university in another country: one student talked about an aunt who had trained to be a teacher in Jamaica, another about her mother training to be a doctor in Pakistan. The institutions in the UK all these students were able to name are predominantly new universities. Students did not differentiate between ‘new’ and ‘old’ universities and most were oblivious to the fact that there were different sectors within the HE system. Most students though, were aware of Oxford and Cambridge. Some were aware that these ‘best’ institutions were probably out of reach but that there would be distinct benefits to accessing them:

Femi: I don’t really know where universities are in this city apart from Southbank and actually I only have three universities in my mind. There’s obviously Oxford and Cambridge and then Southbank. Obviously everybody would like to go somewhere like Oxford or Cambridge but some people are just like not up to it but – I am not saying that I am but I would really, really like to go to a university like that even though it would mean moving somewhere else but it would be good in the sense of education and stuff.

Interviewer: *Because of the reputation.*

Femi: Yeah, and it would be good if you had a CV and you gave it to someone and they said – oh you went to Oxford – oh you went to Cambridge and that would make you very eligible for a job or position.
(Yr 9, West African female student)

While most of the students interviewed seemed confident that HE was not only possible but virtually inevitable, this was not true for all students. Lilly's father is unemployed and she has no connections to people who have been to university. While she is clearly motivated in her approach to work and enthusiastic about university she also explained how she felt ambivalent about it and lacked confidence in her ability to succeed:

Lilly: I am not sure – I don't know. One part of my head – yes and the other part – I don't know – it's just all over the place. Well sometimes I think when I grow up I want to be so many things and – but I have to be good at them first before I try and do them and then when I was in the university I was thinking I could do this but then again, I thought I can't.
(Yr 9, Algerian/ Irish female student)

Summary

Students' ideas about their careers were very fluid – in some instances they even changed during the course of the interview. However, students repeatedly talked about interests in careers linked to the same subject areas. While rarely mentioned as a first choice of career, engineering was frequently mentioned as a possible career choice; though less securely placed than other careers in science related areas, engineering appeared to have become an option in many of these students' minds.

Television was a source of information for students about possible careers. Students' own experiences and encounters were also sources of information. Parents provided both possible role models and information about specific jobs as well as advice. Some parents were able to provide access to useful social networks; especially those who were HE educated themselves. Siblings and other family members were also useful sources of information about possible careers and HE choices.

Students' motivation for their interest in particular careers was generally multifaceted. One of the most frequently mentioned motivations was enjoyment or success in a particular subject area at school. Students frequently talked about earning potential and wanting to enjoy their work. There were some interesting comments made by students relating to gender: one female West African student talked about men and women's

roles in very traditional terms; another student talked about the impact seeing a black female role model in a film had on her.

All the students interviewed were planning to go to university or at least seriously considering it. Most students talked about family members, particularly siblings and cousins who were at university themselves or had recently been. These figures were able to provide useful information about institutions and courses. Some had parents who had been, though not all in the UK. Students were not aware of the different sectors with the HE system; though most knew of Oxford and Cambridge. While most expected to go to university, one student with no familial history of HE and from a low socio-economic background, talked about her lack of confidence in her ability.

Part 2

Attitudes to STEM subjects and careers in engineering

School

While not all the students were effusive about their enjoyment of science, all those that I talked to said that it was a subject that they liked or that they, at least, did not dislike.

Interviewer: *Science – what do you think of science at school?*

Lilly: I love it – it's really interesting especially chemistry.
(Yr 9, Algerian/ English female student)

Vanessa: I don't think I like science but it is the easiest to me out of english and maths. I could – if I've got a level seven paper I could get a level seven. It's not a fact that I don't like it. I could work at it and I could achieve my levels but I don't like it as much as other subjects
(Yr 9 Caribbean female student)

Maths received less enthusiasm as most students viewed it as more difficult, however, most were again not hostile and some were very enthusiastic:

Shanida: I think maths is okay but it's just that there's always one answer – it's okay but it just gets difficult at times.
(Yr 10, West African female student)

Martha: Maths is okay – I wouldn't say maths is really fun but...
(Yr 9 Bangladeshi female student)

Sasha: Same – it's not fun but I wouldn't say I am bad at it.
(Yr 9 Pakistani female student)

Hannah: I like it.

Theresa: I love maths
(Yr 9 Caribbean female students)

It was evident from students' accounts of studying science and maths at school that enjoyment of subjects was closely connected for many students with their own success in them:

Interviewer: *So what do you like about science? What are the good things?*

John: Physics and the biology...I'm really good at them ...it's just easy

A few students explained how the process of developing an understanding of how to do the work, increases their enjoyment of it:

Daniel: I just find that if you understand the work you enjoy it so it doesn't really matter what you are doing.
(Yr 10 West African male student)

Hannah: Do you know what it is – I think maths is a subject that when you meet a particular thing like algebra or doing certain things in maths you think this is hard – you won't like it but once you've picked it up and you do it more you'll start to like it – like equations – I hated it but now I know it, if someone gave me the whole sheet I could do it in like a minute 'cause once you've picked it up you start to like it.
(Yr 9 Caribbean female student)

This need for practice to become proficient at subjects was echoed by Shanida:

Shanida: I think I am okay at science – I am okay – it just comes from practice – yeah I would say I am good at science.

...

It's pretty difficult but challenging at times for maths and the same goes for science as well – you need to practise it because – well I don't get things straight away – I need to practise it over and over again and it gets easier when you keep on practising so I think that comes with practice as well.
(Yr 10, West African female student)

Many of the students interviewed were confident in their ability in science, some were confident in their ability in maths. There was a tendency for some of the boys to present themselves as more confident in their ability than their female counterparts:

John: We are both in top set...We are two of the best at maths in the school

...

Campbell: I am definitely doing anatomy of the human body and I think I would take physics as well 'cause that's got a lot to do with maths and I'm very good at maths.
(Yr 9, white British male students)

When asked about what they liked about science lessons at school, the unanimous answer was the practical work and experiments:

Campbell: I like the practicals. Chemical reactions are very cool – just watching in it

Joanne: Explosions – watching explosions and that are more interesting
(Yr 10 West African female students)

Sasha: I like doing experiments... doing it – you learn more – doing the actual experiments
(Yr 9 Pakistani female student)

Martha: Umm, I like doing the experiments and stuff and when we start a new topic – first learning about stuff – that's what I like.
(Yr 9 Bangladeshi female student)

This enjoyment of practical and hands on work was also discussed in two students' accounts of their decision to choose resistant materials as an option in Year 9. Their decisions were actually influenced by an activity they had done with the Smallpeice Trust:

Joanne: in year nine – I chose science and technology and Resistant Materials...I did bridges with Ahmed and that's when I decided to take resistant materials

Sarah: ... yeh 'cause I chose to do Resistant Materials - before that I had chosen textiles.

Interviewer: *What put you off textiles?*

Sarah: I preferred making stuff
(Yr 10 West African female students)

Martha's comment about enjoying learning new information rather than 'going over stuff' was reiterated by students a number of times. Another aspect of science that students talked about finding interesting was when they found it relevant to 'real life':

Fiona: Biology is interesting because you get to learn about your body and stuff and more stuff related to life
(Yr 10 West African female student)

It is worth noting that several students viewed these subjects as gendered; maths particularly was commented on as being a 'boy's subject':

John: english is a girl's subject. Science and maths is a boy's subject.
Campbell: Actually that's true innit 'cause there are a lot of good boys at maths. Rachel's good at english so yeah, my Dad's good at them two subjects. He's got an A level in both of them and my Mum's good at english.
(Yr 9, white British male students)

Lilly: Science I think it is for everyone...
Interviewer: *Yeah and what about maths?*
Lilly: Boys.

Interviewer: *Is that just because you don't like it?*
Lilly: (laughs) No it's because – I don't know - it's just about numbers
(Yr 9, Algerian/ Irish female student)

Scientist and Engineer

As with other students interviewed over the course of the project, these students' perceptions of a scientist were largely stereotypical. The image of a scientist as unglamorous was again, prevalent:

John: Lab coat.
Campbell: Some guy in a lab coat with big glasses and test tubes in his hand.
John: Like a sixty four year old virgin...
Campbell: A stereotype – he's got that Albert Einstein hair.
(Yr 9, white British male students)

Daniel: Mad hair styles and explosions and gas and hospitals as well.
(Yr 10 West African male student)

Students talked about scientists as people who were not likely to be happy in their work:

Fiona: they always have to test stuff – testing, testing

Sarah: I always get the picture that they are sad as well – I don't know why
(Yr 10 West African female students)

Femi: ... that kind of job needs a lot of - not commitment but you need – it's like a job where you just carry on, carry on, carry on
(Yr 9, West African female student)

Students also talked with admiration about how intelligent scientists are:

Hannah: ...he's smart.

Vanessa: Unique – has a lot of ideas. I don't know the word for it – but has a lot of ideas.
(Yr 9 Caribbean female students)

Theresa: Extremely intelligent...Really intelligent because they are in the police ... and you think that you've got away with something but you could drop a little piece of hair like give it away – but things like that – you have to be extremely intelligent
(Yr 9 Caribbean female student)

For Theresa and a few other students, a forensic scientist came to mind, which, as already discussed, they view very positively:

Joanne: a forensic scientist

Interviewer: *Do you find that appealing*

Joanne: yeah, yeah – I watch CSI
(Yr 10 West African female student)

Perhaps because of this groups' particular propensity towards science related careers, a few students were relatively informed about general routes through the education system:

Vanessa: they have to go through a lot of education to be a scientist.

Hannah: Yeah, but that's also true if you want to be a science teacher because you know you have a choice, once you have your degree and everything you can decide whether to go into teaching or actually do something with science.

(Yr 9 Caribbean female students)

Opinion about the contribution made by scientists was mixed: a few students talked about the role they play in very positive terms, but reservations were also expressed:

Femi: ... it's a really good job and you are like contributing to the world – which is a good thing
(Yr 9, West African female student)

Rebecca: I think that scientists are geniuses but sometimes they are wasting their time. When they come back to space ship science that is a waste of time but the investigating new medicines – things like that – that is a proper scientist.
(Yr 7, West African female student)

Sam: But then when they test on animals - that is just going too far I think
(Yr 7, white British female student)

Attitudes about engineers were interesting. While stereotypical views of engineers remained, there was also evidence students were questioning the stereotypes and were aware of their inaccuracies. One stereotype referred to was of an engineer as someone who works on a construction site:

Sam: A beard – I know it's a bit of a stereotype but there's stereotypes for all kinds of jobs –...for engineer I see like a builder ...
(Yr 7, white British female student)

Sasha: Hard hat, building stuff

Interviewer: *Anything else?*

Sasha: Like drawing and stuff, big plan sheets.
(Yr 9 Pakistani female student)

Daniel: When I think about engineering, I think of dirt – something really dirty...are engineers actually the people that design stuff? ...cause when I think of engineers I don't think of people who think of the stuff I just think of the people that build it – like builders
(Yr 10, West African male student)

However, most students, whilst still mentioning the stereotype, also talked about how the LEP had challenged their perception:

Joanne: constructing

Fiona: before ...(*LEP fieldworker*) came I thought engineering was about construction – building stuff

...

Joanne: people think it's all about construction ... but anyone can do it. If you want to do it you can

Sarah: my perception of engineering has changed because of ... (*LEP fieldworkers*)

(Yr 10, West African female students)

Another stereotype of an engineer that students referred to was that of a mechanic but this stereotype was also questioned:

Campbell: An engineer – a guy working on a car...He's one of these guys on a little skateboard under the car going..

Interviewer: *Is that a mechanic?*

Campbell: Yeah I know but it's what I think of when I think of engineer – mechanic. Mechanical engineer but I know there are a lot of others like those guys that build planes and stuff like that but that's just what pops into my head – the stereotype is always going to be there.

Interviewer: *I think that's what lots of people think – little bit grubby.*

Campbell: Yeah – he has oil splat on his cheek and goes like that.
(Yr 9, white British male student)

Femi: I thought – 'cause you know mechanics – I thought they were connected – like entwined into one but now I know they are not. I just thought it was about like screwdrivers, wrenches, things that you do with a screwdriver – that's what I thought it was all about so I was just like – oh, that's not really what I am into.

(Yr 9, West African female student)

Students also appeared to be beginning to understand the range of work that is encompassed by the term engineer:

Campbell: If we didn't have an engineer it wouldn't exist... They wouldn't exist because you need someone to design and make them. Because I thought engineer was someone who designed it and then you had another lot that built it but you can do both. You can design and build...I thought you were in two different groups.

(Yr 9, white British male student)

Campbell: I saw in the paper which it said something about – a poo engineer – this posh word for poo- all it is, is faeces and it is a sewer cleaner but he is an engineer.

Henry: I've learned more what an engineer does now because before I done this, I didn't know what an engineer done but now I know if we didn't have engineers everything would break.

(Yr 9, white British male student)

Femi: I keep on going back to the fact that engineering can be a lot of things 'cause I just keep remembering tasks that we have done.

...

Yeah in general I have learned that it can be anything – things that I have never noticed at all and it's just that there is a lot more to engineering.

Two students talked about the negative environmental impact of engineers, but one of these students also talked about the role engineers could have in changing this:

Shanida: Yeah, 'cause if engineering is to do with – well I though it was to do with mechanics and stuff like that then most of the stuff they produce actually uses carbon doesn't it so – I don't think it would happen now but maybe in the near future they could start producing products or make machines that could produce less carbon.

(Yr 10, West African female student)

The female students specifically discussed their gendered stereotype of an engineer; some students challenged this as a result of the work they had done with the LEP:

Vanessa: I think of cars – I don't know why. I think of engines and engine being motors... When I think of an engineer I think of an engine and when I think of that I just think of a car mechanic straight away and that's usually men and that's why I think of engineering as man's job but that's not true – that's just the first thing what comes to mind 'cause I think of cars and motorbikes and things.

(Yr 9 Caribbean female student)

Fiona: people think it's for boys only

Joanne:...but anyone can do it

... because before if you were a woman and you decided to do engineering, people classify you as a tomboy. But you don't have to be a tomboy to do engineering; you can be a normal person. You could be a girly girl and still be an engineer.

Interviewer: *You can still be glamorous – you don't have to wear a hard hat?*

Joanne: No, and dungarees all the time.

(Yr 10, West African female students)

Vanessa was also relatively informed about the roles available in engineering; this had challenged her previously held stereotypical perception of an engineer as a 'dirty' car mechanic:

Vanessa:...I think it sounds interesting because it doesn't mean that you have to be an engineer to get your hands dirty. It means that you can be someone in the backroom designing – you can be someone in the background doing presentations. You don't have to build the plant there – it's not what people – life's not always what you think.

(Yr 9 Caribbean female student)

Theresa also described engineers as ‘dirty’ but was again able to question this stereotype. Several of the female students talked positively about engineering because they were beginning to see it as a creative job:

Theresa: They are dirty – that’s it but since I joined the engineering club I understand what they are all about.

Interviewer: *And what are they all about?*

Theresa: They are like scientists. They make things – they get to design things and I think that’s it.

...

Hannah: I think it’s a lot funner ‘cause I get the science. I really get excited when I am making things. I like making things

Vanessa: I am a creative person. You are creative in engineering ...girls are very creative people – very creative gender. I think that they like to be treated so the creativity and the creativeness in engineering will draw their attention because if you wasn’t making stuff people wouldn’t enjoy it so much.

(Yr 9 Caribbean female students)

Shanida: ...just some of them because now I do know a little bit about engineering because the (residential) trip showed us how to make the houses and showed us that engineering wasn’t just about mechanics and cars and car engines and all that stuff – it was also about creativity and making things and just making things you could call your own and designing stuff and I thought that was really good and that. It has changed my perception about engineering

(Yr 10, West African female student)

Sasha: You get the impression that scientists just stay in a lab all day just doing experiments whereas an engineer would be out making things – you can see your creations come to life.

(Yr 9 Pakistani female student)

While it is clear that the LEP has been successful in addressing the gendered stereotype of engineering for some students, it is interesting to consider whether this success is superficial or more deep rooted. Vanessa’s account of how engineers could be women, to an extent, seemed to suggest that the roles she understood men and women to have in engineering were still stereotypical. In this account Vanessa describes the woman’s role as being important in testing the car because she has long fingernails and has to be catered for in the car design:

Vanessa: A lot of people think it is just men but when you look at designing car- women could do that. The men might test it in different countries and all that but when you think about it we have to test it as well ‘cause we have to drive it. The man, Stan Butler, he was talking about he

had to take all different people to test drive a car so the woman who has long finger nails and she couldn't press the button – the car had to be made to suit everyone so basically if she couldn't press the button and everyone else can they would have to change the button. It's things like that.

(Yr 9 Caribbean female students)

Theresa and Vanesha briefly discuss a female character in Eastenders who is an engineer, but Theresa clearly does not see this character as an aspirational figure as she is not feminine. (However, Theresa does later say that she would consider engineering as a career):

Vanesha: but look at ...from Eastenders

Theresa: Yeah, I know but she's like a brain – she's not feminine

(Yr 9 Caribbean female students)

While all the students talked about enjoying LEP activities, it was clear that, for some students, the stereotype of an engineer as a male was very deeply entrenched and had not moved:

Lilly: Engineering – I think that is more of a boyish kind of thing. I think it is more for a man.

Interviewer: *Yeah, what makes you say that?*

Lilly: Because engineering, like is to do with buildings and computers and all of that. It's more of a man's job. – I don't know – just a personal reason – but it's really fun. I like engineering club 'cause you make different things.

(Yr 9, Algerian/ Irish female student)

Orientation to careers in engineering

As already discussed, while engineering was rarely mentioned as students' first choice at the onset of interviews, it was very clear from students' accounts that a large number of the students interviewed (12/17) were enthused enough (by the end of the interview) about engineering to consider it as a career.

John: It's an option...me being an engineer is an option

Campbell: yeh it's an option

Olu: I like making stuff The jobs that I do – I don't want to be sitting down in an office just writing – I want a hands on job and engineering has a lot of jobs available and job opportunities and it's definitely something that I might stick to and if I don't stick to engineering it will probably be that I found something that I liked

(Yr 10, West African male student)

Joanne: yeah – they made me think of doing engineering at university. It made me think it's not just something that boys can do – everyone can do it

(Yr 10, West African female student)

Hannah: I think it was David - we didn't know much about engineering until he introduced things about engineering and things so he got us to think about it. He got us to come here. I wouldn't be thinking about engineering on my own.

Interviewer: Would you think about engineering as a job? Is it something you would consider...

Hannah: No- before this no

Vanessa: Before this no

Interviewer: But you would consider an engineer as a career now? It is something you would look into.

Hannah: Yes.

Theresa: Yes

Vanessa: I think I would - I would think about designing... I wanted to be a designer before but I wasn't thinking about engineering – just designing. I think I would like to be a designer and make models - like prototypes

(Yr 9 Caribbean female students)

Vanessa touches here on a question posed by several students: whether they could combine engineering at university with another subject. Students seemed to want to find out specific information about engineering courses at HE:

Sarah: I would like to go to university...is there anything that mixes engineering and medicine

(Yr 10, West African female student)

Fiona: it's made me think of doing engineering as well as accounting but I don't know if I can do that

(Yr 10, West African female student)

Ganya: I wanted to be an astronaut but ... can mix it together if you do aerospace engineering

(Yr 10, West African female student)

Femi also talks about being interested in a career in engineering. However, she understands that the activities done in the YEC do not represent what a job would be like and her perception of what engineering as a job is, is limited; again, she seems to need more specific information about particular courses and career paths:

Femi: When someone says do you want a job about engineering – before, I would have said no, no, no – that’s screwdrivers and stuff. I’m not saying I would get a job in engineering because like – when I’m older I might change my mind, but at the moment ... I would consider a job in it but I am not really set, I am not really enthusiastic about it. I am enthusiastic about the club and about engineering but the prospect of a job in engineering, when I am older, is not making me jump up and down.

...

like the club – the club excites me but the future in a job doesn’t excite me because it wouldn’t be ideal for me because engineering is sort of a hands on job and I’m not, in general a hands on person....An engineer, to me, is somebody who works ... with say a computer ... the person who makes an object work and run smoothly – that’s engineer to me.
(Yr 9, West African female student)

Frequently, students talked about being interested in engineering as their interviews progressed while not mentioning it as a possibility at the beginning.

Joanne: I really wanted to do medicine but when I do other courses like engineering courses, I think it is more interesting...I thought that maybe I could take engineering – I could be an engineer
(Yr 10, West African female student)

Students’ accounts, perhaps, suggest that when activities are recent or students are reminded of them, they are more likely to feel positive about engineering as a career. This suggests that while the LEP has had a powerful impact on students’ orientations, students have not fully absorbed these possibilities and other more dominant discourses about jobs in the media and at home are likely to over ride them. Students’ ideas of themselves as potential engineers seem to be quite fragile. One example, where this seemed to be the case, was during the course of two interviews held at the same school. Henry arrived at the end of one interview with two other students. He talked enthusiastically about how he wanted to become an engineer; though his knowledge of particular areas of engineering was not developed, he seemed quite definite that engineering would suit him:

Henry: I do want to be an engineer but I never actually thought about anything about engineering until I started coming here.

Interviewer: *Do you know what sort of engineer you want to be?*

Henry: Design and builder – not just one of them...

Interviewer: *Do you know which area?*

Henry: I don’t know.

...

Interviewer: *so you didn’t know anything about engineering before you came?*

Henry: no, I didn’t know anything about it

Because of this, I was keen to talk to him in more depth. However, when I interviewed him almost two months later, the idea of becoming an engineer was not mentioned until I asked him directly about it. It seemed that the fact that the club had stopped running and his having no involvement over recent weeks had contributed to this change:

Henry: ...want to be...still something around the author idea or something around football...either a player or a coach

Interviewer: *You said last time that you wanted to be an engineer*

Henry: I'm interested in engineering

...it's been ages since we've actually done it and it's like only 4 people now in the club

Unsurprisingly, female students did talk about the male dominance of engineering jobs. Femi discussed this but said that if she had decided upon a job in engineering this would not have an impact:

Femi: I'm not being sexist but (an engineer is) probably a man but if you picture an engineer realistically it could be anybody.

Interviewer: *And does that have an effect on you picturing yourself as one?*

Femi: Not really because – no it's not the fact that a woman can't do that job because a woman could do that job if she wanted

Interviewer: *So you wouldn't mind that there were more men doing it – that kind of thing?*

Femi: No, because if it's what I want to do I would do it. It doesn't really matter if it is still unequal like in men and women – so there is no point in stopping yourself getting a job just because of that – I don't think that will change.

(Yr 9, West African female student)

Lilly, however, described how she would not consider becoming an engineer because she still sees it as a man's job:

Interviewer: *In terms of engineering, if I said would you like to be an engineer – is it something you would consider?*

Lilly: No

Interviewer: *Can you tell me why not?*

Lilly: Because as I said, I think it is a man's thing.

(Yr 9, Algerian/ Irish female student)

Summary

Unsurprisingly, as most had volunteered for the YEC or other STEM activities, the students interviewed were positively orientated towards science; most were phlegmatic about maths while some were enthusiastic – maths was generally held to be more difficult. Students' enjoyment of these subjects seemed to be closely connected to their own levels of success within them. Experiments and other practical activities in science were most frequently mentioned as enjoyable; also mentioned was when the subject was made relevant to 'real life'.

Students' perceptions of scientists remained fairly stereotypical though positive comments were made about their intelligence and their contribution to the world in general. Students' perceptions of engineers, however, appeared to be in the process of shifting: stereotypes were stated and questioned – often in the same sentence. There was also evidence that some students were beginning to grasp the variety of jobs covered by the term 'engineer'.

While few students identified engineering as a choice of career at the start of their interview, the majority said that they would consider a career in engineering. Students were keen for more information, particularly about the possibility of combining engineering at university with other areas of interest. However, this very positive orientation towards careers in engineering seemed fragile; there appeared to be a need for continuity and reinforcement to keep engineering as a possibility in students' minds.

Part 3

Responses to LEP activities

YEC

Motivation for joining and attending clubs

Students provided a number of different reasons for joining the club in the first instance. Trips were mentioned, as was the opportunity to be involved in making things:

Campbell: I would love to lie here but I am not going to. It was the fact that I am going to get trips out of school.

Lilly: Because you go on different trips and you learn different things.

Interviewer: *So trips and learning different things and what things did you think you were going to learn?*

Lilly: How to make things.

This desire to make things also seemed to be the motivation for another student who talked about how she enjoyed a STEM day and that this had stimulated her interest in the club. She had asked if she could attend the club, despite the fact that she was not in the targeted year group:

Rebecca: I got interested in engineering when we had that day – STEM day and we all had to make a tower or a bridge. The bridge had to be big but had to hold a certain amount of weight.

... we had to make that and I started to get interested and then I heard mention – I am not sure that it was directed to me but she mentioned it so I asked him about it so I came on the first day and I signed up for it

Other students said that they were motivated to attend because they wanted to find out about different careers:

John: There are more opportunities. I can learn more things if I do engineering.

...I can learn more opportunities like – school stuff....

Campbell: If you want to be a business manager why would you want to..

John: Oh, it's an option. I can do it as an option if I want to like if I fail as a business man then I could be an engineer.

Daniel: ...one reason I started the engineering 'cause like in courses – you don't hear nothing about engineering – you don't really know what it is about 'cause I thought it was about builders and stuff - but I knew that wasn't it so I thought it would be a place where I could ask.

Shanida: ...because I just wanted to see what everything's about because I am still not sure what I wanted to be so I just came to find out – might lead to a career path or it might kind of give me information about what engineering is about

Some students had heard about the club through presentations in assembly and decided to join because they were interested in what they had heard. Some students said that they had not been interested initially because they did not think engineering was of any interest to them but that they had joined later because of recommendations from their friends:

Hannah: There was a year nine presentation and Mr. ... said if we were interested we could come and put down our names and see what it was all about...I didn't come to it like that 'cause I thought it was just about mechanics and stuff like that so I just left it and then several of my friends came and they were talking to me about it and I decided to come. It was recommended to me.

Femi: Like when, I think they said Ahmed came and he came and some other people came as well and then they came to our assembly and they explained about engineering club and when it was going to start but I wasn't really interested because, in general, I wasn't interested because I thought engineering was stuff like sticks and stuff – not like the stuff that we do in club – so I wasn't really interested...
One of my friends was going and then I decided to go for one day – on Monday and I just carried on going after that. I just started engineering – I didn't go on the first day 'cause when they said in assembly – I was like – oh

Other students only mentioned peers as providing information about the club:

Sam: My friend said there is a new engineers club on and I went – oh that sounds a bit boring. I didn't really jump on the spot but when they were going down – at lunchtime they came down and I came down with them and I started to think maybe I would give it a try so I just asked if I could do it just for today. So that's how I joined.

Martha: One of my friends was telling me about engineering and I thought – that's cool and like she was trying to get me to start engineering club – took me one and – the robot that we did – she's the one that got me into it.

Interviewer: *And how about you?*

Sasha: Same friend

For one of the students, it was pressure from a teacher that led him to attend – though not regularly:

Daniel: At first I didn't come but yeah – Mr...made me come – told me to come

Many of the students spoken to, regularly attended the club. However, this was not true of all the students. One reason for students not attending was clubs not always running and boys from one school mentioned as a disappointment. The club at another school seemed not to have ever become properly established; students had only completed one activity and the Year 10 group interviewed talked about finding the day the club ran difficult (the club leader decided to change the day but this was only two weeks before the end of the summer term). It was clear that, for the students interviewed, the club had to compete against students' other commitments:

Shanida: I don't know 'cause I haven't really been here for a while now and I was here for the shape jobs and the experiment we made and I found that quite interesting because most of the time I have meetings to go to and I had work experience but now it is on a Tuesday I might be able to come.

Daniel: ...Sometimes I have other stuff to do after school

Interviewer: What – homework or social?

Daniel: Both – I just go home. Other times – IPC – you basically go to some place inside the school and we have ... and this is every Wednesday and this is on a Wednesday as well.

One student talked about how she had chosen another club over the YEC; there seemed to be a number of reasons for this:

Sasha: Yeah but then there is another club that one of my other teachers said I should join and it was on the same day – he was like – you should go to that one 'cause it's more for you ... we had a big conference on Thursday afternoon and Friday and you represent a country and then you talk about an issue – like in the UN.

Interviewer: *And did that sound more interesting?*

Sasha: Yeah... in the UN thing you were given a country and you had to find out your country's opinion on a certain topic and it's like you get to find out how the government works and how the people work with the government – what your country trades in, allies and that kind of stuff so you get that sort of background information on your topic and it helps your public speaking 'cause you have to debate with other schools.

It is interesting to note her motivations for choosing to join the other club seem to include the fact that the club deals with global and real issues and provides the opportunity for interaction with other schools. These are areas of interest that are both raised during students' conversations about the YEC.

It is also worth noting that the small size of the club is something that appeals to Femi. This is partly because it ensures that she receives individual attention from her teacher:

Femi: You know how our group is quite small – I like it like that ...I just don't like big groups because if a big group came here I wouldn't enjoy it as much as I do now at all because it would feel like the attention has to be even more shared – like we can all get individual help in our little group now and that's what I like – I like help the way it is now but in a bigger group sometimes you have to wait for a long, long time to get help and then when you get your help it would have to be short and that's why I don't like big groups in general. I know a lot of people don't come and I know they are trying to encourage more people to come but from my point of view, I like it the way it is.

YEC activities

When students talked about the YEC activities they had been involved with, what was quite striking about their accounts was the detail they were able to recall when talking about activities that they had enjoyed. Students talked enthusiastically about all the activities they had done. A range of activities were discussed, particularly building bridges out of paper, making a marble run, building towers out of paper, making a radio and making a shape to drop through wallpaper paste ¹. A few key reasons for their enthusiasm emerged in the various accounts: in the following extract, Vanesha lists a number of common areas of enjoyment:

Theresa: We have made bridges out of paper.

Vanesha: Made mazes – like marble mazes.

Theresa: We made bridges out of wood – last week.

Vanesha: Yeah, which shape could go the fastest.

...I liked all those things – making things- construction, winning things, challenges, prizes and the competitions...

(Yr 9 Caribbean female students)

The enjoyment of the competition mentioned by Vanesha was the most frequently commented on aspect of the activities:

¹ This activity, however, was perhaps commented on so frequently because, for a few of the students interviewed, it was the only activity that they completed

Theresa: I liked the competitions – and then you see different stages in the competition –
(Yr 9 Caribbean female student)

Daniel: ... the competition as well.
(Yr 10 West African male student)

Ganya: The first day we started we tried to find out what was the best shape to go fastest. That was interesting. We had races.
(Yr 10 West African female student)

It was clear just how competitive the boys from one school were about activities completed in the club by the tone of their conversation during the interview: they argued about how much weight a paper tower could hold, for, off and on, over 20 minutes:

John: We built a bridge... We built a bridge to see how much it could hold. We actually got a record for it. We got seventeen kilograms or twenty-two kilograms.

Campbell: Kilograms! You put seventeen kilograms in your paper tower!

John: Yeah you weren't there.

Campbell: You didn't put seventeen kilograms – right let's look at something in this room that's seventeen kilograms. What do you think that's in this room that's seventeen kilograms?

(10 minutes later)

Campbell: Seventeen kilograms! Yes but like practically – you wouldn't put that on top of a paper tower and expect it to hold it.

John: Trust me we had...

Campbell: Not seventeen kilograms.

Perhaps because the students that attend the YEC tend to be high achieving, their enjoyment of competition is heightened; part of the enjoyment of the competition was not simply in taking part but in actually winning. It is clear from the following accounts just how important to these students winning was, and what a sense of achievement it provided them with:

Femi: One was where we rolled up papers like this and we had to make the tallest tower. I think it was my first day or the second one and we did it in this room and we had paper and tape and we had to make the tallest tower with just paper and tape and I remember that day because there was just me and my friend and we were in a group together and I remember it because we won – that's how I remember it. We only won because at the last minute I just put another paper on top and it just beat everyone else.

(Yr 10 West African female student)

Hannah: What I remember is that marble game – you know the maze. I won and I started to cry.

Vanessa: She's never won anything.

Hannah: I haven't won before– I've been in a lot and I was really emotional
(Yr 9 Caribbean female student)

Campbell: We had to do a thing in twenty seconds...a marble run

Henry: Oh yes we won that. We won that perfectly.

Campbell: Ours was just the best

Henry: And the closest to twenty-one - me and Campbell think we got twenty-one.

Campbell: We got twenty. They tried to cheat us – stop it early because...

Henry: ...we won – we went mad – we got told off cos we went so mad but we was the only one that got it in 20 seconds...we got a goody bag
(Yr 9, white British male students)

Theresa: The bridge – the wooden bridge - we started in the time and the year sevens did - so we just have to try and make a bridge that would balance how many weights on - was it

...Yes. We were really proud of ourselves because it was our first day back so the other groups had been doing it for three weeks and we came second. If we had longer we could have won

(Yr 9 Caribbean female student)

Sasha and Martha talk about their involvement in the androids advanced competition. From their account, it is again clear that winning second place was important to them. Also important, was the presence of the judges and the other schools. The presence of these participants and experts who are external to their school, clearly plays a part in their sense of achievement:

Sasha: We came second place in the dancing.

... Eight robots were on the stage at one time and then they had two so sixteen could do it and then had like a make up time. So if your robot didn't do well in the actual competition then it could go again and we chose to put ours again 'cause it fell doing the dance in the first round and then it ended not falling at all in the second one during the entire routine...

Martha: We showed it again and the judges were quite impressed because all eyes were on ours ...they could see the good dance moves that we put in – they (the judges) were quite impressed...

Interviewer: Did it make you feel more competitive having it against other schools?

Sasha: Yeah it was more fun as well 'cause it's like - the competition – to beat them as well

(Yr 9 Pakistani student)

This enjoyment of showing what students can do in front of a wider audience was echoed by a group of students who participated in the GO4SET day at LSBU:

Theresa: Yeah...– at first we were shy and then we got into it.

Interviewer: *Can you explain what is good about that?*

Hannah: It's the confidence...

Vanessa: I got really excited. The food was nice as well (laughter)
Actually I think that was one of the best things.

(Yr 9 Caribbean female student)

As well as competing, students also talked about the prizes they won which was clearly important to these students:

Henry: ...we won – we went mad – we got told off cos we went so mad but we was the only one that got it in 20 seconds...we got a goody bag
(Yr 9, white male student)

Femi: *(re. stands at Portsmouth)* Yeah – I liked the ones where they were giving out prizes.

(Yr 9, West African female student)

Ganya: There was one time that we were talking about the go-cart and we were planning what we should do...The thing that makes it interesting is like after the end of building it there is the competition and the prize
(Yr 10, West African female student)

Martha: The prizes were not very good...

Sasha: It was a glass trophy that we got to bring back to school
(Yr 9 Pakistani & Bangladeshi female students)

Another frequently mentioned enjoyable aspect of the activities completed in the clubs, was their very practical nature:

Lilly: ... it's really fun. I like engineering club 'cause you make different things. Last week we made a radio. It was a bit hard 'cause there was this hot metal that we had and we had to combine different metals. We just make new different things, like last time we made a bridge and ... making a radio – that was really good... how to do the metal stuff and how to case them in and put the battery
(Yr 9, Algerian/Irish female student)

Rebecca: I like being practical – it's fun.

Sam: Yeah – I like using my hands.
(Yr 7, West African & white female students)

Students also contrasted this practical focus to what is expected of them in their lessons. The lack of formal instruction and interruption by teachers, as commented on by students interviewed during other stages of the project, were seen by students to contribute to the activities being so enjoyable and challenging. Instead of being told how to do a task they have to work it out for themselves:

Campbell: It's practical. It's not sitting writing.

John: You think about it - in a lesson, you don't have to think in a lesson do you, 'cause you know what they are going to put in the charts

Campbell: And they give you too much detail of what to do.

John: If you are in a science lesson, yeah, you pretty much know – you know all the answers of the questions they are going to ask you. They are just going to ask you the same question over and over again.

Campbell: And to make things as well 'cause I've never made anything like that before.

...

Campbell: It's more challenging when you go out of school 'cause you aint got someone there helping you all the time. I like the same - where you have to think about it – you can't just say do that and you just go and do it straight away 'cause you know what to do. I like to be able to sit down and work it out – like trial and error - do it. In lessons it depends on what someone tells you – blaa, blaa, blaa – it's a bit like that.

Interviewer: *So it's the trial and error bit of it that's quite enjoyable as well?*

Campbell: Yeah, changing it, modifying it - yeah.
(Yr 9, white boys)

Another aspect of the practical orientation of the projects that students said they enjoyed was that they could start making straight away without planning and that it provided the opportunity for creativity – echoing what other female students had said about the appeal of engineering as a career:

Sam: 'Cause you get to - 'cause in normal DT lessons you have to plan in out, write about it and do a flow chart about it but in here he just tells you and gives you some stuff to follow and you go and do it so there is no boring stuff like having to plan it out. I know you are supposed to plan it out but it is boring.

Rebecca: More hands on.
(Yr 7, white & West African female students)

Rebecca: Sir said – like for the bridges- sir said what the instructions said it's meant to be – but to build it how you want it to be – so it can be really artistic.

As with students interviewed during Stage 2 of the project, the opportunity for teamwork was again mentioned as being enjoyable. Lilly who as mentioned previously, seemed to lack confidence in her ability, clearly enjoyed the supportive as well as the social aspects of working in a team:

Lilly: ... It was quite fun really and it was also fun working in a team so we all got a chance to do things. ... We had a little laugh – like while we are doing it we also have fun doing it and we talk about – for example if I get something wrong they would tell me and if they get something wrong I would tell them so we all help each other.

One student commented that she found having her photo taken while doing an activity for the LEC exciting:

Theresa: like pictures – you're basically trying to look concerned for the picture – like it's not going to make it. It is exciting as well.

Interviewer: What, having your photo taken?

Theresa: Yeah – like if it looks at if you're going to drop, they might take a picture and you're like – or if you are happy you are like – oh yeah.

She perhaps touches on an issue here that was raised by another student. Her excitement about having her photo taken is perhaps connected to the wider audience of other YECs in Southwark that that photograph will reach. As mentioned previously, students enjoy competing against but also meeting and working with students from other schools and making new friendships and connections. They also like to be part of something that goes beyond their own specific context of school and year group. Shanida commented that she would like the club to be open to other year groups:

Shanida: it's just the year tens. It's really meant for the top group – so there's not a lot - it would be nicer if they opened up the age range more to the younger ones.

Femi talked in some depth, about how she felt disappointed that her little YEC group seemed to be left on their own, isolated when so many schools are involved:

Femi: One of the things that I don't really like about the club is that the number of the people who do the engineering project never come...
... when we are in the club and it's just us and maybe the teacher and it's just like we are given a task to do and we just do it and then we just like – it would be better if somebody came and explained why we are doing it – what was the purpose and in general it would be just nice to see someone – it would be nice for someone to come who is from the source of why we are doing this. It's just like we are being given the materials to do this on our own.

...I enjoy what we do here and why we do it here but it would be nice if someone ... because it would make us feel that we were participating 'cause there's loads of clubs in south London...

Interviewer: *Yeah – so you feel a little bit isolated because you don't – although this is going on everywhere you don't feel a part of that – you've got no connection to it*

Femi: Yeah, no connection – I wouldn't say that we needed trips and I wouldn't say that we need to commute – we've got our club but would just like the people who are running this whole thing – it would be nice for them to visit us once in a while.

She also clearly felt disappointed and even slightly betrayed that the fieldworker had not visited every four weeks as he said he would – though she understood that he had other calls on his time:

Femi: There was this one man he came at the start and he said he would be coming every four weeks but I don't think I have seen him since Christmas so he doesn't come at all. Nobody comes to visit or anything. We just sort of do our own thing with the materials supplied... I think he said every four weeks yeah – I haven't seen him for months.
... so that it kind of feels that we've just been given the materials to do our self and it feels like they go to everybody else and I know he can't really come – the man – 'cause he has lots of other schools to go to but what about us? There's not even a lot of us but it would just be nice, in general, and I think I speak for everyone when I say that.

Trips do clearly serve the purpose of connecting different school involved in the YECs and it is clear from students' accounts that trips are highly valued and exciting. Indeed, as already discussed, the potential involvement in trips is the reason that some students join the clubs in the first instance. Trips were mentioned as being particularly memorable for students:

Vanessa: (Go4SET at LSBU) ...I got really excited. The food was nice as well (laughter). Actually, I think that was one of the best things

Femi: I have only been on one trip with this club and that was to Portsmouth or some RAF thing...It was really good. There was loads of stuff to talk about ...there was some business stands there as well – they were promoting – I didn't really go to them ones, I went to the more fun ones where you could do stuff and participate.
... it was just like a bunch of stands but some you could get more involved with it...
... I just went 'cause it was a trip.

Femi talked in some detail about the trip to Portsmouth. She talks of how she 'went 'cause it was a trip'. She was attracted to stands where she could get

actively involved and, almost accidentally, found out about engineering jobs and the role of engineering in areas she did not expect to find it:

Femi: – I didn't know what it was really about – I just went and when I got there that was when I realised it was stuff that was there and after that I explored the place and I just found out ... We even learned how engineering was even in other stuff... Some you just went up to them and they spoke to you but there was one I went to – it was like a military one and he told us stuff about Morse code and stuff and he showed us some Morse code machine. It was really good.

... there was this one – there was this interactive one where you did some games and stuff and afterwards they started speaking and they asked us – and I went to speak to the woman and she was telling us how – I can't remember their company name but it was about they would build from a boat and then they were about importing, exporting stuff.

Campbell talks about his enjoyment of a trip being linked to how what they were asked to do was 'challenging' – the questions they were asked related to real issues in the world:

Campbell: ...we went out of school to these meetings where they gave us a few questions like if we were stuck in the desert questions and you had certain things – what would you do? You could make something that would help us. Questions that we would have to think about what we could do. We had to sit down and think about it for a while – I liked that – a challenge
(Yr 9, white male student)

This enjoyment of activities that had clear 'real life' connections was commented on again by Campbell and John when they talked about their involvement with the GO4SET project:

Campbell: We made that water, rain collecting system for around the school. We had to look at the school and we had to think about what would be the best way to collect it, designing – designing the real thing – it's not just randomly making something.

Interviewer: *So designing a real thing was good.*

John: Yeah.

Campbell: Something that was used practically.

...

Interviewer: *What was it about doing that?*

Campbell: I liked the actual challenge of it like we had to get facts about the actual rooftops and the area. We had to make it to a specification – like it had to be the client that had to say he has to have this and this and we have to work out a way for it to work.

Interviewer: *So you were being like real engineers?*

Campbell: Yeah.²

Femi talks about her desire for there to be activities for the YEC that link with real life problems and issues:

Femi: it would be better if we had like - they tried to make it more real life in the tasks that they set – ‘cause you know problem with the sea that we have right now – like the Tsunami – I think that would be good.

It is interesting to note the desire for challenge mentioned by the two boys in these extracts. Femi echoes their views in her comments about her desire for greater challenge in the activities completed during the YEC and again for opportunities to move beyond the confines of the classroom to engage with the real world outside:

Femi: In general I like it but I think that we could do something bigger than classroom tasks - like say go outside and do something outside. It's just that we are confined to our classroom – like we can find engineering stuff in other places as well – within the school but we just choose to stay in the class. Well, we don't choose but we just stay in the class.
... not just have the materials supplied here – why don't we go and find materials ourself and then do something. I think it would be good if we, the students, could make up something to do ourselves – like set a challenge for ourselves - but make a hard challenge
(Yr 9, West African female student)

It seems, from Femi's account that she finds some of the YEC activities to be insufficiently challenging:

Femi: – ‘cause these challenges now – I'm not saying they're easy but I'd like to know more about what we are doing and if we made a challenge we would know exactly what about there was to do because whoever made it up...

Interviewer: *So you're not saying the challenges are easy but they are quite straightforward.*

Femi: Yeah – like the credit card one we are doing, you just have to follow the steps and then there it is and then we test it out and that's it.

Also worth noting was a discussion amongst a group of students interviewed from one school about the planned task of building a go-cart. For two of the students this prospect seemed motivating but one female student sounded unimpressed:

² Despite their enjoyment of this project it is worth noting that they were unable to complete it in the time allowed.

Ganya: There was one time that we were talking about the go-cart and we were planning what we should do...

Daniel: I definitely want to drive it.

Shanida: Yeah – I don't know – it doesn't sound appealing to me but I will go along to see what it is like. It's just a go-cart.

Ganya: The thing that makes it interesting is like after the end of building it there is the competition and the prize that would make it more interesting.

Shanida: That doesn't quite do it for me.

Students' reactions to YEC materials

The YECs at two schools were shown materials used to advertise the clubs and to introduce a torch making task. They were shown two versions of these materials and asked to comment on which they preferred. The materials had been developed over the year – students were shown the originals and up to date versions. The original versions were labelled a) and later versions - b).

The overwhelming majority preferred the more up to date poster: the layout, colours and organisation of the text were all cited as reasons for this preference. What was interesting about students' responses however, was that most of the students preferred the images on the earlier poster; the reason given was the insight it provided into what activities were done in the clubs:

There are more pictures – they'd make you think 'oh this is what you do here, oh I want to go'

They are showing more details of what they do in young engineers and showing more pictures of the actual designs

I like the images in poster a – it shows more what you are building

It has more pictures to show you what you might be doing – it shows you that someone has made it as well

Poster a has more pictures of what you can actually do

The ethnicity of the young people in the images was not mentioned, however, their ages were commented on; several students commented on wanting to see other students' their own age:

...but in poster b they look older – like GCSE and uni students

...on poster a they look more our age

a) has more of a variety of people – some are older and some are younger

Students' preference for the up to date activity was less pronounced (8/14) as some students said that they liked the detail provided in the first version.³ Students' comments about the scenario were interesting. What was evident was that, though one of the groups had just completed the task, they had not engaged with the scenario and were considering it for the first time. Some students were very positive, liking the idea that they were producing the torch for a reason and that the torch would have a function:

The scenario is quite good – it gives you a better picture of what you are going to do and what it's used for

You feel like you are actually doing something for someone

The scenario is good – it tells you exactly what you need the torch for

It puts you in the position of being an actual engineer – making a real thing

However, two students were unconvinced by the scenario, finding it unrealistic:

I don't think it's actually necessary – a small light wouldn't do that much if there was a power failure on the underground – they are exaggerating too much – it would only work if everyone had one and they all turned them on at the same time

The two year seven students appeared to struggle with the scenario. Neither student seemed to understand what the scenario was; one took it literally and the other dismissed it because she believed it to be 'made up':

I wouldn't want to do it – it's for other people – it's not even for me so I wouldn't get to use it...but reading a) you get to keep the torch so I prefer that one

The scenario is a bit childish – it's not really happening – it's just made up

Summary

Students talked about joining the clubs for various and sometimes multifaceted reasons: trips, making things, enjoying STEM days, finding out about careers were all mentioned as reasons for attending. Some students were attracted to

³as they did not have access to the diagrams accompanying the new version this point is probably not significant

the club by presentations in assembly but some said that it was only after talking to friends about their experiences that they decided to go. Most attended regularly but others talked about other commitments.

Students enjoyed all the activities completed in the club. The competition and winning, were important aspects to their enjoyment. Students who had competed against other schools seemed to enjoy this wider audience. Students talked about enjoying the practical nature of tasks and the autonomy they had in making without interruption or advice. The opportunity to be creative was again mentioned as was working in teams. Students also talked about a desire for connections with the wider network of clubs and LEP field workers Trips were evidently memorable for students; activities that connected with 'real life' were valued as were challenging activities. One student talked about wanting further challenge from the YEC activities.

Students talked about the posters used to advertise the club and one of the activities. Both of the updated versions were preferred. From student feedback it was evident students liked to see images of what they would be making and they liked to see other students their own age. The scenario posed some difficulties for Year 7 students but was viewed positively by most Year 8 and 9 students. A reason for this was that it provided a real context for the activity. However, students did not seem to have read the scenario before, though they had completed the task.

STEM activities

Much of what was said about enjoyment of activities in the clubs was echoed in accounts of STEM days. Students talked about enjoying the practical focus of activities:

Sasha: (*re Trebuchet Challenge*) It was a real fun 'cause they just gave you the wood and a toolbox and the instructions: and like you just had to go and make it and it was fun 'cause you had to draw and saw and cut and all that stuff.

(Yr 9, Pakistani student)

Students again talked about enjoying the fact that they were not interrupted by teachers during the activities:

Fiona: I liked it because I liked having the instructions and then building something...I liked getting something to do and getting through the task without stopping all the time and something. A goal straight ahead of you – it was like a challenge

Joanne: we had our freedom...

Fiona: We had to do what we want. We've got time and then we do it

...

Fiona: He showed us how to do it at the beginning and he didn't show us part by part you know and then make us stop and show us how to do it again – we done it all in once.

Joanne: Which is more interesting 'cause every time you stop it gets annoying and boring so it was good.

The competition and winning was, again, important to students' enjoyment:

Martha: It was really fun making the whole Trebuchet out of wood and stuff and we had to do it all ourselves – like working as a team as well and we managed to win as well.

Henry talked about the benefits of being at LSBU rather than at school. As well as enjoying the change of environment and the food, Henry also talks about enjoying competing with other schools (and winning).

Henry: you didn't get people interrupting you – it was a change of environment – better you had more space and you could compare how you do it with how other people do it so the competition's better... and we got to show people how to build the bridge ...most of the thing's we've gone into we've won we beat a record – ours carried 8kg ...the food and drink was nice

As with their accounts of activities in the YEC, it was evident that these students enjoyed winning (and prizes):

Joanne: They gave us this wood and started to build it up ...and made an example and that was our model and we had to make it off that. We won that – we won rulers and a mouse mat

Ganya: Yeah from the start talk to design bridges and then we designed – we got into groups – I think it was two or three – then we designed bridges and then the group would discuss and we would find ways of making the bridge stronger and making it a building we like. We improved on that bridge that we finished making today and we tested it out by holding weights and then we had a competition to see which could hold the most weight

Interviewer: *And which did?*

Ganya: Mine

Interviewer: *So you won two. How did that make you feel?*

Ganya: Quite powerful

Students also commented on enjoying STEM activities because they linked with real life. Being provided with a budget seemed to be a key part of providing the students with a sense that they had a real job to do:

Joanne: We had to make a bridge out of paper. We had a budget to buy the equipment – like screens, paper, drawer things, string and paper.

...

Fiona: That was interesting...Yes it has to hold an amount of kilograms and how much it would cost would depend on how much you had to buy because you had a limit at the beginning of how much stuff we had and if we needed more we had to buy it and that's how much our bridge would cost.

Interviewer: *And was that good? Can you tell me?*

Joanne: You don't waste things and you make sure you have an idea of how much things cost

Sarah: And use your money wisely

Fiona: It was more into reality than just making stuff.

Interviewer: *Yeah so it makes you feel like you're actually*

Sarah: Kind of real shopping

Fiona: Like running your own business or something

Ganya: Before we could even start making it we had to budget ourself. In a real company, if you want to do something you have to have the money – you have to invest your money wisely, know how to spend it on this, this, this and this You can get over budget quickly but at the beginning you're over budget – we had to limit our supply – we had to think of different ways to use all the resources we had to do that.

Joanne: It was kind of interesting and fun.

Sarah: The people with the smallest wind turbine won. (laughter)

Fiona: It was tiny.... Yeah and it was reality more

Having particular roles also contributed to this enjoyment of the activity and effectively linked it, for the students, to 'real life':

Joanne: And we had roles. There was a team leader, a finance manager and a marketing manager, building thingy. There was a building thing – the person who was going to count out the money of how much we were going to spend. There was a designer.

Interviewer: *And how did that work in reality – having roles?*

Joanne: It was quite interesting. I have never done anything like that before so it was kind of interesting. It made you so...

Fiona: 'Cause in a lot of businesses always goes to actual people.

Interviewer: *So again it made it feel as though it was a real thing rather than just a task at school. Did you do it here?*

Fiona: Yeah

Students also commented on enjoying working in a team:

Rebecca: some people who were making the actual material – that was easier - and other people were going to be designing it and thinking how it was going to be planned and we were just working together. Yeah, it was fun because when things looked wrong we had to work out how to put it right.

...

I do like being in a team when it comes to constructing maybe in science I like to be independent but in engineering I like to be in a team.

Sarah: I liked working in a team

Ganya talks about the fact that her team worked well together and won which seemed to provide her with a real sense of achievement:

Ganya: ... You had to conduct the money that we had and use the right amount of materials and you had a budget and again it was a competition, which I actually won... But the thing I liked most about it was – 'cause my people from the start – my people were strong- we had the vision of what we were going to do and how we were going to do that – we just pulled it all together -the group was outstanding. ... we showed our best qualities and we won.

Working in teams with students from other schools was also commented on positively:

Vanessa: We all had to make our Trebuchet. We were all in groups with different schools

...The first day was good but the second day we were split up in the conference halls but basically it was good for us because we got to experience working with new people

Theresa: We got on better with different people than our friends.

Hannah: Yeah – with our friends - say they are not doing something quite how you want it you shout up but obviously you don't know this person – you can't shout at them.

Indeed, students who completed the Trebuchet Challenge when there was only their school present talked about wanting to work with other students:

Martha: Yeah – it gets quite boring working with the same people over and over again. You are not as competitive as you would be with other people.

Students also talked positively about an engineering day where there had been a competition for the whole year group to design and make something of practical use:

Martha: ...It was quite cool what they made. Some girls they made shell with a fan in it. One girl made a foot spa. It was quite cool and it was made out of newspapers and it had sections where you could put all your like bubbles, nail polish or foot cream and stuff like that and other girls made a jewellery box with a light and one was just a rocket – that they made in my class.

The appeal of this for the students seems to have been the opportunity to be creative and design something original. Martha talks about how she would have liked to have more opportunity for 'design' during the Trebuchet Challenge:

Martha: The Trebuchet was alright I think we should have got a chance to design the Trebuchet a bit more and make it a bit nicer because all we did was make the Trebuchet and that was it and we should have had a chance to paint it or something.

Residential Courses

There were many echoes in what students' said about the residential courses with what they had said about STEM days and the YEC session. They enjoyed the competition, the prizes and the opportunity to do something practical. Having to work to a budget was again mentioned.

Lilly: *Harper Adams University.* Four days there and, oh my God, it was really good. We had to make these cars and basically, we had an egg in the middle and you know a van, we had to protect the egg with all different fabrics and we had to pretend that the fabrics cost ten thousand pounds and all of that.

...we had to make these cars and once the egg goes down the ramp – it was like a competition with all the groups and basically what happened was, it had to go down the ramp but there can't be one mark or a smash or anything and because they were gone off eggs, they stank! It was unbelievable

Sarah: Because we were actually split up into groups – each group – first – we didn't go into building at first – we had to do research at first. We chose straws and spaghetti to build the pylon and we won. We won!

Hannah: Yeah and you had to find out – you had a budget of one million pounds – you had to make a presentation

The presentation was mentioned by a number of students; they seemed to enjoy it as it provided them with an opportunity to show others what they had achieved:

Daniel: I enjoyed that. You had to explain to other people what you did and why you put it there.... 'cause you want other people to know why you did it and just like you just prove that you actually did it and it shows everyone else that.

Fiona: we used the computer for research and then we did a power point presentation and we had to show it to everyone ...I wasn't nervous

...

Joanne: I get nervous – only when I'm around people I don't know or when I have to stand in front of a lot of people...

Interviewer: So did you enjoy doing the presentation?

All: yeah

Joanne: people did it in turns and you had to advertise your pylon ...say how efficient our pylon was and say what it can do

The time allowed for the project also allowed students to make something that they felt was substantial and that they were genuinely proud of. This was the reason Shanida gave in her explanation of why she had enjoyed making the house most out of all the LEP activities she had experienced. Having the opportunity to be creative contributed to Shanida's enjoyment of this project:

Shanida: Umm, I think I have to go for the house – the house was the best.

...because it was mainly my design. It just made me feel like it was my creation even though I was working with other people – it was our creation and we had worked really hard on it and we had worked really hard on it. The way it was different from bridge building and the other things – I don't know if it was working with other people and making a real thing and not actually playing about – it just seemed more the real thing to me.
 ... Something better and more kind of bigger and quite impressive – I mean pictures of it because I just felt proud of what I had actually made.

This enjoyment of designing the house was echoed by Daniel who talked about having to balance the design with the need to be pragmatic and use available resources:

Daniel: ... You had to be like creative – you are only given a certain amount of materials to use and I really needed something that looked like metal and you had to think what it would actually look like, you know what I mean, and you had to put it in.

Students talked about how the whole experience made them feel that they were doing a 'real life' job and they enjoyed the experience of having to work completely independently:

Vanessa: You are a scientist and you have to ... it's your own ideas and you are motivated and it all depends on you.
Hannah: They don't even tell us what we had to do. They just handed us a brief and they told us the equipment what we needed and that was it.

There was, however, some consternation amongst a group of girls who had had to construct a pylon rather than build a house:

Fiona: one used solar panels to save energy in the house
Joanne: someone had a car park underground the house
Interviewer: *so there were some really good ideas*
Sarah: yeah – and we had to make a pylon

Students also, again, talked about enjoying the opportunity to work with new people and to work in teams:

Shanida: It was really good because we had to use team work and we had to actually listen to each other

Lilly: Yeah, there were other schools there.

Interviewer: *Did you work with other schools or did you just work by yourselves?*

Lilly: We worked with other schools –like, from Bacons College and Southwark schools – yeah.

Interviewer: *How did you find that?*

Lilly: It was really nice, making friends, yeah.

As Lilly identifies, part of the enjoyment for students of the residential course, because of the time available, was rooted in the opportunity to socialise:

Daniel: The social aspect was good because you mix with different people and get to talk to people that we have never talked to before

The social activities themselves were widely discussed. The Disco generally received poor reviews because the music was not to the students' tastes – R&B was the generally requested genre rather than pop.

Joanne: No – the music wasn't good. The DJ wouldn't play good music ...the music was terrible

Daniel: I'd like R & B

Shanida: Yeah, I prefer R & B

Though seemingly trivial there is perhaps an issue here of the need for an awareness of the youth culture of inner city black teenagers. The formal dinner was also commented on. One student talked about her conversation with the adult at her table:

Shanida: ...on the dinner night I got talking to this gentleman from the Smallpeice Trust and he kept asking me questions about engineering and my future career aspirations and I enjoyed speaking to him. I think he was the chairman of something and he just talked to me and he was quite interesting.

What was, perhaps, most striking about students' accounts was on how it had raised their awareness of what life at university would be like. Students particularly talked about being in a room on their own and being responsible for themselves. Daniel also talks about his concern that it could be lonely:

Daniel To me university is kind of like independence – you are on your own and if you go to university without knowing someone you could be really lonely...

Shanida: I just felt a bit – I don't know – I just liked the whole atmosphere 'cause I kind of got to do things on my own for once and not rely on my mother and it just gave me that feeling of independence being away from home.

(Yr 10, West African students)

Hannah: I think it was really good because we were on the trip and we had no adults – it's like

...Well, we didn't have our parents. There were obviously supervisors but we felt like mature adults

Vanessa: Yeah, it's like waking up and you're going to work – you have to get your breakfast at this time - you had to be at that class at that time...

Hannah: It made you more independent.

Vanessa: Yeah, it's not like they are really, really waking you up - you have to be prepared. You have to think for yourself – that your parents 'aint there for you.

(Yr 9, Caribbean students)

The students' response to this experience was overwhelmingly positive; several students said that it had inspired them to want to go to university. One student talked about wanting to go specifically to study engineering

Hannah: I think it is fun – I want to go away to university...Obviously it's not going to be fun all the time because it is hard work but you can see what they are going through – have an idea of what it is all about – that's good.

Interviewer: You were at university doing it weren't you? What was that like?

Lilly: Yeah it was like – showing us how to work and things like that. They were telling us what it is like to be at university and how to work - things like that...

Lilly: I thought it was amazing – it was brilliant.
(Yr 9, Algerian/Irish female student)

Interviewer: How did that make you feel about university?

Joanne: Yeah that was what motivated me to go far away from home... the residential course was really what made me think I'd like to do engineering...
(Yr 10, West African student)

Shanida: I think going to the residential course that started it (thinking about engineering as a career) I was a bit like - that's a bit boring but I thought I would just go and see what it was like but that was before I actually got to make the house which made me feel that I can do more- I don't know – I just felt different afterwards 'cause now I had made something and it wasn't a bridge or a go-cart but it was my house and I made it and it was big and it made me happy to see what I was able to do.

There were some complaints: Shanida had attended the residential course with a group of boys and clearly felt a little isolated, particularly meal times when other students tended to sit with their school group. However, as she got to know other students she enjoyed herself more:

Shanida: I was the only girl from my school over there so I had no one to talk to – had to make friends and stuff like that.

... I just had to sit with them lot during dinner the whole time. They were the only ones I could actually talk to so it was a bit awkward – I don't know – boys – there was six of them and I was the only girl from my school there so it was a bit awkward but then we got into groups and then it was a mixture of boys and girls

The other complaint was simply that there were not enough residential courses and that they could not afford to go to them all the time. One student complained that she had not had a chance to go:

Joanne: You know the courses, they could make them more fluid – like not wait until next year to do another course – they could have it in half term holidays, for instance – lots of people don't go on holiday – they don't really do anything.

Sarah: Yeah – they could have more of those. And not to charge so much for it – for some of them have to pay quite a lot to go... it was £125 – which is a lot.

Fiona: I want to have a residential course in the summer holidays.
...Summer holidays, during the half term holidays – not near Christmas.

Interviewer: *Half term holidays and at what age group do you think.*

Sarah: Eight or nine and then you could think about your choices more – before you choose your options.

Femi: I wanted to go and I kept on asking the teacher but there was only six spaces and I think I came too late to the teacher because everybody else went before me. I didn't know anything about the trip at all so I just went to the teacher too late.

... I was very disappointed not being there.

Summary

STEM days: the practical focus and uninterrupted nature of the activities were again commented on positively. Enjoyment of the competition and winning also featured regularly in students' accounts. The trips where students competed with other schools were also commented on. Students enjoyed the links in the STEM day activities to real life. Being given a budget and particular roles to do contributed to this. Teamwork and working with other schools was discussed. The desire for opportunities to be creative was also expressed.

Residential Courses: again competition, winning, the prizes and the practical focus of the activities were all discussed. Students also enjoyed the presentation

as it provided an opportunity to show to a wide audience what they had achieved. The scale of the project appealed to students and the opportunity to be creative. Students discussed how they felt that they had a real job and had to work independently. The opportunity to work in teams with students from other schools was really valued; students also clearly enjoyed the social aspects of the courses. The experience seemed to have raised their awareness of what life at university would be like.

What have students learnt?

As already discussed, it was very clear from students' accounts that they had learnt about engineering and, to an extent, about the variety of roles covered by the term. There was also evidence in students' accounts of other useful learning taking place.

Students talked about developing important generic skills such as ability to work in a team and to work independently:

Lilly: (*YEC/ Residential course*) I learnt how to work as a team

Campbell: (*YEC*) I've learnt ... how to organise a group

Joanne: (*trebuchet*) I learnt how to keep time and how to work in a team and then to listen to other people's opinions

Joanne: (*Trebuchet*) *working without interruption by teachers...* It also challenges your mind because you have to learn how to ... get it yourself which is basically what we want to know – not being told everything that you have to do every minute. We got to learn about health and safety for using drills and that.

Particularly in reference to the residential course, students discussed learning important life skills: independence was again mentioned as was learning about money - having to work within a budget and even finding out about inflation:

Fiona: ... if you buy something today it might be cheaper – it might cost one pound one day and the next day it costs six pounds.
...it gave us that experience. When you added up what you'd spent – if you'd used over a million pounds then you couldn't buy it if you understand what I mean... it made me understand money. (laughter)
... You've got to think about it ... It seems like what your parents have got to go through if they have to pay this bill and they got to pay – and you

think money just grows on trees – like the fact that you need to know where your money's coming from. You need to know how much money you're earning.

Also, students talked about developing specific practical skills:

Joanne: (*trebuchet*) ...we carved different shapes that we don't normally do like a slanted thingy and we used different materials that we never used before

Sarah: (*YEC*) in the engineering one we used an electrical drill and a screwdriver

Three students had learnt how to programme a robot:

Sasha: (*androids*) We learned how to programme from the software into the robot and then testing it out

Martha: Yeah and I learned how to become more patient as well because the robot kept dying on us so we learned patience a bit – that's what I learned.

In terms of learning related to Maths and Science, again, there was evidence from students' accounts that this was taking place. Several students talked about the strength of different shapes and the effect that shape has on velocity:

Ganya: (*STEM day - building bridges*) First we had a small task to find out which was the best shape for building in and what was the best shape for holding heavy weights.

Interviewer: *And what is the best shape?*

Ganya: For like the shapes the cylinder was the best. For small groups the triangle was the best.

Martha: (*YEC*) Like seeing what shape from plasticine – what shape would be the best – like make it go through the wallpaper paste the fastest...

Sasha: It was just really interesting 'cause if you found out you had a shape that was really fat it wouldn't go – not quickly and if it was thin it would just go straight through

John and Campbell's account of the marble run revealed that they had developed a systematic approach - repeating the same angles to achieve the same speeds:

Interviewer: *So how did you work out to get it in twenty seconds?*

John: Trial and error.

Henry: Yeah we wrote line by line other speeds on the top one and sort of slant ...

Interviewer: *You just changed the angle.*

Henry: Yeah – the starter one blew up then the next one took the speed so you just need the faster one to get over the slower one and so on.

John: We made that three and then we timed how much that would give – say there was that much left and we figured out how much we'd need.

Lilly talked about learning about electricity when making her radio:

Lilly: ... making a radio – that was really good... how to do the metal stuff and how to case them in and put the battery in and how electricity can pass through and connect as the metal is already working -so it's all working at the same time.

A few students were able to identify links to the school maths and science curriculum school when asked directly:

Daniel: *(residential)* Yeah, maths 'cause you have to budget but ... You had to use science as well 'cause you had to make a house with doors, energy, and environmentally friendly... You need to know about solar panels for the sun's energy. You need to know geothermal key.

John: ...You find out about angles and you make calculations which links with maths and you find out about different matter and that links with science

One student volunteered that she had found the practical focus of actually making wind turbines had motivated her and enabled her to learn about the subject whereas at school she had not engaged with it:

Fiona: The thing is – before that we were learning about wind turbines in school and I didn't find it interesting until I actually sat making it and then I learned some stuff about it.

... But in school when they were telling us, I wasn't really paying attention.

Interviewer: *And what made you pay attention to this then?*

Fiona: 'Cause it was interesting – you actually make something and you still learn from it – that's the thing.

However, many students, though aware that LEP activities were related to what they did at school, were unable to articulate any links:

Lilly: I've learned science and maths together and how to do things...

...

Interviewer: *So it supports maths and science together and does it link with anything that you are doing in science and maths?*

Lilly: No.

Interviewer: *Have you ever thought – oh I can see how that relates to that and that?*

Lilly: No, not really.

Summary

Students identified that they had learnt about engineering and different engineering roles as well as generically useful skills like working independently and developing their ability to work as part of a team. Some life skills were also discussed, particularly relating to money, as well as some quite specific practical skills. In terms of learning about maths and science, students did talk about learning about shapes, electricity and angles. A few students could articulate some links between what they had done in LEP activities and science and maths within the curriculum but most struggled with this.

What teachers think of the LEP

Contributors

club leaders from 3 secondary schools

All three teachers were very positive about the LEP:

it's brilliant – it's a really good thing'

It's exactly what we need

It's a useful resource...STEM days are a fantastic resource...activities outside school like the Trebuchet challenge – it's fantastic

One teacher commented that the LEP activities done at the school had even received comment in a recent OFSTED report:

I think it even helped in our recent OFSTED inspection ...raising achievement, improving value added engagement ...it improves teaching and learning and the school community because it's across year groups

Also commented on was the quality of the fieldworkers and how easy they made the working relationship:

the fieldworkers – they're all good

Working with the LEP is really easy – it's all email some phone calls

One teacher felt that the YEC filled a useful gap as there was a shortage of science clubs at the school:

(re. YEC) we don't have many science clubs and it's an opportunity

The information provided by the LEP about careers in engineering was also viewed as being useful:

The students are salary orientated but lack awareness about jobs

...our girls here have contacts with medics – not with engineering

Problems encountered

There has been a problem with the clubs generally that they have not run consistently throughout the year. I talked to one of the teachers involved in detail about this. He identified the problem as being demands on his time that made running the club impossible at certain times of the year:

The difficulties are noting to do with the club – the problem is an internal one – we don't have the human resources to cope with it
 ...next year we're going to operate with one less member of staff...there's no shortage of people who want to be involved it's just the time
 ...I run exams for a seven week period – schools honestly believe it's important but pressures on resources in schools are so great

He was also aware that when the club did not run for a while this affected students' enthusiasm:

...I feel guilty about not running it – a few weeks and it loses momentum

The other two teachers also talked about the problem of time. One particularly talked about the time needed to organise trips:

...it takes time to run the YEC –lots of paperwork – the trips – there are too many trips – that’s the Smallpeice Trust...I don’t know whether to take on the egg crash challenge – I think I’ve had enough

...to get trips organised is very difficult

For this reason, this teacher particularly commented on how useful he found the STEM days, as he was not involved in organising them:

STEM days are great – cos I’m not involved

He also found the ideas of student ambassadors helping with the YEC club appealing, as it would be an extra pair of hands.

One comment he made was that there was, perhaps, too much on offer from the LEP and that he had not been selective enough – a mistake he does not intend to repeat next year:

we didn’t know what we were in for when we started – this trip, that trip...it was a bit overwhelming – we didn’t know what things were – ... Next year we’re going to be a lot more guarded about what we go in for

Also commented on was the sheer quantity of advertising material sent to schools about different courses etc.; the LEP partners were commented on as being responsible for sending out a lot material:

As a teacher you get a lot of propoganda about this or that course – you get really saturated...stuff with the LEP stamp on I’m more likely to go for it...but even within that you get Smallpeice, YEC leaflets...

One teacher felt that it would be helpful if this information could be more organised for teachers so that they know in advance what was happening over the course of the year:

A filing system for all the stuff that comes along would help... maybe a calendar – a file with what happens in which month – a section for the YEC, a section for Smallpeice

The GO4SET Challenge was mentioned by two teachers as being a particularly ‘ambitious’ project and one that they struggled with:

the GO4SET day I didn’t realise it was as good as a whole GCSE project

We started the GO4SET project – it was too ambitious but parts of it were very good – the visit to BP where we met an engineer

The YEC who should be targeted and who comes?

It was felt that SATS made it difficult for year nine students to attend the club. One teacher suggested targeting Year 7 and Year 8 so that the club could impact on their subject choices:

Year 9 is a difficult year for the YEC – with SATS – Year 8 is ok...I think the YEC should be directed at Year 7 and 8 – you've got to hook them to inform their subject choice

It was clear that in all three schools, the high achieving students tended to be the ones that came to the club:

...one pupil who came – he's not one of the academic ones but he was a really enthusiastic member of the club but it's hard to avoid just attracting the academic ones

A problem related to these high achievers being club members was identified as being that they are the students who want to be involved with 'everything':

...one week I get no one coming – the next 5 or 6 come...it's the girls that want to do everything – it's hard to get the other kids

...the girls who want to go are the ones that go to 3 million other things – we say you don't have to go to every one

Students' response

Teacher commented that students enjoy the activities and are motivated by them - the trips and the prizes and goody bags were mentioned particularly:

They like having stuff – going away with stuff and being given stuff – that makes them really keen

The trips were great and the students loved them

It motivates them

Those who are into it are really into it – they keep asking me 'when's the next residential trip – am I going to get a crest award

Also discussed was the impact that LEP activities were having on students' orientation to engineering and to their preconceived ideas about what engineering is:

STEM days are great – cos I'm not involved – that all helps to change perception about what engineering is – they all think it's car mechanics

Some of them are beginning to talk about engineering as a possible career

However, there was a cautionary note to this. One teacher said how 'entrenched' he thought most girls were in terms of thinking of engineering as 'for boys':

The girls are still entrenched – it's fun but it's for boys
...2 girls have definitely said we want to be engineers

He did not see this entrenched viewpoint as impossible to change but observed that to change it would take time and continuity. He also observed that if activities did not continue it could actually alienate students who had been involved:

If it continues it will continue to have more effect ... Give it three years and everyone who comes into the school – they'll be this background of engineering – not just one club – and when that's there that's when they'll start choosing it
... but if it stops you may as well not have bothered – it'll just invalidate it – they'll think they've been had

Learning

Like the students, the teachers were confident that useful learning was taking place during students' engagement with LEP activities. Teachers commented on students learning about teamwork, about engineering and about links between subjects like science, maths and resistant materials. One teacher observed that they were more aware of what was going on around them:

The obvious thing is about the way they learn to work; they are much better at working together

They learn a lot about teamwork, about supply and demand –

It raises awareness of links between the subjects and about engineering
...there is some awareness at that level but their general awareness has moved on a lot

They are much more curious and enquiring...they're a bit more observant about what goes on out there – it's obvious that they actually notice things

There was some confidence that students were also learning specifically about science and maths:

...they subconsciously learn maths along with it

... electricity and how to build circuits

However, some caution was expressed about how well students related their learning to the theory they learnt in the classroom:

I sometimes think this is a bit superficial...but that's where children start from

1st off, they're just really keen – perhaps they're not learning so much but teachers can build it in...by building and making they're learning but they teacher's need to draw out how it all relates to the curriculum

In the detail of what they are learning I'm not sure we did so well ...They enjoyed doing the activities but I'm not sure they made connections on the theoretical side – the theory is at a higher level than the practical demands of the project and the pupils just want to go through it and get it made

...the marble run the did think a little bit about what was actually going on in it

There was some concern over how curriculum links could be made explicit and theoretical learning ensured without jeopardising the 'fun' of the activities and consequently alienating students:

STEM days links to Science, technology and maths – they're there but we don't make them explicit – we want them to be fun activities... They make stuff and are aware of how to do curriculum related things but it's fun – a different way

...After school – you don't want it to be like a lesson

One teacher also commented that he felt YEC activities were not sufficiently challenging for Year 9 students, though well suited to Years 7 and 8.

Some of the activities for the YEC are a little bit easy for year 9 but they are fantastic for Year 7

Suggestions

Various suggestions were made by teachers particularly relating to the YEC. One was that an engineering module could be designed to be taught within the curriculum at KS3:

The problem is the pressure on time – the solution must be to integrate it into the work they are doing during the day but pressure from the demands of the national curriculum makes that difficult...a sensible thing for us to do would be to commit ourselves to an engineering module at KS3 – we can't do that at GCSE as the project is dictated

Another suggestion was that discrete boxes of material for year groups 7, 8 and 9 could be put together. The idea of project work was also mentioned:

YEC boxes of material tailored for Year 7, 8 and 9 - for 8 week slots could be good – even if they focus on a particular topic – it could be project orientated

Another idea was to run the club for one term and then have, again, project work and visits during the following two terms:

...you could plan something completely different in, for example the summer term when running the club is difficult like, for example, there's a house building day at Lewisham College ...in the winter you could do after school clubs and in the spring term something different – a longer project with some external stuff...we did some external stuff before Christmas and it was very good

Motivation for involvement

One teacher provided a list of reasons for his own involvement with the LEP:

I want more people to be engineers
 The head asked me to do it
 It looks good on my CV and it's a good idea – I want to be part of it
 If you're interested in helping pupils become more rounded this helps – if you're interested in improving your grades and data this helps as well

When asked about what would put schools off involvement there were various responses. The issue of time was identified as being a likely cause for teachers not wanting to be involved. It was also commented on that in some schools, teachers were provided with a financial incentive for running the LEP, whereas this was not the case in others:

Some schools will pay teachers to do after school clubs – some just rely on good will but some teachers just won't do it

It was felt that the involvement with the LEP, however, provided a useful career move for recently qualified teachers:

It's good for NQTs – because it's cross curricular it's a good opportunity for career development

It's great for professional development – ... got me into JIVE...training in gender and equality

Summary

All three teachers were very positive about the LEP. They also commented on how easy it was to work with the LEP fieldworkers.

Pressures on teachers' time impacts on their ability to run the club consistently all year. The organization of trips is also time consuming. One teacher commented on how useful STEM days were as they are less demanding of teacher time. Student ambassadors to work as an extra pair of hands were also viewed positively. One teacher commented on the sheer quantity of material he had been sent by the LEP partners and asked for some rationalisation of this, such as a calendar with activities outlined.

Targeting the clubs at Year 9 was questioned, because of Year 9 SATS tests. It was also suggested that it would be useful to target Years 7 & 8 to have more influence over their subject choices for GCSE. There is a tendency for academic students to attend the clubs; these students are also generally motivated so want to be involved in other activities and so can struggle to attend regularly.

Teachers described students as being motivated by the trips and the offer of prizes. The activities were viewed as having a positive effect on students' orientation to engineering. One teacher commented that girls are still entrenched in the view that engineering is a boys subject but felt that continuity of activities could successfully challenge this position.

Teachers identified that students were learning useful generic skills during the activities and that some useful learning about maths and science was taking place. However, teachers were less confident that students were able to relate practical activities to theory covered in the classroom. There was some concern that if this was done, the activities would not longer be as 'fun' and would lose

their appeal. One teacher said that he did not think the YEC activities were sufficiently challenging for Year 9.

Suggestions made by teachers included: an integrated 8 week engineering module for KS3; boxes of material to last a set number of weeks for Years 7,8 & 9; that the engineering clubs should run for one term and then be followed by other activities. The fact that not all schools pay teachers to run after school clubs was commented on as a factor that may discourage participation by schools in the YECs. Involvement with the LEP and running the YEC was identified as being a useful career move for newly qualified teachers.

Targeting

Introduction

Fieldworkers and line managers from partner organisations were confident that they were reaching their numerical targets in terms of BME students, gender and students with no family history of HE. However, while the focus within the project was clear in relation to gender and BME students, the focus on students with no family history of HE has been less clearly defined. It is worth noting that the guidance for Aimhigher partnerships and higher education providers, 'Higher education outreach: targeting disadvantaged learners' (2007) identifies students from lower socio-economic groups¹ as being most underrepresented in HE and identifies them as the key target group for outreach activity:

Resources for widening participation are limited, so we wish to ensure that they are used effectively. As a principle, resources should be targeted at learners from communities that are underrepresented in higher education. Overwhelmingly these are people from lower socio-economic groups and disadvantaged socio-economic backgrounds.(5)

Indeed the guidance goes on to suggest that 'around two-thirds of participants in widening participation activities' should be from this target group. The report does not identify BME groups as a specific target but does go on to suggest that BME groups are likely to be included:

Many members of minority ethnic groups live in the most disadvantaged communities and will therefore often form part of the key target group(9)

The processes of targeting students for LEP activities and the particular issues impacting on their inclusion in activities are complex and have needed some careful interrogation. However, it is perhaps useful to consider the emphasis here on socio-economic status of students, in relation to current practice within the LEP.

A clear issue in the targeting process has been the powerful role of the schools themselves in actually identifying students for activities. A problem for the project, in terms of engaging target groups, has been the difficulty fieldworkers have experienced in accessing some of the schools. Indeed, this again relates to the priorities identified within 'Higher education outreach: targeting disadvantaged learners'. There is an emphasis within the report on the need for there to be strong working relationships with teachers in the schools and with other involved organisations:

¹ The report identifies that 'those whose parents/carers have not had previous experience of HE' as being within the target group and a particular target.

Two factors are critical to the success of targeting. The first is the quality of the relationships between all those involved, including widening participation practitioners, teachers in schools and colleges, and Aimhigher and 14-19 co-ordinators in local authorities. (5)

This resonates strongly with the findings of this evaluation; relationships with schools appear to be a key area for further development. The partner organisations also have a role in the targeting process; their individual agendas can impact on fieldworkers' actions and orientations and there appears to be a need for more collaborative working. There are also different perspectives about how partner organisations can best facilitate fieldworkers in engaging schools and in sustaining links with schools.

Another issue that resonates again with the 'Higher education outreach: targeting disadvantaged learners' report is the need for data collection. The second factor considered 'critical to the success of targeting' is:

... the quality of the data that Aimhigher partnerships and HE providers collect about learners in a range of widening participation activities such as mentoring programmes, day schools, and summer schools. These data indicate whether targeting is working or not, and provide the basis for improvements. (5)

Method

This report is based on information obtained through interviews with teachers, fieldworkers and representatives from partner organisations. A conversational and open approach was taken to interviewing; the aim was to work in collaboration with participants to explore current practice and consider ways forward for the project (Kvale 1996). Conversations with all participants were transcribed in full; codes and categories were subsequently developed. This report is an attempt to outline the views expressed and information provided.

Part 1: Target Groups and emerging issues

Where figures were available it was clear that during the last academic year, fieldworkers were meeting or exceeding targets in terms of working with BME groups and girls. The only exception were the YE clubs in secondary schools but they were very close to their targets in terms of proportion of girls. Fieldworkers did not supply figures relating to numbers of students with no family history of HE but they appeared confident that they were meeting these targets also.

Fig 1: % of students who have attended LEP activities

Organisation/ activity	% of BME	% girls
Smallpeice	86	83
YE/ secondary clubs	70	48
BA/ YE primary clubs	72	57

The focus of activities on geographical areas where there are high proportions of the target groups and girls only schools has effectively ensured that many activities have successfully engaged large numbers from target groups

- **Identified Targeted Groups**

There was a shared understanding that girls and ethnic minorities were target groups though some people closely involved with the project were unaware of the focus on students with no family background of HE.

I was aware that the LEP target groups were mainly girls – Asian girls were the main ones that were being looked at and generally from the ethnic minorities were the target groups. I was told that – I am fairly certain white, working class wasn't on the list. (Teacher: LEP School)

Identifying potential and ability in students was an agenda shared by fieldworkers and partners but not all teachers were aware of this agenda. It was clear that schools' own agendas impact heavily on which students they target.

- **Issues impacting on distribution of LEP activities across target groups**

Working with whole year groups during STEM days was agreed to be an effective way of reaching large numbers of target groups and of raising awareness of the project within schools and amongst students, so usefully raising awareness of other aspects of the programme.

I always say we need to be doing more year groups to get the best out of the LEP ... it's about progression (LEP fieldworker)

Due to the difficulty fieldworkers encountered engaging some of the schools with activities, it was clear that students in a limited number of schools were involved in a lot of activities while large cohorts of the target groups were not reached in other 'inactive schools'. Some concern was expressed that fieldworkers were focusing too much attention on a small group of schools.

While clubs have been successfully set up in the target number of schools, there appeared to be problems in sustaining numbers of students attending clubs and sustaining the clubs themselves throughout the year. Some secondary clubs had very small numbers attending.

The view was expressed that targeting in the primary sector was less problematic. Fieldworkers' perceptions were that numbers attending clubs were higher and more sustained in primary clubs.

I think probably primary is probably about twenty whereas secondary is about twelve – it's lower but they are ones that come regularly. (LEP Fieldworker)

Fieldworkers suggested that there had been a lack of support for recruiting schools in the primary sector. Fieldworkers in the primary sector also identified that the cohorts of students in some primary schools they had visited had not been representative of the target groups the project is aiming for.

- **Issues relating to specific groups**

Year Groups:

It was clear that schools' own agendas had impacted on the targeting of year groups. In a number of schools the clubs had moved from targeting Years 6 and 8 to being mixed while some clubs target other year groups. The fieldworkers and their line manager were positive about mixed clubs.

... If you engage year nine for example, how do you keep year sevens, eights, tens and elevens motivated? I think that is the club ethos and it's great. Bring all the year groups in and they can work

together for their own benefit and I regularly see year nines taking charge of year elevens in the clubs – it doesn't matter because they have a passion (YE)

It was felt by both BA and YE Fieldworkers that available resources could cater for this range in ages.

Different views were expressed about gaps in the programme in terms of year groups: Year 7 and Years 10 and 11 were mentioned. A suggestion was made that some club activity should target Years 10 and 11.

I think what would be good for that school in the next phase possibly is to offer the club to a higher year group as well – year tens and year elevens because what we did in year eight and year nine – what happens after that - there's no continuous weekly activity going on. (LEP Fieldworker)

Also discussed was the problem of students not being engaged in activities post 16 if the ambition of recruiting more students to degree programmes is to be achieved.

Gender:

Targeting girls has been successful and girls are not in a minority in LEP activities – 'girls are not in a minority, there are at least 50% at our activities and events' (UKRC).

we're actually being very successful in engaging with the female, with girls. I think our residential courses are running with 70% female at the moment.
(Smallpeice Trust)

However some issues were raised. Smallpeice identified that more single sex schools have engaged with their activities. None of the fieldworkers were yet aware of the numbers of girls from mixed schools participating in activities. Also raised was the importance of looking at levels of engagement with activities and retention of girls in clubs; this will be monitored during 08/09.

Retention and what activities people enjoyed. It's slightly different from who did what – yes, engagement... that was essentially what I wanted to know. It was that bit more detail – okay they are there and then what (UKRC)

'Boysy' activities (such as building cars) were identified by a number of line managers as being potentially off putting for girls.

if the activities are seen as very boy centred activities and you know any learning activities in secondary schools – they haven't quite got it as far as girls are concerned. There's an awful lot of car making.

... Girls can be competitive as well but if what they see is a club that's centred around making cars or those kinds of activities then they will just vote with their feet (BA)

However, others commented that this has been successfully mitigated against in some contexts by the presence of positive female role models and the projects having other dimensions (such as environmental concerns). The success of primary clubs in retaining and recruiting female members was linked by one manager to the focus and type of activities.

Another reason given for the success of primary schools was that girls at that age are not intimidated by boys and that this changes in secondary school. There were accounts in secondary schools of girls being intimidated by boys in YECs.

...I think what is interesting is I find that in some cases the girls overtake the boys – they tend to show the boys up
 ...I think they felt intimidated by the boys at times and it's a shame because the girls we have had in the class were good (Teacher: LEP school)

An issue said to relate to Asian girls in particular is that parental concerns impact on their attendance at clubs and on residential courses.

BME groups:

Targeting BME groups has been very successful in the project; BME students are in the majority in all LEP activities.

In many schools ethnic minority students are in the majority but a concern was how effectively the LEP would target BME students in areas where this is not the case.

I am slightly mindful that if this just rolls out to schools where they don't have such a high proportion of BME, it would be far more of an issue. It's not a particular issue at ours really ... (UKRC)

One line manager stressed the need for accurate and current statistics about areas where the LEP focuses, as representation of different ethnic groups is constantly shifting and is very different in different contexts.

I think and you might find something different now (to when the project started)... that was the situation when those statistics were formed. Since then there has been a huge influx of Eastern European children coming into schools – you know, Turkish children, travellers children who want to achieve in schools so there is a slight change in focus, I am guessing, from the level of schools where they are saying working class, white boys are under achieving and I know that LEP is looking to the future and to roll out and I think it would be a great mistake if it got stuck with that demographic and didn't look towards what the demographic is now (BA)

Currently BME students are grouped together in any analysis of targeting. The need for the groups encompassed within this term to be considered more carefully was another issue raised as was a need for expert input in this area.

... The other factor that really messes up your measurement is the fact that African Caribbean means many things as well – you get the Somali population coming in so where you've got the Somali population coming into different areas and being included as African- but they are very poor communities. (STEMNET)

Also identified was the need for an increased awareness within the whole project of the different levels of achievement (statistically) within these groups.

There is currently no perception amongst teachers and fieldworkers that any one ethnic group unrepresentatively dominate over others during most LEP activities, however, this was identified as a problem at one LEP school. This could have implications for a national roll out and strategies to counter this may need to be considered.

...one of the problems we found is that there is still this underlying prejudice that exists so if you have got a mixed cohort of ...we had the club – now originally in the club there were two white boys but because the rest of them were Asian they didn't want to come any more. So the problem we have here in this school is the targeting in the lower school has been quite problematic ... we originally started off with a very, very balanced group which had whites, blacks and Asians and then, like, one person would pull out and then his friend would pull out and before long you're just left with Bengalis. (Teacher: LEP School)

Social Class/ students with no family history of HE:

Targets of students falling into the category of having no family background of HE were identified as being met by fieldworkers though figures were not readily available.

While many BME students come from backgrounds with no family history of HE, this is clearly by no means necessarily the case. One line manager identified his own initial misconception that ethnic minority students in Southwark are necessarily from lower socio economic groups. There was a suggestion from two line managers that there should be an awareness of the socio-economic circumstances of different minority ethnic groups - 'the complexities on the ground'- amongst those involved in the project.

activities often work against those from poorest economic backgrounds especially girls who are expected to go home and pick up on child care and fetching other children from school.
(STEMNET)

One teacher in an LEP School identified white working class boys as the most disaffected and underachieving group. He also identified white students specifically as being outside the target group for LEP activities.

Ability:

The range of ability of students selected to attend events and young engineers clubs is actually difficult to identify as no data about those students' achievements is held by the LEP. It is clear from what both teachers and fieldworkers have said that there is a tendency in some schools to target gifted and talented groups, especially for excursions.

Fieldworkers talked about how they were designing activities to cater for mixed ability groups, particularly STEM days. Some partner organisations identified how activities and materials were designed to cater for different abilities:

...the materials progress and we are very careful not to put an age group on them, although we say principally this kind of age group to give teachers a feel for it – that's not printed on the materials at all so you could use primary material in secondary schools if they were appropriate. That's always been important to us. (BA)

we make sure that whatever each group is achieving, at the end of the day, that child should be able to achieve that to their own level of attainment – that is how we always do things (STEMNET)

Contacts in schools were also not always in possession of detailed academic records of students who were involved in LEP activities;

information supplied about the ability of groups involved in LEP activities was in some cases based on perception.

Yes in the club – they range from medium ability to high ability. I am not at the stage where I have data – you know, got together their SATs results or anything and worked it out but certainly a couple of them are very high ability (Teacher: LEP School)

There were accounts to suggest that primary and secondary clubs had helped to motivate and re-engage disaffected students with school life.

(YEC) it's attracted naughties – it's attracted kids on the fringe of naughty activities and it's engaged and motivated and made a difference and it's actually improved their behaviour and their involvement in school (Teacher: LEP school)

Parents/ Community:

There was general agreement that parents needed to be reached if the LEP is to be really successful in motivating students to pursue careers in engineering. One teacher talked about the need for a continuum of activities to ensure students are reminded repeatedly of engineering as a possible career because the 'default model' provided by parents and family is that students should become doctors.

...They're doing engineering activities, they're interested in engineering. Are they interested in it in the future or do they want to be doctors? Both – I think it needs continued pressure...the hand me down default mode is doctor'...but now they're saying things like, I'm not sure if I want to be a doctor or an engineer... (Teacher: LEP School)

It was identified by a number of people involved in the project that parents needed to be provided with more information about engineering careers. One teacher suggested Asian parents in particular viewed engineering as a 'working class profession'.

The LEP fieldworkers had developed some strategies for targeting parents but were restricted because of other commitments. One line manager suggested that working with parents is difficult and expensive as the most effective approach is through large events.

It is a tricky one with parents. It always is with any WP stuff unless you've got a big event. ... Unless you've got that sort of activity I think it is quite difficult to try and get parents along without putting a

massive amount of resource into it. Otherwise you have got to have specific events for parents which would really divert resources away. (LSBU)

A suggestion was also made that the LEP should be more involved with the wider community. A model for building business links and financial support for YECs was suggested by one line manager:

I would like to see more company engagement in the next stage. If a local company wants to sponsor a club that's going to be a real opportunity ... if big local companies sponsor a club it works really well. I know because we've got several clubs sponsored by local companies and it takes a lot of the pressure off teachers as well. (YE)

One line manager discussed the necessity to consider the particular economic and employment needs of communities before considering a national roll out.

There are skills shortages in London - and in the engineering area as well. Transport needs so much engineering support. There should be a picture that you can paint of jobs that are needed and jobs that are available close to home and that's not the case across the country. (BA)

- **Data and tracking**

The need was identified within the project for a central database to record which schools fieldworkers have worked with: the names of students, their ethnicity, gender, year group and family history of HE. The lack of availability of this information appears to have impacted on fieldworkers' ability to work in a coordinated way to target particular groups of students. This approach has also meant that each organisation has had to ask students individually for information. This is a practice that the 'Higher education outreach: targeting disadvantaged learners' (2007) report warns against.²

There is also a lack of information across organisations of students' performance on LEP activities. One fieldworker has his own record of students' performance on STEM days but this is not general practice. None of the fieldworkers have information about students' performance at the different key stages. This lack of information makes fieldworkers almost completely reliant on teachers to target students for activities. One line manager identified the desirability of actually finding out students' performance at different key stages in order to provide information about

² '...every effort should be made to avoid multiple approaches to individuals for the same information' (12)

which students are able but underachieving so that they could be targeted effectively.

The team work closely together so have an understanding of which schools they are visiting. However, a central data base would make it easier for fieldworkers to be systematic in their approach to schools.

One line manager identified a problem as being that there is no common evaluation framework. While evaluation forms are collected, they are not always input into a data base and the lack of a central database allows comparison of different target groups across activities impossible.

I have got about three thousand forms to put it ... I look through my evaluation forms when I get them but I have left them all in the folders because I don't have the time to do it (LEP Fieldworker)

There is currently no analysis of individual ethnic groups' participation and engagement with activities.

However, collecting information is not simple; there appeared to be a specific problem in primary schools as schools would not supply students' names on the grounds of data protection. The 'Higher education outreach: targeting disadvantaged learners' report explicitly states that schools 'should not be asked to provide personal data about learners' (12).

Tracking students was discussed as desirable but appeared to pose a number of problems. The difficulty in accessing names in the primary sector is currently an obstacle. One line manager also suggested that the lack of involvement with the project within the post 16 sector would make any evaluation of the process in terms of students opting for engineering degrees very difficult to acquire.

There does appear to be some hard evidence available to suggest that LEP activities are impacting on students' decision making. One teacher identified the direct impact on recruitment for the Level 2 Engineering Diploma of the YEC. She explained how many of the students who chose the diploma had been members of the club:

... the club has acted as a promotional thing, in a way alongside the other projects because otherwise engineering – they wouldn't have a clue what it meant.

... we have done options and we know we have got a cohort and we've got sixteen.

Interviewer: So sixteen students are doing the diploma? Do you know how many of them are from the club or have had that sort of contact?

Teacher: I think most of them actually. I won't say all but I do think most but they have in any case – all year nine have had the taster days so they've all been exposed to it 'cause otherwise they can't make it – how can you choose what you don't know? (Teacher: LEP School)

However, there is, as yet, no system to ensure that this information is captured.

The advice provided in 'Higher education outreach: targeting disadvantaged learners' suggests that the targeting process should have three stages. In the first instance there should be 'area-level targeting' which should draw on 'the expertise of local authorities and local 14-19 partnerships'. Other sources for information at this stage are suggested such as 'Fischer Family Trust data and data on free school meals and educational maintenance allowances'. The second stage of targeting should be 'learner level and the third stage should be 'monitoring the effectiveness of targeting procedures' (10). It is clear that more work needs to be done if the project is to target with this level of accuracy.

However, while a central database is clearly needed by the LEP to provide more precise information about students, it is worth noting that some specific and selective targeting that is now happening within Aimhigher³ is viewed as problematic by practitioners.

CREST

The Crest Award scheme is being developed to address some of the problems associated with tracking students and may also be a way of accessing more information about students. It was described by one line manager as a way of 'joining up' the current programme.

Fieldworkers and line managers were keen for there to be a system where some formal recognition was given to students for participating in activities and if students do take up the Crest Award scheme this could provide some answers to the problem of tracking students and of acquiring information about them.

... I want recognition for Young Engineers. Young engineers could get a Crest gold award, a Crest finalist. ...Crest is what I see as a national scheme for science and some kind of science passport - a Duke of Edinburgh type of award for STEM interventions. The projects are about application, project management, leadership (YE)

³ This issue was widely discussed during an Aimhigher conference 26/6/08: 'Making Progress? Issues of class, gender and ethnicity'

Part 2: Schools and targeting

It was clear from fieldworkers, line managers and the teachers themselves, that targeting students for particular activities was in the hands of the schools. While the fieldworkers can request certain students, it is currently the schools that identify which students actually attend. One line manager identified 'conveying the message' of who the target audience is as being a difficult aspect of the project, as accurately identifying the sort of students the LEP would like is a time consuming process for teachers.

- **The processes of targeting students for LEP activities**

STEM days in schools are the least problematic for schools in terms of targeting. Comments from teachers in schools suggested that they appreciated the opportunity provided to include all students in a year group.

Yeah we've tried to do it out of fairness ... we try to get all of them to experience it because that option has been given to us ... what we will do is a group at a time over several days so eventually we will work through the entire year group and that is quite impressive, to be honest because most organisations never give you the opportunity to do the whole year group. ...that's something the LEP in that sense – the activities they offer, are genuine equal opportunities because everyone has access to those opportunities (Teacher: LEP school)

Selection of students for **YECs** varied considerably in schools: voluntary; selected on ability and levels of underachievement; selected on interest in cars; selected on the basis of the type of project.

... then there's the kit car. We are entered for a competition where we are making the electric solar car and that obviously required a dedicated team and we've got about eight year eights working on that one so there are certain projects where we can't offer it to the whole year (Teacher: LEP school)

In all the schools, maintaining club numbers required considerable work. Where teachers had not had time to put into actively recruiting students, even if the club was running regularly, numbers often appeared to dwindle.

Primary teachers were not asked directly about targeting for **primary clubs**, but fieldworkers suggested teachers in some contexts were targeting students in order to use the clubs for revision.

Some teachers will target specific students who they think are failing a little bit. Some teachers run the clubs as booster classes – like if they want to teach them specific things before their SATS and then they can choose the relevant activities. (LEP Fieldworker)

All the teachers spoken to identified the YECs as being the first place where they select students for **residential courses**. In two of the schools, the teachers talked about how students had been applying directly via the Smallpeice Trust website. In another school students were selected for various reasons: being identified by student support and their performance in science were both mentioned as strategies.

my first port of call would be student support. There are sometimes special reasons why ... residential would be good for them regardless of ... what they're actually doing on the residential... Yes I don't think we would send anyone who had absolutely no interest and we knew that but in some cases that might be a secondary... On our residential last year there were a couple of students who were specifically really encouraged to get on board because they were shy (Teacher: LEP school)

The selection of students for trips and events was considered the most difficult by fieldworkers who expressed various opinions about how this should be done. In schools, teachers selected students for trips and events in a variety of ways. Students were selected for: being members of YECs; as a reward for work/ attitude at school; because they are on the

G&T list; because they could be relied upon to behave well and because student support at the school had identified them.

- **Focuses on Year Groups**

The Lead Fieldworker was keen to engage schools with LEP activities with each year group. However, this was not happening in most schools. A key reason given by schools for not allowing access to year groups was exams: this affected Years 9, 10 and 11. It often appeared to be senior managers in schools who were responsible for vetoing activities. It had been easier for fieldworkers to organise activities with Years 7 and 8 in a lot of the schools.

running up to SATs is equally a restraint. ... I have had a problem with convincing people that – even though it is small groups at the end.

... there is a restraint in year eleven and part of year nine – a rule from the top which says don't take them out - and you have to make out a special case ... the school will not let year eleven do anything which in itself can be a bit of a barrier and a bit of a problem (Teacher: LEP school)

Teachers suggested there should be a meeting at the start of the year where activities that the school would be involved in could be planned out; the involvement of senior management in this process was identified as being necessary.

to look at what was available in the coming year that would be really useful – for ... and I to sit down with them and say we'll do this, we'll do this, this clashes with this week so we can't do it or we'll make it part of that week. ...So maybe a sort of planning meeting might be good and ... (Senior Manager: LEP school)

Exam times were mentioned by several teachers as a very busy time and a difficult time for any activities to run. Several teachers talked about the need within the school to be selective about the projects they take up due to the demands on staff time.

An issue raised at one school was that the Smallpeice Trust had encouraged students to apply for residentials on line. The senior management was irritated by this as students had been applying for places during term time. While it was stressed that residentials were a 'fantastic opportunity' for students, this was felt to be inappropriate.

I was a bit concerned that kids were applying for things off the Internet. They hadn't actually asked schools if it was okay at that

stage so kids were applying for things and they were all term time – two or three days term time ... I did write expressing concern that they hadn't actually come through the school and said – I want to offer this. Can they apply? I mean, it was obviously someone who didn't fully understand how schools operate and how they work but if you want to take kids out of school during term time, you ask first. You don't wind the kids up and get them all, you know, what's the word - looking forward to it for us to say – no, sorry it's school time – you can't go. (Senior Manager: LEP school)

Engaging schools

A key and intransigent obstacle to reaching target groups of students has been the inability of fieldworkers to gain access to schools.

- **School Contacts**

One of the biggest obstacles to fieldworkers being able to engage schools has been the process of accessing the school through a key individual. This key contact person is often also the club leader, though this is not always the case. Even in schools where the contact is very keen for the school to be engaged, there are times when that person is too busy and the LEP is not a top priority.

it's kind of petered out a bit – it's a bit of a pain. It makes it very hard to get on with the car projects – it's so big and we need lots of people and I haven't got time to go and get more people. (Teacher: LEP school)

Problems relating to key contacts have been that teachers are promoted or take on more responsibility; they are ill or they leave. These issues have affected primary and secondary schools. Clubs have been very affected by these issues. In some schools, as club leaders are often the key contact person for the entire project, the loss of that person can mean that the whole project grinds to a halt in that school.

... we found this year, quite unexpectedly, that of the fifteen clubs we formed, nine started afresh because the teacher had moved on (YE)

... as soon as that contact goes you cannot do a STEM day ... the contact who was looking after STEM days - as soon as the contact had gone we are not doing any activities with that school and the relationship has almost gone, no matter how hard you try (LEP fieldworker)

A further problem is that if the contact is a mainstream teacher in one department this can limit the students who are invited to attend activities to being from a single department (e.g. technology).

...he takes his class – as many as he can get...he would only bring his ...DT class – cause that's what he teaches and they are a really great crowd but we see them at every single event that he comes to – he will bring the same girls which is really great for them, they are very fortunate but obviously from our point of view it's not what we want (LEP Fieldworker)

A more effective model appeared to where the key contact was also the head of science who was able to delegate responsibility for activities to other teachers.

I think it is quite key that it is head of department because if it was someone else, they would have to say – well yes - I'll have to talk to my head of department then the head of department has to talk to someone else and then before you know it you've been lost in the chain of command. ...If the head of department is not enthusiastic and says I know someone who wants to do it then you know it's going to fail miserably because what will happen is that he'll just – that poor someone else probably has more teaching than the head of department so it will never ever get done (Teacher: LEP school)

One line manager suggested that lack of confidence in their own engineering knowledge may affect teachers' willingness to take on a weekly club with an engineering focus. It is worth noting that in the schools visited, a number of successful clubs were run by teachers with engineering degrees.

there are very few engineers in schools. There might be a resistant materials person or a DT person who might have a bit of engineering skills but who needs a bit of confidence. I think that's one of the things that stops lots of people forming clubs as well – it's too much risk (YE)

The success of the project at one school where the key contact person and the club leader have no/ reduced teaching commitments paradoxically reveals the problems caused in other schools by individual teachers not having time to organise activities on top of a full teaching timetable.

We only manage, and I am being honest, we only manage because of our timetable and because I don't teach. I wouldn't be able to be head of Careers and do my Aim Higher work if I had to teach. ...

The whole process of getting students to do things is very -it's very time consuming

... I'll say things like – to a certain teacher I've got a project ... and I'll say – give me a list of names and I'll do the rest – because I have to do that and then I have to go and see the students – I can't rely on people to recruit. (Teacher: LEP school)

- **Senior teachers/ raising awareness across whole school**

Teachers' accounts suggested the need for the involvement and backing of the head teacher and other senior managers. It was identified that there needs to be awareness within the project of the priorities of senior managers within each school. Teachers identified various issues that management were concerned about; including providing cover for teachers and students missing english, maths and science lessons.

The profile of the LEP varied in different schools. At one school a teacher described how LEP activities had ensured the project was well known across the school:

The teachers, students – its profile across the school is very, very good. The rockets was just spectacular because we were doing them in the playground so everyone was aware of those so it's generally got a very high profile and that's good because it's science with a high profile which is unusual so in that sense we would like that to continue. (Teacher: LEP school)

In some schools, only a small number of students and teachers were aware of the project. The point was made by teachers involved at one school that awareness of the issues that led to the instigation of the project need to be raised with teachers across the school. The current lack of knowledge of engineering as a possible career across the school was also identified as a real problem.

Our careers officer has been on long term sickness and is retiring at the end of this year – nobody knows what engineering is ... (the LEP) it's very unknown. We haven't made, despite all the STEM days and all the residential trips we haven't made much headway into changing people's attitudes towards engineering and by people I mean students, staff and parents because I don't have the time to go out there and bang the drum for engineering (Teacher: LEP school)

Teachers and fieldworkers talked of the need to embed the project more effectively in the schools. The Lead Fieldworker is keen to raise the profile of the LEP and issues related to STEM and engineering at a whole school

level. He talked about providing INSET in schools as a way of achieving this.

- **The involvement of a senior LEP figure**

Fieldworkers and line managers discussed what they perceived to be a need for more input in schools from the LEP Project Director, schools or another senior figure. The presence within schools of a senior LEP figure was viewed by the one fieldworker as necessary in order to engage schools and maintain the profile of the LEP within schools.

I think if you just maintain some communication link with the school – I think it is a managerial thing in all honesty. And we could actually keep a tab on what schools are doing and what I'm doing.
... (LEP Fieldworker)

Other fieldworkers identified a difficulty in recruiting schools to the project as being the lack of involvement from a senior figure.

One line manager discussed the importance of the involvement of a senior figure to identify how the project can work within the strategic plan of the school. Another line manager suggested a similar sort of intervention from a senior figure in the project; explaining the need for someone who would be able to talk with some expertise about the role LEP activities can play in supporting students' learning.

...it is more straightforward from the point of view of take-up but I think it is easy to carry on and just operate at that level than it is to go back to the head teacher or go back to the science specialist in the school and say, okay this is what we want for these children – what can we do so these benefits can be seen for other children and for that you really need a bit more of a holistic view of how enrichment and enhancement work and where their benefits are ... I don't think within LEP there's someone able to have those conversations at the moment and I think that they should. I think there should be somebody who can.
and to be able to have that conversation back in schools. Now that will have been had in general terms in order to sign schools up in the first place but I don't think it's been had later in the programme sufficiently to enable sustainability to take place and it would be a shame if having this great project in primary schools that we didn't leave a lasting legacy. (BA)

- **The need for Science Departments/ technology work together**

Having only one or two key contacts in schools presents the issue of the project being restricted to a single subject area. One line manager suggested that involvement through technology departments is problematic as academic students often do not choose technology; consequently the students being targeted by activities may well not have the mathematical ability needed to progress to HE level engineering.

It was suggested that if the LEP could effectively work across science, maths and technology, it could provide students with an understanding of how those subjects connect. One senior manager in a school identified a way forward as being to encourage departments to work together to increase students' understanding of the connections between the subjects and engineering and to make stronger curriculum links with the LEP activities. An ideal situation was identified as being one where it was not only the club feeding into students' understanding of science and maths but science and maths departments making links with what students were doing in the clubs.

I think it will be better as more teachers get involved because then they can take it back into the curriculum. Very much this year we've had one teacher involved who's a DT teacher who's going to be leading on our – his degree is engineering – and he's going to be leading on our engineering diploma. Next year we've got two other teachers who have done the training and are going to be involved in the club and one is from science and one is from maths and I think then what I will maybe try to do is meet the three of them once a half term – them to report back and so that I can see how it is feeding into science and maths and try and influence that.
(Senior Manager: LEP school)

If the LEP could be effectively entrenched within all three subject areas across whole departments and into curriculum planning as this model suggests, this would very effectively stop the problem of engagement with the project being obliterated because of the change of job or workload of a single individual. One teacher explained how he thought the process of addressing the whole schools and identifying select people from each department could work.

... it's there and it's having an impact – it's changing people's minds and winning hearts and minds as it were. Take it to the next level. Introduce it to the whole school. Get dedicated people in each of the three relevant departments and maybe get one person who's on it all the time. Get some money in there – like teaching and learning, you know, responsibility points for ...and/or some individual teachers – can't fail... Can't fail. (Teacher: LEP school)

- **Embedding the project within the school curriculum**

There were various accounts of LEP activities usefully feeding into the school curriculum at both secondary and primary level.

The students who went on the solar car challenge at LSBU actually said to me – now we understand some of the stuff we have learnt in science also the students that went on the Harpers University thing. They were broken up into smaller groups and several students came up to me saying – I know understand the aeroplane activity with what we learnt in science (Teacher: LEP school)

Those involved in the primary schools cited examples where teachers had used activities as revision and where clubs had impacted on children's KS performance. Where this had happened head teachers had been keen to maintain clubs.

One or two schools have tracked the children who have been to science clubs and compared them with children who haven't and found that these children do better in Key stage tests. ... where head teachers themselves have been able to do that and heads have always said – we must for evermore have a science club because how can we avoid having these benefits for the students and then we must also extend the science clubs so that benefit can be felt by all these children. (BA)

However, there was a view in secondary schools that the curriculum connections within the project could be made clearer. One teacher explained how, if connections were more explicit, this would help her to argue, at a senior management level, for the need for the school to be involved with activities.

I think once they (the LEP) start incorporating more of the subject knowledge into the actual activities which we run ...that way no-one has an excuse to say no (senior management) and it gives us more of an advantage as the people who are running the projects. (Teacher: LEP school)

The need to relate the LEP activities to the curriculum was made by one senior manager who talked about how involving all STEM related departments with the project could help to 'take the project back into the curriculum'.

I think if you did that you'd get more going into the club, in a way – although we've got big enough numbers, you would actually get more... you could get a situation couldn't you, where somebody

who goes to the Engineering Club leads in a lesson on science and maths – you know, something they've done in the Engineering Club. Teacher says – you've been doing this in the club, I want you to show the class. What a boost for them, particularly the ones I'm telling you about, the ones who get into trouble. We could work on something like that really. (Senior Manager: LEP school)

One teacher identified an opportunity for engaging and embedding the project in schools through the new curriculum demands for creativity and cross curricular activities.

...here's what they could do – the new national curriculum is coming in in September for year seven ... they've largely taken the old curriculum and reworded it but one of the new words they've put in is a cross curricular and creativity which the Engineering Club and the LEP in particular – it's all about that. You can't get more cross curricular. ... (Teacher: LEP school)

He also felt that the LEP needed to work more with the schools; especially at a senior level, to ensure that the positive impact the project has on students' learning is appreciated.

Another teacher suggested that there needs to be some form of assessment of students' knowledge if the project is to raise students' levels of attainment.

... The thing is you can never prove that attainment has been raised unless there is some form of assessment and that will be a challenge and that will need some sort of recognition, some sort of award at which they work towards through various assessments and assignments and that is the only way they can do that. (Teacher: LEP school)

- **The Schools' Agendas**

A greater need for an understanding of individual schools' agendas permeated many of the discussions. One line manager identified this as being one of the central problems for the project if it hopes to be sustained without the continued input from fieldworkers working in schools. She suggested understanding the individual contexts of particular schools and

developing a more strategic view of how activities can relate to this as being a key way forward.

In a number of contexts, school management had a strategic view of how the LEP could support agendas within the school. The head of science at one school viewed the project as a very useful tool for raising the profile of the department and for raising enthusiasm amongst students for science. He felt that the LEP had been instrumental in increasing numbers of students opting for science at the end of Year 9.

...I think it has helped science in terms of options because the only optional bracket in year nine and the science is over subscribed as an option.

Interviewer: And is that a new thing?

That is probably a new thing. That's probably a combination of factors that – the fact that we are heavily involved in LEP does help that we have this extra dimension to our work and that really is something which – without the LEP I think the science department would be just another ordinary department in the school.... the fact that boys will come up to me – when are we gonna do the rockets? When can we build the car – we want to build the car – and that's happening all the time so it's lovely . (Teacher: LEP school)

Specialist status schools or those applying for specialist status in Science and Technology have agendas that the LEP fits closely within. One school has used LEP projects to raise levels of interest in and understanding of engineering across the lower school to ensure that they successfully recruit for the new diploma course. It is clearly this agenda that has led to senior management thinking in a very engaged way about how to embed engineering across STEM delivery within the school. It is not surprising that the LEP has been welcomed at the school.

There is money available in schools for running activities and it was clear from discussions that where schools were really engaged, and the LEP linked with their own aims, they could be proactive in identifying sources of money. Specialist Science Schools have particular incentives to find money to support activities and to work with other schools. The role that can be played by ASTs was also discussed.

Part 3: Targeting and the role of LEP partner organisations

The organisations' agendas

It was evident when talking to fieldworkers and managers from companies that there were differences in the approaches of individual companies, and companies had different experience in terms of the groups they were accustomed to working with. In some instances, the new focus of inner city schools appeared to have required some readjustments to previous approaches. There also appeared to be differences in terms of each company's commitment to and interest in working with target groups.

- **Smallpeice:**

While The Smallpeice Trust described some of the students they had worked with through the LEP as some of the 'most able we have ever come across'. It was clear that the organisation had found the challenges posed by working with some of the target groups of students new and difficult.

Specific problems were identified on residential courses. The Smallpeice Trust identified the behaviour of the students as problematic and as having caused the withdrawal of company representatives from Year 9 residential courses. A suggestion made by the Trust, to ensure better behaviour and commitment from students, was to extend the number of schools that could be targeted. This would make it easier to limit the number attending residential courses from any one school and ensure genuinely interested students have access to courses.

because we haven't had enough schools and we've had to take too many students from one school and people coming along for the ride and then you've got – I wouldn't say disruptive – but students who's attention span is severely limited and they need more help – disproportionately, and that reduces the amount of attention that the others get and it doesn't work so well so what we want to do now is bring one or two more schools into the field. (Smallpeice)

However, criticisms were made of this way forward as it would 'dilute the offer' that was being made to LEP schools. It is also important to acknowledge that students with potential to benefit from these courses may not conform, in terms of their behaviour, to the Trust's expectations, as these expectations are not based on the behaviour of LEP target groups. Pupils from disadvantaged socio-economic backgrounds are likely to provide challenges in terms of behaviour, attendance and attainment. The decisions made by the Trust to increase the numbers of students on

residential courses and decrease the numbers of company representatives involved on the courses were specifically identified as having impacted on the quality of the experience for students and to have contributed to the behaviour problems.

Working with fifty students you have a calmer and more controlled atmosphere than you would have with more students – especially South London students. They make a bit more noise than the average. (Smallpeice)

...there were a lot of problems actually – lack of companies - we had thirty five per room and the rooms weren't that big for that number of students. When they are with their friends (LEP Fieldworker)

- **YEC:**

The YEC have historically worked with predominantly white middle class boys. However, they have worked closely with the LEP to develop resources that are culturally and gender inclusive. The YE were keen to engage more girls and ethnic minority groups but they were also keen not to exclude white middle class boys. They identified the need to 'find a middle road' so that the YE traditional membership base is not excluded from LEP YE clubs. The Young Engineers are sponsored by organisations that favour work within the independent sector and it was identified that the 'behaviour', in terms of targeting, of the organisation had changed for the LEP but would not change overall.

Specific concerns were expressed about activities being offered to LEP schools that had not undergone any scrutiny in terms of their gender and cultural appropriateness. Issues had arisen when LEP school students were invited to take part in the Royal Navy challenge where the predominant group was the YE traditional target audience.

The Royal Navy Challenge ...it was a white middle class man with mainly boys taking part over a load of London kids and the people there – one of the army guys for example ...he said to someone – 'I'd keep an eye on that lot'. I was observing and I know I am protective over our lot but ... because ours were from London – they think they are from the ghetto or something that's how they behave (LEP fieldworker)

- **LSBU:**

LSBU appeared to be the least 'hands on' in terms of managing fieldworkers who were left to design activities specifically for the LEP

themselves. The fieldworkers had been able to develop good working relationships with colleagues involved in WP at the university and whose work relates closely to their own.

The fieldworkers' line manager is also in charge of recruitment and admissions to the university. She explained how the links with the schools, where the diploma in engineering is running, are useful in recruitment terms and expressed the desire to build on these links.

I know that those schools are also the fourteen to nineteen diploma schools for engineering as well. They overlap ... which is obviously really handy for us as an institution – in terms of communicating with other schools and getting them engaged.

... it is a nice way to tie things together. For example, we have an associate student scheme where we basically give local schools and colleges – college students – the opportunity to become an associate student where they can access the library and the computers and things like that – to just use our resources and we want to, this year, to roll this out to make sure we are including the fourteen to nineteen diploma schools which will tie up nicely because LEP covers all of those anyway so it ties things together quite nicely. (LSBU)

- **STEMNET:**

The views expressed by those involved with STEMNET appeared to be in conflict with the ethos of a number of the organisations involved with the LEP. Concern was expressed that organisations should have charitable status if they work to support young people from affluent backgrounds. STEMNET approached activities with a clear agenda of inclusion. The need to engage students from less affluent backgrounds was a definite priority for STEMNET. Meeting numerical targets was a secondary priority:

...It's the quality and looking at the inclusion of every child rather than looking at - oh this group is showing a bit of interest and let's go there - it's more like inclusion.

... he'd rather have twenty engineers out of the 6300 than no engineers just for the sake of making the 6300 and even if you get there slowly better to get the twenty than to get none at all. (LEP Fieldworker)

The importance of developing a genuine understanding of BME cohorts was also stressed as was a concern that the project should reach out to those from the poorer communities.

- **The BA:**

The BA have worked closely with the LEP to develop their resources for primary school clubs. This opportunity appears to have been welcomed and exploited fully by the BA.

... we had a really useful relationship with LEP because as we were developing materials we could trial them with the LEP schools and we could also put them in front of the UK Resource Centre for Women and ACNST and get them vetted for gender and ethnicity appropriateness so that relationship with the LEP was incredibly valuable for us and of course it made us realise that the issue that we weren't covering was accessibility so we know now that as we move forward that we need to make sure that we keep an eye on the accessibility of the activities to all. (BA)

The BA has historically worked with any group that has expressed an interest and this has previously been more 'middle class, white children' (LEP fieldworkers). The BA, however, appeared to be keen to engage less privileged students and are currently involved in a range of outreach projects.

Collaboration between companies

It was suggested that the difficulty encountered by fieldworkers in accessing schools may be lessened if the LEP offer was more coherent and companies were not viewed as separate entities by schools. The problem of engaging schools in the first instance may also be helped by a coherent offer that is reinforced by a sound rationale explaining to senior managers the benefits of working with the project. This is difficult to achieve without close working relations between companies.

- **Internal Marketing:**

There was evidently collaboration on the part of the fieldworkers; the Lead Fieldworker was identified as being particularly pro-active in promoting the different aspects of the project. Teachers discussed how the work done with whole year groups had been an effective way of recruiting students for other LEP activities.

The enthusiasm really started – it took off because of projects that had been done in schools for large numbers of students and that in itself was a recruiting tool in getting bigger projects – well, not

bigger projects but projects involving more students. Because ... always talks about the club – yeah when he does his tower building or whatever it is, he promotes the club and talks about residential. (Teacher: LEP school)

A standard presentation to promote the project has now been developed to be used by all fieldworkers; a newsletter about the project has also been developed. The suggestion was made that, to eliminate confusion about the project, a clearer initial message needed to be created for schools that all activities are LEP. In fact, a suggestion was made that all logos associated with individual companies should be eliminated from LEP materials. However, one line manager identified that the branding promoting individual companies was important both in terms of companies' motivation and for long term sustainability.

if you say you have an LEP residential experience ...then what's the value to the partners involved? We are looking for a brand image/ brand awareness that is going to help – 'cause when these kids move out of the LEP to another area what do they do when they want to form a club? They can't say they want to form an LEP club or they want to do an LEP residential, it's got to be – I want to do a Smallpeice course or I want to do a Crest award or join a Young Engineers Club so I think that brand awareness is pretty important but it's got to come under the LEP umbrella. (YE)

Comments were made suggesting that not all activities promoted in school were done so with due consideration for other elements of the LEP project. The take up in schools of Green Power and the Royal Navy Challenge were mentioned as instances where YE activities had impacted negatively on other activities within the LEP. Fieldworkers felt that a more collaborative approach could help to ensure that more LEP schools are engaged further in LEP activities. Some frustration was expressed with partner organisations for not engaging with ideas about ways that this could be developed.

In a diplomatic way I've said why don't we have an ideas session where each company talks about what they actually do so you can go out and talk about the whole of the LEP – it's like a little refresher so you know exactly what LEP does, exactly what young engineers, the academies and the rest of it and everyone said – yeah, we're really up for it. Nothing came of it. (LEP Fieldworker)

It was suggested both that individual organisations tend to 'push' fieldworkers to promote their own companies before the LEP as a whole, and that fieldworkers have allegiance first to their companies and second to the LEP:

...at the moment they feel that prime allegiance to their own company rather than prime allegiance to the LEP (YE)

- **Range of activities – benefits and issues:**

The teachers in schools all talked positively about activities delivered by all the different partner organisations involved with the LEP. Indeed all teachers spoken to in schools were delighted to be involved with the programme.

Yeah it just does not exist – it does not exist. In this area nothing on these lines exists and so in that sense what the LEP offer is really, really impressive in terms of sheer scale of support and activities. There's just no other organisation which even comes close, even paid – even comes close to the sheer amount of opportunities available. The diverse nature ... the fact that these opportunities are there – so I am not going to complain about it ... (Teacher: LEP school)

However, it appeared that schools have been somewhat overwhelmed by the range of activities on offer. Schools talked about how they had had to 'rationalise' the activities that they take up.

I mean I think we have gone for almost everything that has been offered but the down side of that is that there are so many – we have had so many opportunities and as a school we don't like to turn down anything – we are up for the lot but it can get quite unwieldy and then particularly when it's things going on during the day, you'll get people saying – these kids are out of lessons again (Teacher: LEP school)

The problem of how to engage schools with a range of activities in order to provide a continuum for students was widely discussed by fieldworkers and company representatives.

... The school will pick bits off the menu that it likes and not engage with the rest so it's patchy in that context and it's a weakness in the LEP. (Smallpeice)

However, there were a range of views about how this could be addressed. One line manager discussed the problem that LEP schools selected either Smallpeice or YE activities and suggested more coordination was needed by those coordinating the project. Another line manager suggested a problem for the project, in terms of engaging schools, has been the lack of

focus on progression which had contributed to the schools being selective about activities.

The best you can describe it as is a succession curriculum because it is a succession of things that we give the students that they could do but then you've no notion whatsoever of progress being made through the curriculum that we offer. Not progress in the form that schools would understand – no building on of activities (STEMNET)

He identified an urgent need for companies to sit down together to consider the offer they are presenting as a whole.

... What is needed is an awful lot more of this sitting together and saying – if we put that bit here, you put your bit there, what could we do to fill in the gap (STEMNET)

One line manager suggested LEP fieldworkers act as 'brokers' and identify activities from the range on offer that relate best to the specific needs of the school. He suggested the LEP could identify areas in the curriculum where individual schools feel less confident and help to support the schools in those areas. In his view this would mean looking beyond specifically LEP activities. He gave Green Power as an example of how this model had worked in some schools.

... Being able to broker a variety of schemes that could appeal to schools but also have the flexibility to say – we haven't got anything like that but we know someone who has so there are schemes that are marketed inside the LEP which are not LEP schemes. Green power is a prime example. (YE)

Another point raised was the need for closer working between partners in terms of developing projects on the basis of feedback. The suggestion was made that products should be evaluated and changed on a regular basis to ensure that they are appealing to schools. However, some schools talked about choosing activities because of their familiarity.

- **Organisation of fieldworkers**

There was some suggestion that the number of fieldworkers approaching each school contributed to their sense that they were being bombarded by offers. Fieldworkers also identified a need to have closer working relationships with schools. A suggestion was made that fieldworkers should be attached to a group of schools and should promote all LEP activities within those schools as this would allow for closer working relationships between fieldworkers and the schools.

... They're fieldworkers who have a number of feeder organisations who they represent so I would naturally say ... this is what is going on in the Young Engineers – new stuff – new ideas – make sure they are comfortable with the varied products and services we offer so they are confident on doing the brokering because the schools will complain to you as well on the number of people coming in. You can sort that out. (YE)

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The role of Student Ambassadors and Science and Engineering Ambassadors within the LEP

Overview

The following report is a part an extended piece of work about ambassadors and their work with younger students and should be viewed as work in progress. The discourses surrounding student ambassadors (SAs) and Science and Engineering Ambassadors (SEAs) have been traced in different contexts in which they work. These discourses appear to 'position' SAs and SEAs in a variety of different ways, for instance within marketing, teaching and learning, careers advice and youth culture. The environment within which SAs are prepared and trained to work with younger students (YSs) is influential, both in terms of their self perception and how they interact with YSs. This appears to be influential in the emphasis circulating in discourses surrounding SAs on marketing and their positioning in their work with YSs marketing HE and engineering. YSs responses to SAs and SEAs suggest that they can be open to such marketing. However, these messages only appear to be heard by YSs when they develop close working relationships with SAs and SEAs and are able to relate to them. These relationships seem to be formed through SAs and SEAs being able facilitate and support YSs in their learning processes.

Method

Data for this report was collected in a number of different contexts: activities have been observed as well as informal group conversations/ focus groups held during these activities. Activities observed include a STEM day held at LSBU, a careers day and days for younger students (from years 7-10) at engineering related workplaces; three days of the five day LSBU summer school where year 10 students were attending a course in Robotics and a day and a half of a residential course for year 9 students run by the Smallpiece Trust. Student ambassadors were involved in facilitating most of these activities and SEAs attended a number of the one day events.

Much of the data for this report was gathered through an ethnographic approach. Conversations were held with participants during activities. Given the time constraints imposed by the contexts within which activities took place, focus groups/ group conversations with younger students and paired interviews or focus groups/ group conversations with student ambassadors appeared to be the most propitious way to proceed (though conversations with SEAs were held on an individual basis). However, there are reasons beyond the pragmatic that support his approach. I suggest that working with others enriched the accounts of younger students and ambassadors who were able to build on the contributions of others where they may have struggled to speak much about the relationship on an individual basis (Gaskell 2006: 46). This negotiation of accounts will inevitably impact on what is said. Gaskell suggests that in group contexts there is 'the development of a shared identity' which he suggests is 'captured in the self description 'we'' (46). Where possible, conversations were recorded and transcribed in full and these 'texts' form the basis of much of this study. The para-linguistic is however also clearly important when considering relationships between people. By drawing on ethnography and observing interactions I have been able to consider the way that ambassadors and younger students stand, sit and physically orient themselves in relation to the other.

Through discourse analysis it has been possible to explore and identify the positioning of SAs within each context. This has usefully illuminated the ways in which the different contexts delineate the nature of the relationship that develops between younger students (YSs) and student ambassadors (SAs) and younger students and science and engineering ambassadors (SEAs).

Outline of Findings

This overview is drawn from the detailed reports included in the appendices. The focus of these reports has been to trace the various ways in which SAs and SEAs are talked about by YSs, teachers, organisers and the ambassadors themselves. These emerging discourses provide some insight into the ways in which the environment within which SAs have been prepared and the different activities they do with YSs, facilitate and constrain the development of relationships between them and impact on the nature of the relationships themselves.

Student Ambassadors (SAs)

SAs work with YSs in a range of different contexts. This report is based on observations and conversations in three different types of context: one day events, a summer school and a residential trip.

1. STEM days

STEM day at LSBU

During this event 4 ambassadors were working with year 8 students from two South London schools. There were two female students and two male students; all four were black or of mixed race. SAs were working with YS in a ratio of approximately 1:3. The student ambassadors were all in their early twenties. The morning session was organised and led by an LEP fieldworker. YSs were designing cars that they were going to present in the afternoon to a panel of Science and Engineering Ambassadors in the format of the television programme 'The Dragons' Den'.

Emerging Discourses

Customer services: Discourses focusing on marketing and specifically customer services were evident in SAs accounts. SAs at this event also worked for 'Marketing and Recruitment' within the university in these sorts of capacities. This perspective on their work may reflect SAs own ambitions and desired identity.

Teaching but not like teachers: the SAs and the LEP fieldworker were keen to stress that being a SA is 'not like teaching'. However, discursive constructions used by SAs about and during their work closely relate to those found in teaching. There were some important differences identified between teachers and SAs: these related to the active participation in activities of SAs, the contexts within which they were working and the small numbers of YSs they were working with.

Promoting engineering and university: the coordinator identified 'promoting engineering' and 'making university seem accessible' as key focuses of SA work. SAs' discursive constructions of their work also related to careers advice and guidance.

Role models: the coordinator identified SAs as role models for younger students and suggested that YSs are excited to work with SAs and to have lunch in the canteen. It

is worth noting however, that there was little evidence from observations made that YSs interacted with SAs outside allocated work time.

Gender/ ethnicity: the coordinator viewed it as important to have SAs who share ethnic and gender identities with YSs. Both the coordinator and one SA commented on how YSs are challenged and suprised by female SA engineers.

STEM Careers Day

There were approximately 80 students attending this event, 30 of whom were girls. The students came from six different schools. The focus of the day was on careers in STEM. There were stands around the room: Amp, LBTH, the army, British Gas, Tower Hamlets – sustainable development, computer science unplugged, Centre of the cell, LEP (Dome Sweet Dome and the Egg Crash Challenge). An introduction to the day was followed by a talk from the Science Museum and Punk Science. The younger students then moved around spending half an hour on the stands. YSs made domes and cars for the egg crash challenge with the LEP. Helping YSs with the domes were the LEP Director: Schools and two black male student ambassadors (BMSAs). On the Egg crash stand was one WFSA (white female student ambassador) and one BMSA. Data is taken from observations made during the day and a few brief exchanges with younger students. Data is also drawn from a conversation with two of the ambassadors: Ed a 24 year old BMSA who is Indian/Congolese and Kelly a 24 year old WFSA who is from the North West.

Emerging Discourses

Teaching but not like teachers: one SA again stressed that being a SA is 'not like teaching'. However, another compared the work to her previous job teaching English as a foreign language. Again, discursive constructions used by SAs themselves and YSs about and during their work closely relate to those found in teaching.

Promoting engineering – careers advice: SAs appeared to be consciously promoting aspects of engineering they consider appealing to YSs: the design focus and salaries. SAs were also providing YSs with information about different types of engineering. One SA commented on how longer contact with YSs enables him to provide them with 'better advice'.

Role models: the SAs were identified as 'role models' for YSs by organisers. The also modelled the enthusiasm and engagement they hoped to stimulate in YSs through their own active participation.

Youth, friendship – like a cousin: SAs suggested that the time spent with YSs on this event was too short to develop relationships with them. One SA went on to compare the relationship he liked to develop with YSs during events and activities to the one he had with an older cousin. However, despite the short time spent with each group of YSs, there was evidence of bantering conversations. The 'fun' YSs had with SAs appeared important to them and enabled the quick development of informal working relationships between YSs and SAs.

Gender/ ethnicity: SAs suggested that during these brief interactions with YSs both their own gender and raced identities were important in some instances to their working relationships with YSs.

Tubelines day

The day was held at Tubelines offices in Canary Wharf. The day was a collaboration between the LEP and Tubelines. Initial presentations were made where YSs were told about the company and the jobs of the Science and Engineering Ambassadors who were also working with YSs during the day and the tasks YSs had to complete. YSs were then divided into groups of 3-5. They worked in their groups for the rest of the day on designing stations, trains or tracks. Students had a budget with which they had to buy equipment at a 'shop' set up in the corner of the large office suite where the day was held. The initial idea was for them also to have to buy time with consultants (SEAs) but due to time constraints and the age of some of the groups this was abandoned. SEAs and SAs worked alongside the small groups of YSs facilitating them with their tasks.

Emerging Discourses

Teachers: One SA compared the work of the SAs directly to teaching. The YSs frequently talked positively about how the SAs had facilitated them in their task.

Role Models: one group of year 10 Asian girls talked quite explicitly about how they view the SAs as role models. The enthusiastic accounts provided by SAs about their own experiences appeared to have influenced this group positively towards further study in Science and Engineering related subject areas.

Careers advice – parents?: YSs talked about the opportunity provided by working with the SAs to think about their own careers. The context of the day appeared important to this. YSs explained how this 'real world' context of engineering was different to school. One SA compared working with YSs to being a parent as she said she was 'telling them what to do'.

Promoting university/ Promoting engineering: One SA talked about her focus being to encourage university and engineering and Science subjects. However, the focus on this SA's own experiences during her interaction with YSs appeared to have been initiated by YSs. The context of the day seemed important to this as the work they were doing encouraged them to focus on engineering and to think about what engineering is. This combination appeared to have been successful in promoting positive orientations to engineering amongst the girls in this group.

Friends – youth – students – 'in the same boat': YSs talked about SAs being more 'in touch' and understanding the way they talk in a way that older adults would not be able to. One YS commented that it is SAs' status as students that is important in enabling them to 'seem like us'. The expertise and experience of SAs combined with their positioning as students was identified as important by the group of Year 10 girls.

Gender/ ethnicity: one SA talked about the focus in her training on targeting girls. It is worth noting that the group of year 10 girls quickly developed a bond with their SA. This reflects findings from previous research and activities that girls seem to find it easier than boys to build relationships with SAs quickly. The shared Asian identity of this SA and the group of girls she was working with may also have contributed to the relationship developing quickly and the positioning of this SA by YSs as a role model.

2. Residential Course

The residential course that was observed was unusual in that thirty female students from one school attended in order to fill the places available (the optimum number of students from each school was identified as 10 by LEP fieldworkers). This group was

a dominant presence and was commented on by both Smallpeice and LEP staff. The girls were described as having an 'attitude' and as being 'very dominant'. One member of staff commented that it was 'difficult to develop a relationship with them because they're so defensive'. It was also commented that not all of these students were motivated by the activities and some had even commented to staff that they were there 'cos it's a week off school'.

Emerging Discourses

Promoting engineering: SAs' discursive constructions of their work were frequently focused on promoting engineering. SAs discussed the strategies they used to achieve this: these included relating engineering to YSs' own interests and describing the lifestyle of engineers. One YS described how a SA had influenced her to study engineering further. However, it is worth noting that YSs also seemed aware that SAs were marketing engineering.

Promoting university – 'we're selling that': promoting university and university courses formed part of SAs constructions of their work promoting engineering. SAs' accounts suggested they were involved in conversations with YSs about life at university. There were some accounts from YSs suggesting that they had found out more about university from the SAs. However, one YS appeared irritated by the SAs focus on promoting university.

Careers advisers: SAs described how they were providing YSs with information, advice and 'help' regarding careers in engineering.

Role models?: SAs' accounts suggested that they see themselves as role models; aspirational figures for YSs. One SA suggested that YSs could relate to her because of her background. While YSs did not comment on this directly YSs did appear to share with this SA an awareness of the disadvantages of their own backgrounds in relation to HE. One SA described how she was modeling behaviour to encourage YSs to view the work they were doing, and engineering more generally, as 'fun' and 'achievable'. This perception of the SAs' work was echoed by a teacher present on the course who described how SAs' participation in activities encourage YSs. Little from YSs accounts however, suggest they viewed SAs as aspirational role models. It is interesting to note that YSs talked about SAs as supervisors and not all appeared aware that they were students at all. A number of YSs spoken to did not feel motivated to talk to SAs outside their official role as 'supervisors'.

Teaching - 'Like a teacher': Most SAs did not explicitly identify their work as being teaching though their discursive constructions of their approach to YSs did imply this. Some YSs did identify some differences between SAs and other teachers and supervisors on the course saying SAs were less 'strict' and more 'fun'. However, not all YSs differentiated between SAs and other supervisors. One SA explicitly explained how she was 'like a teacher'. One teacher and some YSs' perceptions of SA appeared to position them as similar to teaching assistants. A few of the YSs identified the work of the SAs as disciplinary and viewed this with some hostility. It appeared that SAs and others involved in running the course felt positioned as teachers by the YSs themselves but none of those spoken to were comfortable with this positioning.

Friends – youth: One SA suggested that while 'friendship' with YSs would be beneficial to sharing information with them it was unachievable because of the positioning of SAs as 'teacher' and 'mentor'. This SA also identified the age gap between SAs and YSs and the transient nature of the relationships as problematic for

the development of friendships. However, there was some suggestions that connections between some YSs and SAs were being made. One SA suggested that YSs positively orientated to learning were easier to develop relationships with. SAs and YSs accounts suggested that connections were made because of the proximity in age between SAs and YSs and in their orientation to having 'fun'. One YS suggested that SAs are more approachable than other adults on the course because they are less disciplinarian and do not 'shout at us'.

Gender/ Ethnicity: there was some evidence that conversations female YSs have with female SAs were gendered. The male YSs orientation to SAs appeared to be different to the female students; male YSs appeared keen to stress the fact that they had not spoken to SAs as they were not in need of help. One WMYS and one BFYS responded very differently to a talk given by one of the male SAs. The WMYS appeared motivated by the information provided about how this SA had enjoyed taking electronic items apart while the BFYS described the same presentation as 'boring'. One SA was observed drawing on the Ghanaian identity she shared with YSs when talking about international opportunities in engineering.

3. Summer School: Robotics

The summer school occurred at LSBU at the end of June/ beginning of July 2008. It lasted five days and involved a total of 143 year 10 students. Subject related courses ran every morning and extra-curricular activities ran in the afternoon. There were six different subjects for younger students to choose: Engineering, Media, Health Care, Games Culture, Forensic Science and Sports Science. The ambition during the morning sessions was to provide students with some insight into a particular subject area; the afternoon session was to provide YS with an opportunity to mix with students from other subject areas and to illustrate a range of extra curricular subjects that students could become involved with at university. The YSs also had lunch in the student cafeteria and had some free time in the student union after lunch. The large scale of the summer school at LSBU has been a deliberate strategy; one manager explained that his previous line manager had said 'if you are going to run a summer school that really shows YS what it is like to be at university it has to be big'. The students were expected to move around the whole university to get to different lectures, activities and for lunch and other social activities. The SAs were constantly present in large numbers to guide YSs around the buildings and to help.

During the morning academic activities I worked exclusively with the Engineering students. The engineering students were an ethnically diverse group with the largest group being black. The group consisted of 16 male students and 9 female students. It is worth noting that of the female students only one had selected engineering as their first choice, whereas 8 male students had done so. The students worked in groups and there emerged a number of coherent groups who worked together in a lively and coherent way. However there were other students who appeared to be more marginalized and isolated.

Emerging Discourses

Customer Services and tour Guides: discursive constructions of SAs were used by SAs and YSs that related to tour guides and customer services. SAs at this event also worked for 'Marketing and Recruitment' within the university in these sorts of capacities. It is possible to suggest that YSs and SAs drew on discourses related to customer services, as they are aware that the SAs are being paid to help, positioning the YSs as potential customers of HE and SAs as marketing the university.

Role Models: another discursive construction used by SAs was of themselves as 'role models'. This view of themselves had two facets: one to promote university and the other to promote engineering. However, the use of the term role model appeared to also have been used in a more explicit way. SAs had been asked by the WP team at LSBU to provide YSs with models of behaviour to encourage the participation and engagement of YSs. SAs viewed this 'performance' as important; this view was reinforced by observations of SAs interacting with YSs where their focused engagement with tasks did appear to actively encourage YSs to participate.

Promoting University: SAs referred implicitly and explicitly to their responsibility to promote university to YSs. During conversations SAs appeared keen to present themselves as effective marketers of university; one SA appeared to view success as effectively marketing his own course. YSs also seemed aware of the SAs' positioning as marketing university. However, YSs were interested in finding out about university from SAs and both SAs and YSs described conversations they had had about modes of teaching and learning, living arrangements, differences to school, specific courses and LSBU in general.

Promoting Engineering: As LEP ambassadors, SAs were evidently aware of their responsibility to promote engineering and STEM subjects, particularly to girls. YSs were very aware that the SAs working with them were engineering students and could identify the subjects studied by several of the SAs. One SA described how she had talked to YSs about the different ways her course is taught. She also suggested that female YSs are particularly interested in the fact that she is studying engineering. There was some suggestion from YSs' accounts that they admired the SAs for studying engineering but viewed it as a difficult subject – particularly robotics. Only two of the YSs in the focus group spoken to had selected engineering at the summer school as their first choice and this was still reflected in the interests they expressed at the end of the summer school.

'Like a friendship', 'distant cousins' and youth culture: YSs suggested that SAs were like 'distant cousins' in relation to themselves. This perception suggests that in this context SAs have effectively developed positive relationships with the YSs. YSs suggested the proximity in age of SAs in relation to themselves as important to this, as well as their positioning as fellow students. YSs also referred to conversations with SAs relating to youth culture; particularly music and fashion - YSs and SAs appeared to share a knowledge of music. One SA suggested that this shared identity as young and students is important in enabling YSs to see themselves at university. Observations of interactions between SAs and YSs also suggest the importance of this shared identity. YSs enthusiasm for SAs was highly visible. However, there was a clear separation between SAs and YSs when they were not jointly involved in structured activities.

Learners: YSs identified SAs as learners who were academically ahead of themselves. SAs presence and input to YSs during a lecture YSs perceived to be boring appeared to contribute to YSs perceptions of themselves as learners who would, in the future, also be able to cope with such lectures. However, YSs attending the summer school were all already positively orientated to university.

Teaching and not like teachers: SAs were described by both SAs and YSs as 'keeping' YSs 'on task' a phrasing that appears to relate closely to teaching and school. However, YSs were keen to identify differences. These included the fact that SAs do not 'tell' YSs 'what to do'; that they allow them to use their own initiatives; that the focus is fun; that unlike teachers the SAs do not drill them and SAs do not have the authority to discipline YSs. One YS described how he felt 'more

comfortable' with SAs than with teachers. These views reflected those of the SAs themselves. One SA suggested that SAs have a different status to those found in schools; she suggested that SAs fit somewhere 'in between' and so are not seen as part of the official life of school.

Gender: YSs claimed the irrelevance of gender to the relationship they have with SAs. However, their accounts themselves suggested that, to the contrary, they were intensely aware of the gender of SAs. There was also some evidence that both YSs and SAs draw on stereotypically gendered subjects to build relationships with each other. YSs also discussed how being in an all male/ female working environment might alienate them. Unlike the YSs the SAs themselves were emphatic about the importance of gender. One BFSA described how she had been asked by one of the female YSs if she was 'in the right room' at the onset of the engineering summer school. It is also worth noting that male younger students were happier to talk to SAs that they had worked with everyday than female younger students, who, unlike their male counterparts, appeared happy to develop relationships relatively quickly; especially if they had a shared interest.

Ethnicity: as with gender, YSs denied the importance of the racial identities of SAs and YSs. However, YSs' accounts suggested that racial identities were important to them. YSs were also keen to stress that the UK is multicultural – indeed this may reflect their own experiences. One Nigerian YS referred to one of the SAs as 'my Nigerian Homie', which does indicate a shared sense of ethnic identity.

Science and Engineering Ambassadors (SEAs)

The SEAs predominantly work with YSs on one-day events or for parts of those days. The focus of this report is on three different types of days SEAs participated in.

STEM day at LSBU

During this event four ambassadors were working with year 8 students from two South London schools. The morning session was organised and led by an LEP fieldworker. YSs were designing cars that they were going to present in the afternoon to a panel of Science and Engineering Ambassadors in the format of the television programme 'The Dragons' Den'. Two SEAs arrived for the afternoon to participate as 'Dragons'.

Emerging Discourses

Promoting engineering careers/ teaching students about engineering?:

The LEP fieldworker expressly identified 'marketing engineering' as being a focus of SEAs working with YSs. This was echoed in the account of one SEA. Both SEAs also explained how their interactions with YSs in 'The Dragons Den' related to focuses in real engineering contexts such as problem solving, costing and understanding the market and technology and teamwork. Both SEAs talked about the benefits to YSs of presenting to them in a new and challenging context and how this relates to experiences that they will have in their adult lives.

Role Models: the LEP fieldworker identified the SEAs as 'role models' for YSs. This view was shared by one SEA who discussed how he had dressed smartly in order to present young black students with a positive 'role model'. The role of Dragons taken on by the SEAs effectively positioned them as experts and their judgements were taken seriously by YSs. However, they were not formally introduced so YSs were not

aware of their working identities. The SEAs were also only with the YSs for a short time so there was little opportunity for YSs to interact with the SEAs.

TFL days

The two days run by TFL were both attended by SEAs. During the first of these events two SEAs attended the first part of the morning with one senior figure from TFL giving a presentation at the start of the day. During the second event, again the same senior figure provided an introductory talk and this was followed by three SEAs giving presentations about their own jobs. These SEAs were all male, two were Asian and one white, and in their twenties. The YSs attending the second day were then divided into two groups: YSs remained in their original school groups. One Asian male SEA then remained with the group of 12 year 10 black male students observed for the rest of the day which involved a tour and YSs engaging with two practical engineering related activities. It is worth noting that a teacher accompanying the group identified them as some of the most challenging students he had taught.

Emerging Discourses

Promoting Engineering/ learning about engineering: YSs appeared to have learnt about engineering careers on both days from an introduction given by a SEA in a senior position at TFL. YSs talked about learning about salaries, the availability of jobs and the opportunities for 'everyone' – including 'girls.

Teaching strategies: on one of the days, several presentations were made by SEAs one after another. One group of Year 10 boys became bored and restless during these talks. Several students commented on the skills of the SEAs as speakers and explained that two of the speakers had been engaging but that others had not. One teacher commented that the SEAs had not pitched their talks at their audience and were too long. He suggested that the talks could be made more explicit and visual; indeed the first talk of the day was accompanied by slides and, as discussed, was received positively by students. One teacher and one SEA identified that some YSs were engaging with practical activities conceptually but that others were not and this level of thinking was not being effectively communicated across the teams.

Role Models: there was no interaction between the Asian male SEA and the group of Year 10 boys during the practical activities. YSs appeared to lack confidence to initiate conversations and there was no interaction built into the activities during the day. As a result there was no opportunity for the SEA to talk to members of this group on a one to one basis. This SEA made the suggestion that students should work in groups with SEAs to find out about their routes into engineering as a way to break down the barriers between SEAs and YSs.

Tubelines day

After initial presentations by SEAs and LEP staff students were divided into groups of 3-5 and worked on designing stations, trains or tracks. Students ranged in age from year 7 to 10. Students had a budget and had to buy equipment. The initial idea was for them also to have to buy time with consultants (SEAs) but due to time constraints (the start of the day was delayed because of problems with the Jubilee Line) and the age of some of the groups, this was abandoned. There were 7 teams in total. As well as 6 SAs (4 FSAs and 2 MSAs) there were 6 SEAs: three were white males, one Asian male and two white women. All SEAs were in their twenties to late thirties.

Emerging Discourses

Promoting Engineering/ learning about engineering: students talked about the practical engineering related skills they had learnt through working with SEAs. One YS also commented on how he had learnt to 'interact better with people' as a result of the day. One SEA, who had worked with one group of YSs for the whole day, appeared to have been able to provide YSs with advice about their own future plans. Other SEAs said they had talked to YSs about working as an engineer: YSs had asked about income and the hours SEAs work. YSs commented that they had learnt about the different types of jobs in engineering and that there are different ways of solving problems. SEAs commented that the day's activities had facilitated YSs in learning about the multifaceted nature of engineering and different roles within it. SEAs also commented that YSs will have learnt about Tubelines and that the office venue at Canary Wharf was useful in challenging any preconceived ideas about engineering. It was clear that the majority of conversations YSs had with SEAs had focused on the activity itself and how to achieve the task in hand. One SEA commented that alone the day would not raise awareness about engineering but this would develop if YSs attended other engineering related activities.

Teaching strategies: SEAs had developed different approaches to working with groups of YSs during the day. One SEA explained that he felt working with different groups was preferable to avoid providing YSs with too much advice whilst another SEA explained that the group he had worked with needed support in accessing the task. The age group of the YSs appeared to be significant in this with younger students requiring more support.

Role Models: one teacher expressed doubts as to whether the SEAs could become role models for YSs when the time available for interaction was so limited. However, there was evidence to suggest that for the YSs spoken to, working with the SEAs and the 'help' they provided was highly valued. The informality of the working relationships between YSs and SEAs appeared to positively orientate YSs towards the SEAs. One female SEA also explained that the practical focus of the day and working collaboratively with YSs had enabled her to develop more positive relationships with YSs than she had on previous days where she felt that because she was female she had been viewed with suspicion.

Discussion

Student Ambassadors

Discourses drawn from marketing about promoting HE were dominant in conversations with SAs about their work. SAs appeared positioned as marketers of HE: consciously marketing and promoting HE and even their own course and institution. Where SAs had not been able to develop informal working relationships with YSs this was on occasion viewed negatively by YSs. Generally, however, YSs were not hostile to these approaches from SAs though there was some suggestion that they were aware that SAs were marketing university. However, YSs appeared to be willing to listen to these messages from SAs if they had developed positive working relationships with them and SAs had become trusted sources of 'hot' (Vincent and Ball, 1998) information. YSs were, however, less inclined to listen when positive working relationships had not been established.

SAs were also consciously promoting STEM subjects and specific engineering messages. Again these messages appeared to be heard in contexts where SAs effectively developed positive working relationships with YSs. There was also some

suggestion that the context of activities and how this affected YSs' expectations also impacted on their willingness to hear these messages. During a STEM careers day, because of the focus of the day as a whole, YSs appeared more focused on acquiring information about engineering careers despite the limited time they had with SAs than during other days where the focus was not quite so clearly defined. SAs appeared, at times, to be positioned as careers advisers, providing YSs with information about routes into university and engineering careers. The presence of female engineering SAs appears to be important in challenging the preconceived view of some female YSs that engineering is for boys.

Despite some claims to the contrary by SAs themselves, discourses identified during all the activities positioned SAs as teachers to the extent that they were always facilitating and supporting the learning of YSs and, at times, instructing YSs. However, there were important differences. Where relationships between YSs and SAs developed and SAs appeared to become trusted 'hot' sources of information, SAs were working alongside YSs, encouraging and facilitating them. It also appeared that through this collaborative approach to active engineering related tasks, YSs were able to consider what working in engineering would be like. The SAs appeared to play a key role in enabling some YSs to think about this. The SA training provided by the LEP did work on developing SAs skills in working practically with YSs and supporting this practical work – this was incidentally much appreciated by SAs themselves who felt this focus was missing in other aspects of SA training.

Discourses importantly also positioned SAs as students. YSs appeared to enjoy and respond to the proximity of this positioning of SAs as fellow students. Different contexts appeared to support or undermine this: where SAs work alongside YSs, making and working with them, this sense of proximity appears to have been supported and reinforced. Indeed, there were times when SAs described how they were modeling the behaviour they hoped to illicit from YSs and this did appear to be an effective strategy in engaging YSs with tasks and enabling YSs to feel confident to relate to SAs. Conversations that developed during this working relationship were often where information about university and engineering courses and careers were shared. Where SAs were positioned differently and given a more didactic status in relation to YSs, this sense of proximity was undermined. It is important to note that the development of trusting relationships appeared to have been most effectively achieved during the summer school where YSs spent a week with the same group of SAs.

The identity of SAs in relation to YSs appeared to be quite important to this sense of proximity; a shared sense of fashion, knowledge of music and sport all appeared to contribute to this shared identity. Indeed this actually appeared to be more significant to YSs than the specific age of SAs, as YSs perceptions of age were closely linked to this shared youth culture. Despite YSs claims to the contrary, ethnic and gender identities seem significant. The knowledge of youth culture that appeared to connect SAs and YSs is often linked to their ethnic identities. There were a number of instances where YSs were more 'comfortable' working with SAs from similar ethnic backgrounds to their own and developed the confidence to talk to SAs relatively quickly; consequently developing positive relationships. There may be some gender differences in this; it is possible to suggest, as found in previous research (Gartland & Paczuska, 2007) that female YSs bond more quickly with SAs than their male counterparts. Some male YSs seemed to take longer to develop relationships with SAs and preferred to work with SAs who they had got to know over a longer time frame. It is interesting to note that when SAs were placed in authority over YSs as supervisors, mirroring relationships YSs have with adults in school, male YSs were

keen to distance themselves from SAs perceiving any help they received as a reflection on their level of ability.

There was some suggestion from interactions and accounts, that working with SAs was impacting on the subjectivity of individual YSs and positioning them as 'apprentice' university students and that SAs had become aspirational role models for YSs. I would suggest that this supported the development of an identity where progression to HE seems to these YSs to be a logical and even inevitable next step. However, the instances that support this claim appeared to be limited to SA interactions with YSs who were already positively orientated to university and further study.

Science and Engineering Ambassadors

The positioning of SEAs was again different in different contexts. During one STEM day the SEAs were very much separated from YSs and made to seem inaccessible through their role as dragons and their physical placement in a separate room where YSs had to go and present. However, the YSs were utterly focused during these encounters and the questioning of the 'Dragons' related to focuses in real engineering contexts. In this capacity the SEAs did appear to facilitate YSs' learning about engineering roles and the skills and knowledge that they would need in the workplace. During the Tubelines event the SEAs were again positioned as experts but in this instance they worked closely with YSs on their particular tasks. It appeared that through this collaborative approach to active engineering related tasks and the conversations that ensued between SAs and SEAs, again provided YSs with some insight into what working in engineering would be like.

It is difficult to ascertain to what extent these SEAs will be seen as aspirational role models by YSs. It may be that SEAs seem too far away from YSs; unlike SAs they are not 'the next step' or 'in the same boat' as students. Arguably becoming a role model is unlikely to be instant or a conscious decision on the part of YSs. However, seeing SEAs and hearing about their work may provide them a greater sense of the possibility of work in that field. Again, matching in terms of ethnicity and gender may be significant in allowing different groups of YSs to view such futures as possible for them. It may also be that the age of SAs is important in the development of relationships with YSs. The SEAs working with YSs at Tubelines were all relatively young and, like SAs, they were described as 'fun' and YSs appeared comfortable in their presence.

YSs evidently enjoy working with the SEAs and talking to them but, as with SAs, these relationships only developed when SEAs and YSs were given specific tasks and responsibilities; a focus for their interaction. During one event where this was not clearly defined, YSs did not interact at all with one SEA. It is important to note that despite the bravado of some YSs they often seem to lack the confidence to initiate conversations with adults unfamiliar to them.

Conclusion

The marketing discourses surrounding SAs within the university are powerful and particularly dominant in the work many of them do for 'UK Recruitment'; they may also be attractive to SAs as being positioned in marketing may well seem more glamorous than being positioned within education. However, from data gathered during activities where both SEAs and SAs have worked with YSs, it is possible to conclude that YSs value them for the quality of support and information that they are

able to provide. It appears to be in these contexts that SAs are able to talk to YSs about engineering and promote particular engineering messages. The positioning of both SEAs and SAs as role models also appears most likely to be effective if SAs and SEAs are able to work collaboratively with YSs and facilitate their learning on specific tasks. In these contexts they may then be able to provide YSs with information about routes into university and engineering. In the light of these findings it may be that the training of SAs and SEAs should focus more on pedagogy and ways in which they can interact and facilitate YSs in this learning process. However, if it is hoped that SAs will be viewed as role models it is evidently important that they are not positioned as figures of authority as this undermines sense of proximity that YSs can share with SAs. The positioning of SAs and SEAs as careers advisers may also have implications for training. While YSs evidently enjoy talking to SAs about their own experiences, if SAs and SEAs are being asked for careers advice by YSs it may be that their own experience alone does not equip them sufficiently to provide YSs with accurate information about possible routes to take.

Matching YSs with SAs in terms of ethnicity and gender seem to be worthwhile, especially in contexts where YSs are only with SAs and SEAs for a short time. Providing female YSs opportunities to work with female SAs and SEAs appears to be particularly significant in the context of engineering. However, it is worth noting that YSs enjoy working with the opposite gender and students from different backgrounds and that SAs and SEAs from different backgrounds may challenge their ideas about who they can be 'comfortable' working with.

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STEM days

Introduction

The following report traces the discourses that emerged about student ambassadors during three separate days involving SAs. The days were all focused on raising YSs interest and aspirations in STEM and specifically engineering. The first was a day run by the LEP at LSBU and focused on engineering. The second was an event for south London students aimed at raising awareness of different STEM careers; the LEP Director: Schools was there with four student ambassadors to work with younger students. The third day was hosted in the city by Tubelines and was supported by student ambassadors as well as a number of engineers working for the company.

Participants

Interview/ conversations were held with five SAs during these events and the LEP fieldworker. Brief conversations were also held with individual and groups of YSs during the activities.

Table 1: List of student ambassadors interviewed with their age, ethnicity and gender:

Name	Gender	Age	Ethnicity
Freya	F	22	Black African
Wendy	F	22	Black African
ED	M	24	Black African/Asian
Kelly	F	24	White British
Rachel	F	29	Asian

1. LSBU STEM day

During this event 4 ambassadors were working with year 8 students from two south London schools. There were two female students and two male students and all four were black or of mixed race. SAs were working with YS in a ratio of approximately 1:3. The student ambassadors were all in their early twenties (22 and 23 years of age).

The morning session was organised and led by an LEP fieldworker. YSs were designing cars that they were going to present in the afternoon to a panel of Science and Engineering Ambassadors in the format of the television programme 'The Dragons' Den'.

Emerging Discourses

Customer services

During a discussion at lunch both female SAs talked about working as a SA as being like working in customer services. This was particularly identified as being an important aspect of the work these SAs do for UK recruitment within the university

where particular tasks were identified as being similar to those that would be expected of a 'customer services executive':

Freya: ...Working on course enquiries is most like being a customer services executive - you organise give tours' book rooms (BFSA)

However, this discursive construction of SAs as 'customer services executives' was also applied to the work they were doing during the event with the LEP:

Wendy: working for the LEP is like customer services – you treat the children with respect so that they're nice back to you (BFSA)

Wendy is talking more specifically here about the importance of treating customers generally, and in this instance children, with respect. Later on in the conversation Wendy stressed the need to be 'approachable' as SAs; which is again suggestive of customer services. It is important to consider the action orientation of the two ambassadors here. This construction of their work as ambassadors as similar to working in customer services may be suggestive of their own ambitions and sense of identity.

Teaching but not like teachers

It is interesting to note that when asked what job being an ambassador is similar to, one of the first responses of those involved during the day was to explain what it was not like. The SAs and Fieldworker responsible for organising the SAs for the LEP all explained that being an ambassador is not like being a teacher:

... is there to run the event and to be the teacher...They are not there as teachers at all (fieldworker)

Wendy: it's definitely not like teaching – the kind of relationship we have is totally different' (BFSA)

However, by far the most ubiquitous exchanges between SAs and Ys during the day were those facilitating Ys to carry out their task. Ed (BMSA) was helping a group of 3 students to build their car. He sat with them at their table and asked questions about their design and was positive and friendly in his responses:

Ed: ...how do they get in?...in the top, they jump in – ok you like the active way (BMSA)

He was also in charge of the stanley knife and asked the students for instructions about where to cut the plastic to make the car chassis: 'where do I cut it here?'

During lunch he explained how he facilitates Ys:

Ed: I help them participate in what they are supposed to be doing...It's more about them - we help them to do things the way they want to – I just try to help them open the door' (BMSA)

Ed also identified that he also has to 'direct them' and 'explain to them':

I talk to them about what they need to do and once they get the idea I try to direct them – explain to them so they know how to do things (BMSA)

Wendy explained the need to be able to interact with the young people. She also explained the need to be able to 'do':

Wendy: it's a really interactive job – you have to be approachable – you have to be able to do' (BFSA)

The fieldworker described the work of the ambassadors as being there to 'assist':

To assist the students to do challenges but not to give pupils answers – to help them understand (fieldworker)

It seems that these constructions of SAs are very closely related to teaching: they are there to 'assist', 'direct', 'explain'. They, like teachers, appear to be facilitating the learning of the younger students. The coordinator went on to explain that SAs are also there to 'mentor behaviour...to patrol' which again appears closely related to the positioning of teachers in schools. However, the context appears to be significant here. The SAs are working with small groups so they can 'mentor behaviour' by modelling the behaviour they expect from Ys themselves by actively engaging in practical tasks; they did not have to manage any difficult behaviour. They are involved in 'making' with the Ys; there is no written work and, unlike in schools, there is no need to meet criteria for coursework. SAs were able to work exclusively with a group all morning which facilitates a calmer working relationship than in school; there is little frustration from younger students waiting for assistance and attention. Ys are also out of the school building, working in a university in a group with another school who are unfamiliar to them; this new environment perhaps challenges Ys and, in the words of one of their teachers, 'raises their game'.

Promoting engineering and university

The fieldworker described succinctly what she felt ambassador' work with younger students should achieve:

...promote engineering messages, challenge the stereotype of engineer as mechanic and make university seem accessible (fieldworker)

Ed described how he attempts to develop a relationship with students which enables him to provide Ys with information. He suggests that there is a need to 'listen to them first' and then 'start talking to them'. This construction suggests he is positioning himself as a councillor or perhaps careers adviser:

Ed: I listen to them first – it's the first time they have ever seen you – then I start talking to them – I explain to them and create this sort of relationship so they are happy to ask you questions' (BMSA)

Role Models

The fieldworker suggested that SAs promote engineering and 'make university seem accessible' through 'telling Ys about their experiences' - a discursive construction that clearly identifies the SAs as role models for Ys. She identified lunchtime as one of the Ys' 'favourite things':

School pupils are excited to work with students – their favourite thing is to come to the canteen and have lunch because it feels so different from school and they get to call the SAs by their first names (fieldworker)

The SAs were allocated groups of Ys at lunchtime to chaperone and sit with, however, the Ys and SAs talked amongst themselves rather than each other. I did not observe, in the group I sat with, younger students using the lunchtime to talk to SAs; they appeared to be more reluctant to interact in this context than during the workshop session.

Gender/ ethnicity

The assumption that SAs are 'role models' for YSs was again present in the fieldworker's account of the benefit of having SAs who share ethnic identities with YSs:

Most of the SAs are from BME backgrounds which is good for the students from the schools we work with (fieldworker)

Both the fieldworker and one of the SAs commented on the way in which YSs a female student training to be an engineer challenges expectations:

Some students are really surprised to see a female SA who is studying construction or studying chemistry (fieldworker)

It is worth noting according to Freya's account that because she is female and studying Petroleum Engineering YSs respond to her with surprise combined with admiration:

Freya: People don't know about it- petroleum engineering – people think I'm a girl so I'd be doing something different – people think I'm like Einstein – but I'm not it's just a normal course BFSA

2. Careers day: Your future in Science and engineering

There were approximately 80 students attending this event; 30 of whom were girls. The students came from six different schools.

The focus of the day was on careers in STEM. There were stands around the room: Amp, LBTH, the army, British Gas, Tower Hamlets – sustainable development, computer science unplugged, Centre of the cell, LEP (Dome Sweet Dome and the Egg Crash Challenge). An introduction to the day was followed by a talk from the Science Museum and Punk Science.

The younger students then moved around spending half an hour on the stands. I spent time with younger students working on making domes and cars for the egg crash challenge with the LEP. Helping students with the domes were the LEP Director: Schools and two BMSAs. On the Egg crash stand was one WFSA and one BMSA. Data is taken from observations made during the day and a few brief exchanges with younger students. Data is also taken from a conversation with two of the ambassadors; Ed a 24 year old BMSA who is Indian/Congolese – who was also an ambassador on the previous STEM day and Kelly a 24 year old WFSA who is from Cheshire.

Emerging Discourses

Teaching but not like teachers

As with other SAs, Ed explained how he is not like a teacher. However, the ambiguity of his positioning as a SA in relation to teaching was suggested by one of his explanations of his position of authority in relation to YSs:

I try to make it clear –I am not the teacher – but still they have to listen

During the workshop sessions the SAs were evidently instructing YSs about how to accomplish the task that had been set. The two BMSAs worked with YSs to construct dome shapes. One BMSA explained the task while demonstrating himself:

...yeh what you're gonna do is make a triangle using these yeh

...all you're doing is joining the triangles together to make on like this ...
(BMSA)

He uses a range of imperatives to instruct the YSs about how to work, such as 'Join that. Use that.'. He also makes statements with the purpose of instructing YSs about how to complete the work effectively:

...to do this successfully you need a lot of teamwork

However, when one student ignored this approach he was more direct, using questioning to guide the YS:

you are having these problems holding this down – don't you think it'd be faster if you had someone to hold it for you?

As well as providing guidance and instruction, SAs also provided YSs with encouragement such as 'that's not bad'. All of these linguistic strategies are identifiable in any classroom context. These discursive constructions appear to position the SAs close to teachers; again they are clearly facilitating YSs to achieve the task but in this instance they are also directing and instructing YSs. Indeed Kelly (WFSA) who has worked as a teacher of English as a foreign language commented on the similarity between the work she did in that context and working with YSs as a SA; pointing particularly to the practical focus of activities:

it's most like my old job – teaching TEFL...with the young kids we did singing and making party hats

This positioning of SAs as being like a teacher is also implied by YSs' responses to the SAs. Both Ed and Kelly described how the YSs referred to them as 'miss' and 'sir' during the day.

... some of them called me sir a couple of times

...I got called miss

One YS also described the SAs as like his English teacher:

...they're friendly ...like my English teacher – she's nice innit – they appreciate you innit (BMYS)

However, while much of this suggests that the SAs are positioned similarly teachers in this context, there are also suggestions of difference. The YS here described the SAs as being like his English teacher, but it appears from his account that he views his English teacher differently to his other teachers; she is perhaps his favourite because he feels that she 'appreciates' him. The SAs were enthusiastic with the YSs and encouraging about the designs they produced; despite the little time they had with the YSs they appeared to have begun to develop a relationship with the YSs that was less formal than that YSs generally experience in a classroom context and one where they are viewed positively by YSs. Kelly described how one of the YSs had called her miss and then had questioned this - 'one of them said – do I have to call you miss?'. One YS explained that the SAs are different to teachers because 'they're younger – they don't seem as professional'

Promoting engineering - careers advisers

Both the SAs and YSs talked about how they had been discussing engineering as a possible future job:

Ed:....we were talking about their future and jobs – what they want to have. One said if engineering is about being creative they'd be interested...some of them were really like – yes this is what I want to do (BMSA)

It is interesting to note that jobs requiring creativity are attractive to YSs and are particularly mentioned by girls so this is an aspect of engineering that the LEP focuses on. This appears to have been taken on board by the SAs who made reference to this aspect of engineering, in an apparently conscious promotional strategy, when talking to younger students. During the dome making exercise one of the other BMSAs commented about the need for a design focus during his explanation of the task:

...engineering is not just about building you've got to make it look nice (*re. the selection of colours for the dome*)

It is interesting to note that this appeared to have been absorbed by some of the YSs; one YS commented to me that something she had enjoyed about the work had been 'designing' – though she seemed to be somewhat ambivalent about whether this was part of what was required of her in the task:

I like designing – even though that's not their aim the designs are quite pretty

Kelly also relayed a conversation she had had with a younger student about her car design:

I said if this was your car in the garage what colour would it be – I work for VW how would you sell it to me? And she (*BFYS*) said it's purple and it's got hearts on so it's for girls

Another conscious way that SAs appeared to be involved in promoting engineering was in discussing the possible salaries available in the profession and in discussing the different types of jobs available in engineering. Student ambassadors talked about how they had been discussing different types of careers:

he was talking about how he wanted to be a chemical engineer (Kelly – re. discussion with BMYS)

Again, both these messages were commented on by YSs I spoke to:

...I didn't know you got paid that – it's quite a lot for that (*BFYS*)

I've learnt about engineering jobs – there's lots of different types (*BFYS*)

Clearly at this early stage, many of the young people's ideas about their futures are unclear and undeveloped. This fluidity was illustrated by one student who, when talking to a SA, had said that he wanted to be a pilot, whereas 15 minutes later in a conversation with myself he said he wanted to be an engineer. He may, of course, have said this as he believed that as an evaluator of the work of the LEP this is what I wanted to hear. However, it could equally be suggested that the interest SAs have in the YSs and the conversations that they have can be quite influential – this was the student who said that he had enjoyed working with the SAs because 'they appreciate you'. The long term impact of this influence is of course unclear.

SAs also appeared to be raising YSs' awareness of jobs within engineering by talking to them about the roles they were taking on in the work they were doing. Because of

the work one YS was doing in his team I overheard one SA saying to him ‘...you’re going to be technical manager’.

Ed discussed the way in which the day raised awareness of engineering. He commented that where there was longer contact with the YSs the information SAs provide YSs with can be more tailored to them and their interests:

(compared to STEM days where spend 3 hours with students) today we don’t know what they are good at but it’s good – it makes them more aware of what it is ... the summer school is even more different you know the kids even better – you know what they are good at and can give them better advice as well... (BMSA)

In this account of his work Ed describes how he can give ‘better advice’; again thus discursive construction appears to position him as a councillor or careers adviser within the specific context of giving advice about careers in engineering. One of the organisers of the day from Tower Hamlets 14-19 school improvement commented on how valuable SAs are for the day as they can provide YSs with information about jobs, again suggesting that SAs are there to provide YSs with information about different careers:

these sort of events rely on SAs (LEP) people can’t really take time off work

Role Models

There were few discursive constructions relating to SAs as role models during this activity and conversations about it. However, the organiser from Tower Hamlets 14-19 School Improvement office did comment on the importance to YSs of having ‘younger role models’ as it enables them to see where they could go next:

Having younger role models is really good for them – it something they can aim for (Tower Hamlets 14-19)

However, in the other sense of the term, the active practical engagement of SAs in activities meant that they were modelling the behaviour they wanted from younger students: interested, focused and engaged.

Youth/ friendship – like a cousin

The SAs themselves commented on how the brief time allocation they had with YSs prohibited the formation of any type of relationship:

Ed:...today there’s pretty much no relationship – we supervise and that’s it – when we spend 3 hours with a group we get to understand them – know which kid’s good at what and help them out (BMSA)

However, Ed went on to describe the kind of relationship he attempts to build with YSs. He explained how his relationship with his own cousin who studied engineering has affected how he tries to work with YSs. Ed described the way his cousin talked to him and how using a similarly respectful approach to YSs he endeavours to develop their confidence:

He talked to me not as a kid but like an adult – and I respect the things he has to say...that’s what I try to do – to make them feel confident enough to do whatever they want to do (BMSA)

Despite the very brief time SAs had with YSs there were many instances where SAs appeared to have successfully ‘connected’ with YSs. I observed various bantering

and light hearted conversations. One exchange observed, where SA criticised a YS's work in a light hearted way, was quickly followed by a question from the YS about the university that the SA attended (though this was not heard by the SA himself):

...this isn't properly done! (BMSA)

(laughter) forget about it there's no time...which university are you from?

(AMYS)

It seemed from my observation that this light hearted exchange had given the YS confidence to ask the question.

The YSs talked about what they had enjoyed about the activities and working with the SAs featured prominently in their accounts. One BFYS explained '...it was really fun'. As discussed, she went on to talk about the age of the SAs and lack of formality in the relationships. This contributed to her final evaluation of the SAs – 'they're nice':

'they're younger – they don't seem as professional...they're nice' (BFYS)

Gender/ ethnicity

The SAs discussed their gender and ethnicity and how this impacts on their relationships with YSs. Ed described how he felt that his mixed heritage enables Indian YSs to feel 'more relaxed':

I'm not really black – I'm half Indian ...it makes them more relaxed – the Indian ones when they find I'm half Indian – one boy today – he changed a little bit – he relaxed more

During my observations of the day, I noted that a small group of Asian boys appeared to be a little shy and reluctant to contribute but that they were evidently more actively engaged and talkative during the car making exercise where they were working with Ed.

Kelly also noted that 'some of the boys seemed a bit quiet' but explained that she had found interactions with female students easier and she hadn't felt that the students' ethnicity had impacted on their relationship with her:

...from my point of view the race doesn't really matter – with the girls it seemed fine –some of the boys seemed a bit quiet though (WFSA)

Her interactions with a group of black girls I observed her working with appeared to suggest that a shared gender identity facilitated her in working with them. She was enthusiastic about their car design and talked with them about its 'girly' features – the car was going to be purple and was covered in hearts.

3. Tubelines

The day was held at Tubelines offices in Canary Wharf. The day was a collaboration between the LEP and Tubelines. After initial presentations where YSs were told about the company, the jobs of the Science and Engineering Ambassadors who were also working with YSs during the day and the tasks YSs had to complete, YSs were divided into groups of 3-5. They then worked on designing stations, trains or tracks. Students had a budget with which they had to buy equipment at a 'shop' set up in the corner of the large office suite where the day was held. The initial idea was for them also to have to buy time with consultants (SAs) but due to time constraints and the age of some of the groups this was abandoned.

Participants

Approximately 30 students attended the day and there were seven teams in total. Six SAs were present during the day four female SAs and two male SAs. There was one white female student ambassador, one Asian female student ambassador, two black female ambassadors and two black male ambassadors. Brief interviews were held during the day with Rachel (AFSA) and three year 10 Asian female Ys.

Emerging Discourses

Teachers

Rachel clearly identified working with the Ys as being like teaching. She explains this as being due to the fact she is 'the adult there' and the 'children are in a learning process'. These discursive constructions relate to her age (she is also a mature student in her late twenties) and the focus of the Ys:

... it's like teaching – I am the adult there and they are the children and they're in a learning process...I look at it as like a teacher (AFSA)

One of the Ys's accounts of how the SAs had 'helped' him is also reminiscent of teaching in that he suggests that SAs evaluated his designs and discussed them with his group; again the SAs appear to be facilitating the work and learning of the Ys.

...they were very helpful...they talked about designs and how realistic they would be (BMSA)

Indeed the SAs expertise and consequently their ability to facilitate Ys was commented on a number of times: 'he gave us good ideas' (BMYS).

Role Models

A group of three year 10 Asian girls talked explicitly about how they saw the SAs as role models – though they did not use the term directly. One student explained that 'by seeing them it inspired me to learn more'. Her suggestion here is that she feels motivated by meeting the SAs and wants to 'learn more' to be like the SAs themselves. Another in the group explained how this motivated her in more detail; again, the implication in her account is that she is aligning herself with the SA and sees her as someone whose experience is similar to her own:

Ayisha: I always wanted to do further education within a certain field but knowing how someone else went through the same thing - yeh, kind of drives you more (AFYS)

The SAs appear to have become role models for these Ys. The Ys appear, at least at this moment in time, to have been inspired by the SAs and to want to emulate them; specifically by pursuing science and design related courses after their GCSEs.

Sarah... they were inspiring to me because they told us about what they do (AFYS)

The SAs appear to have acquired this positioning in the Ys' eyes through narrating their own experiences of how they made their choices. However, they are also being 'role models' in another sense, they are, through their enthusiastic accounts, modelling behaviour that they hope to see in the Ys by talking enthusiastically about their own courses (though this is also a conscious strategy used by SAs to promote university and engineering):

Ayisha: ...it reassures you, you know and to see that they're enjoying themselves as well it gives you extra

Meena: it's not like depressing...

Sarah:it kind of um makes us feel happy as well cos the vibe we're getting is really nice (yr 10, AFYS)

The SA who worked with these girls was aware of the students enthusiasm, describing how their 'eyes were wide open talking about it'. She described how in her training she had been told that she SAs 'are like mentors' who 'should speak about our own experiences'.

Careers advice – parents?

This group of girls also described how working with the SA had facilitated them in thinking about their own careers:

Ayisha: ...you can talk about your future (yr 10, AFYS)

However, the context of the day's activities also appeared to be important in this. The group explained that the activities had helped by demonstrating to them that a job provide an opportunity to 'get you're ideas out':

Sarah: and this has helped us in deciding what to do in the future ...definitely

Clare: what do you want to do by the way?

Sarah: something in design

Clare: how's this helped?

Sarah: in knowing that this is the kind of stuff you're going to be able to do...you can get you're ideas out, you don't have to just do the same repetitive thing (yr 10, AFYS)

The day's activities were also identified as helping this group of students understand what design in the 'real world' would be like. This is contrasted by students to the artificial world of school where real world considerations such as measurements and cost do not have to be considered in D&T lessons in the same way:

Ayisha: and also be aware of what you're getting into so you know if it's the right path for you

Sarah: ...in terms of design, we've learnt like what it's really like...

Ayisha: in the realistic world - the prices

Sarah: cos in school you just draw sketches and make it without any measurement and you don't have to think about cost whereas here you do... and that helps us think about the future (yr 10, AFYS)

Rachel also described being a student ambassador as being similar to being a parent as you are 'almost telling them what to do':

it feels like you're parenting them as well – almost telling them what to do but maybe that's because I'm a mum as well (AFSA)

Promoting university and engineering

Rachel talked about how she had been told in training to promote university, science and engineering:

We were told in training – encourage science, encourage engineering, encourage university ... (Rachel, AFSA)

It was evident in her account and those of the YSs that she had effectively 'encouraged' the YSs and promoted these subject areas and study at HE. However, whilst this suggests a conscious awareness of her relationship to YSs being orientated around promoting these subject areas and courses, her interaction with the YSs and its focus on her own experiences appears to have been initiated by the YSs themselves:

Rachel: they were asking about my degree and university and where it leads (AFSA)

It is also worth noting that again, Rachel's conversations with YSs combine with the day's activities and these seemed to have been effective in raising these YSs' awareness of engineering roles:

Sarah: (engineering) there are some difficult things to consider ...I wouldn't say it's an easy subject – it's something where you'd need to use your initiative – you need to put other people into what would go wrong and what would go right

Ayisha: you need to plan it all out exactly ...it's about team work ...although it's complicated you are able to work it out in small stages so you will eventually get there...

Sarah: engineering before – I probably thought it was to do with mechanics and how things work but now I have a broader view of it – except I can't say it in words.

Meena: You know chemical engineering involves science and DT? ...I'm just interested (yr 10 AFYs)

In terms of promoting engineering messages, the combination of the SAs' input and the activities during the day appeared to have been successful in promoting positive orientations to engineering careers amongst this group of girls:

Sarah: engineering is another word for making things

Ayisha: I want to become an engineer now

Meena: only if it involves science

Aiysha: yes for the rest of my life (yr 10, AFYs)

Friends – youth – students – 'in the same boat'

One of the younger students (year 7) explained that the SAs were different to 'anyone else'; he identified the source of their difference as being in that they understand 'slang' and are 'more in touch' than other adults he knows who he felt would not have been able to understand him in the same way:

...they are not really like anyone else...say I'm talking – adults wouldn't know cos I use a mix of slang – teachers would like say pardon and wouldn't know what I was talking about – they're more in touch (BMYS)

Ayisha commented that the SAs status as students rather than their age was important in enabling them to 'seem like us'. Rachel, the SA she worked closely with, is a mature student in her late twenties with a child of her own and so is not particularly close to the YSs in age:

... because we're students and they're students –I know they might not be the same age but - you kind of have the sense of...they seem like us Ayisha (yr 10 AFYS)

Indeed, this group of younger students discussed how this combination of SAs being older, more experienced, having more expertise and yet being the same as the YSs in that they too are students enabled them to talk and relate to them:

Meena: they're in the same boat

Aiysha: yeh they're experiencing what we are. The fact that they're older does help because you can ask them about their experiences and stuff

Meena: we've asked them about what they're doing and stuff like that

Sarah: they have more experience than us – they have more skills

Meena: they're easy to talk to

Alysha: they're similar to us because they're students – they're young and they understand the difficulty of making choices and the pressure we're under (yr 10 AFYSs)

It is worth considering the action orientation of this group of girls. Their enthusiasm for the SAs seemed rooted in the fact that they clearly liked her and had enjoyed working with her. They were also clearly enjoying talking to me; especially when I started to record the conversation; one girl said 'I'm loving this by the way – it's like what you see on the telly when journalists ask people questions'. Their new found friendship with Rachel and their enjoyment of the attention of being interviewed clearly combined to motivate them to talk extensively about how Rachel had helped them.

Gender/ ethnicity

One SA explained how they had been instructed in training to specifically focus on encouraging girls:

Rachel: We were told in training – encourage science, encourage engineering, encourage university – especially the girls (AFSA)

This focus was reflected in this SAs approach during the day as, as discussed, she worked closely with a group of year 10 female students.

It is certainly worth noting that this group of girls appeared to develop a bond quickly with their SA. This reflects suggestions from previous research that girls find it easier to build relationships with SAs more quickly than their male counterparts. It is also important to note that the ambassador in this case was also Asian; it seems likely that this connection also facilitated the relationship in developing quickly. It seems likely that this contributed to Rachel's apparent positioning by YSs as a 'role model' – someone that they aspire to be like.

Summary

At all three days discourses related to teaching were evident. These were often contradictory with some ambassadors and an organiser keen to stress that ambassador work is 'not like teaching'. However, during all three days SAs work and their discursive constructions about their work appeared closely related to teaching. SAs on two of the days compared the work they were doing specifically to teaching. YSs also talked about how SAs had facilitated them in their tasks. These discourses appear to position SAs close to teachers in the work they are doing with YSs during these events.

While discourses related to promoting university were evident during all three events, the SAs appeared to be very specifically focused on promoting engineering and science related careers and courses. SAs appeared to be consciously promoting engineering and science as possible careers especially during the Careers in STEM day and day at Tubelines. As well as discourses related to promoting these areas, SAs also used discursive constructions of their roles relating to careers advice and guidance. One SA commented the more extended the contact with YSs the 'better advice' he is able to provide. YSs talked about the opportunity provided by working with the SAs to think about their own careers. The activity YSs were involved with during the day at Tubelines appeared important to this. YSs explained how this 'real world' context of engineering was different to school.

Discourses focusing on marketing and specifically customer services were evident in SAs accounts of their work during the day at LSBU. SAs at this event also worked for the Marketing and Recruitment Department within the university in these sorts of capacities. This perspective on their work may reflect SAs own ambitions and desired identity.

It is interesting to note that it was the organisers rather than the SAs themselves or the YSs that identified the SAs as 'role models' for YSs during the careers day and day at LSBU. However, during the Tubelines event YSs themselves used discursive constructions that positioned the SA working with them explicitly as a role model. They also explained how this SA had influenced them positively towards further study in science and engineering related subjects.

During all three days there were suggestions from the SAs themselves, organisers and the actions of YSs that the gender and ethnicity of SAs is important to the development of relationships. YSs appeared to be challenged and surprised by female engineering SAs. Shared gender and raced identities appeared to facilitate the development of relationships and, during the Tubelines event, contributed to one SA being positioned as a role model by YSs.

SAs commented that events were too short to enable the development of relationships with YSs; this was especially true of the careers day where SAs only spent a few minutes working with each group of YSs. As a result discourses relating to ambassadors did not specifically focus on the nature of their relationships. There were though, suggestions of shared youthful identities observed in bantering conversations between SAs and YSs and informal relationships appeared to develop quickly. During the Tubelines event one YS commented that the fact that SAs are also students enables them to 'seem like us'.

Residential Course 3/08

Context

The residential course that was observed was unusual in that thirty female students from one school attended in order to fill the places available (the optimum number of students from each school was identified as 10 by LEP fieldworkers). This group was a dominant presence and was commented on by both Smallpeice and LEP staff. The girls were described as having an 'attitude' and as being 'very dominant'. One member of staff commented that it was 'difficult to develop a relationship with them because they're so defensive'. It was also commented that not all of these students were motivated by the activities and some had even commented to staff that they were there 'cos it's a week off school'. It is within this challenging context that the data was collected for this report.

Participants

Interview/ conversations were held with four SAs, a teacher and other fieldworkers and supervisors during this event. Brief conversations were also held with individual and groups of YSs during the activities.

Table 1: List of student ambassadors interviewed with their age, ethnicity and gender:

Name	Gender	Age	Ethnicity
Akua (LSBU)	M	30	Black Ghanian
Gill (LSBU)	M	24	White British
Antonio (Greenwich)	M	24	Black
Emmanuel (Greenwich)	M	24	Black African

Promoting engineering

The SAs' discursive constructions of their work were deeply rooted in an understanding of themselves as promoting engineering as a career to younger students.

SAs' constructions suggested that they approached this in a number of ways. One student described how he tries 'to make them understand engineering isn't boring and abstract'.

Antonio: Engineering is abstract to them. Some of the kids have an interest and some are fascinated by Science we are here to try to make them understand engineering isn't boring and abstract (Greenwich BMSA)

He explained a number of strategies he deploys in achieving this. One approach described was to relate students' own interests to engineering:

One student said he wanted to design trainers – I explained to them it's biomechanics. Other students said what about clothes and I said that's

materials – I give them something in brief, telling them about different types of engineering. Students mostly think engineering is maths so I try to give them something they can relate to - what they are used to and what they know (BMSA, Greenwich)

In this account of his relationship with the younger students, this SA is clearly constructing the work of SAs as that of experts sharing their expertise about engineering with the younger students. This approach to younger students was echoed by another SA during the same conversation. He describes how he relates his own project work at university to younger students' interest in mobile phones:

Emmanuel: I explain my own project that I am doing - the amplifier and bandwidth – and relate it to mobile phones (BMSA, Greenwich)

In both these accounts the SAs action orientation appears to be relatively clear; they want to be viewed as engineers who have expertise in the field that they are keen to share with younger students. The fact that I was working in this instance as an evaluator for the RAE may well have contributed to this emphasis.

Another approach taken to promoting engineering appeared to be through describing the lifestyle of engineers:

Antonio: I have spoken to one of two of them about how engineers travel all over the world and that it's integrated in everything that they do at school – Maths, Physics – that's why they should continue doing what they do at school (BMSA, Greenwich)

This again appeared to be a conscious strategy to market engineering and again the ambassador appears to be constructing himself as an expert about engineering and engineering jobs.

Both these strategies to promote engineering to Ys were strongly reflected in the account provided by another SA from a different university. This SA talked about how she stresses the benefits to younger students of being an engineer in terms of job opportunities:

Akua: I said if you do engineering you have a profession – you can work anywhere – whereas something like drama is not the same in Ghana as it is here...engineering you can still follow your career anywhere (BFSA (mature student))

Later in my conversation with her she also explained how she had talked about her brothers' work to younger students. Again, the emphasis in her account appeared to be on the opportunities for travel. She appears to be consciously attempting to market engineering to younger students as a glamorous and international occupation:

Akua: A last night we were just chatting after watching the film – it was really fun. I was telling them about my brother – he is into computer networking – he is now a consultant in Germany for 5 years- he works for P&O and goes all over Europe... I said you can work in Kuwait, San Fransisco – you can go anywhere (BFSA)

This SA again described how she had provided younger students with information about engineering careers that related to their own interests:

Akua: ...the kids were in a group after we had finished what we were doing...he said 'I like designing, drawing...I liked working on the project' and I told him about civil engineering and he said 'can you work anywhere in the world?' and I said yeh and he said 'on small or big projects?' and I said small and big projects...I can throw more light on it – he doesn't like planes – he wants to go into construction. So now if he fills in his UCAS form he knows what to put on it. (BFSA)

It is interesting to note how Antonio describes his response to younger students' questions. He talks about promoting engineering in general terms saying 'it's challenging and it's for challenging people – you have to create solutions'. These constructions of engineering relate closely to some of the engineering messages that SA are presented with during training sessions:

Antonio: They ask questions one to one. I explain from my own experience how I came into engineering. I say it's challenging and it's for challenging people – you have to create solutions – exactly what you are doing now with the projects – you start to break things down into bits and then the bits come together and you get a solution (BMSA, Greenwich)

There was some suggestion during the brief conversations held with younger students that this focus on promoting engineering was having some effect. One younger student described how she was considering engineering as a direct result of her contact with Antonio:

I think I want to go down that path...*(re. talking to Antonio)* it's made me more eager to study – that he said it was fun and interesting – it's made me more sure of that – I want to go down the design route...he always answers my questions to the full...in school it's DT and I really enjoy it and stuff – I'm still not sure if I want to go down that route...50% of me wants to go on to study engineering and 50% RE (BangladeshiYFS)

However, it is evident from her increasing hesitation as the conversation progresses that her conviction that she 'wants to go down the design route' is fragile and by no means embedded.

The action orientation of her account is perhaps also important to consider. She is talking to someone who is asking about the SAs' work and she appears keen to stress the impact of the SA who has worked with her 'it's made me more eager to study...he always answers my questions to the full'. She appears keen to construct her SA as 'successful'. Her criteria for his success appears to be how effectively he has marketed engineering courses at university and how effective he is in providing her with information. It is interesting to note how closely this appears to relate to SAs' constructions of what being a successful SA appear to be through the emphasis they place on providing information about engineering careers and promoting engineering at university. As well as the action orientation of this younger student, it is interesting to consider the action orientation of the SAs in these accounts. They are talking to someone who is working for the RAE who is evaluating the work of ambassadors on the programme. It is perhaps, in this context, unsurprising that they are keen to construct themselves as successfully marketing engineering. It is interesting to note that this is so heavily foregrounded in their accounts of their work.

Promoting university – 'we're selling that!'

As discussed, SAs discursive constructions of their work focused to a large extent on promoting engineering and part of this was promoting courses at university. One SA

suggested that her 'job' as a SA was to 'motivate' YSs and 'show them' that engineering at university 'can be fun:

Akua: ...the job is motivating them – showing them what it's going to be like – it's not different from any other course. Some of them are saying it's hard – it's showing them it can be fun – find a solution not just lots of reading...it's not as difficult as people make it out to be(BFSA mature student)

Another SA explained that she used 'any opportunity to tell them about university'. Her use of the phrase 'we're selling that' draws directly from discourses of sales and marketing:

Gill: Any opportunity we tell them about uni – in a subtle way like 'you need a degree for everything!' – we're selling that (WFSA)

SAs' accounts suggested that they were involved in conversations with younger students about life at university.

Antonio: They start asking – do you go to university

It is, however, interesting to note that one SA makes a distinction that it is 'kids that are keen' and who 'know that uni is the thing for them' who ask questions about university life:

Gill: The kids that are keen, they do ask questions about uni and engineering – some kids know that uni is the thing for them so they are asking about it like 'what do you do in the evening? Do you have to work really hard?' (WFSA)

One YS spoken to did identify learning about university as being a benefit of the SAs being present at the residential course. He plans to progress to university to study Psychology:

Nigel: I found out about uni courses(WMYS)

However, some of the YSs responses to the work of the SAs seemed less positive and even hostile. Indeed, there is a suggestion in this account that she has found the approach taken by the SAs, telling her about 'the stuff you can gain from it' slightly irritating:

Fabienne: the SA didn't really help me- it's 3 years till I go to university – I don't really want to know – I'm not bothered. I already know what you have to do – I knew the stuff that you can do – stuff you can gain from it (BFYS)

Careers advisers

Akua's (BFSA) account of how she attempts to relate YSs interests to engineering also implies her construction of her work as an ambassador as providing younger students with careers advice about routes into engineering.

...he said 'I like designing, drawing...I liked working on the project' and I told him about civil engineering and he said 'can you work anywhere in the world?' and I said yeh and he said 'on small or big projects?' and I said small and big projects...I can throw more light on it – he doesn't like planes – he wants to go into construction. So now if he fills in his UCAS form he knows what to put on it. (BFSA)

Antonio (BMSA) also used discursive constructions related to careers advice saying he 'can help students who are indecisive' and 'show them different scopes':

Antonio: ambassadors should have varied backgrounds – I spent some time searching what to study so I can help students who are undecided. Kids are indecisive – they know that they are good at school but they don't really know what they want to do – you need to show them different scopes (BMSA, Greenwich)

In his account of his work he related how he provides younger students with information about different routes into engineering:

Antonio: Students ask what do I need to study to become an engineer? Do I need A levels? And I explain the different routes – vocational which is the way I got in or A levels. (BMSA, Greenwich)

As well as talking about the different routes available Antonio explained how he related this to his own route into engineering:

They start asking – do you go to university – I say yes and I explain how I started off wanting to build things and fix things so I went into engineering (BMSA)

Role Models?

SAs' accounts suggested that they viewed themselves as role models for the younger students though in terms of being figures that YSs could aspire to be like. As discussed, SAs described talking to younger students about their own experiences and routes into engineering. One SA explained that she felt YSs related to her well because of her background, which she implicitly identifies as being underprivileged:

Gill: They respond to my background – my Dad's a builder my Mum's a cook in a pub – I moved out of home at 16 and got a job in accounts for the council (now studying surveying at LSBU) (WFA)

Indeed this perception of being from the wrong background was echoed by YSs. One WMYS explicitly commented on how his friend was unsuited to the traditional intake of elite universities. Nigel had said to me that he hoped to go to Oxford. This was met with amusement from his two friends who commented:

Bill and Dan: you're aiming high!

Bill: not saying you shouldn't go for it you could get there

Dan: it's for rich people not for rough kids like us (WMYS)

The term role model can again be interpreted in two ways in the light of SAs' accounts. Akua described her work as 'showing them' what studying engineering is like. She describes achieving this through working with them on the engineering projects they have to complete during the residential course:

Akua: showing them what it's going to be like – it's not different from any other course. Some of them are saying it's hard – it's showing them it can be fun– find a solution not just lots of reading...it's not as difficult as people make it out to be

...

...it's like building the plane ...bit by bit starting and finishing – you know where you are going – you have an end product which is always achievable (BFSA (mature student))

In this context she appears to view her work as modeling, through her own behaviour, what is expected of the younger students. In doing so, she believes she is challenging their perceptions of engineering as 'difficult' and enabling them to see themselves as potential engineers.

This discursive construction of the work of the SAs was echoed by a teacher who had accompanied one of the groups of younger students on the course. She suggested that by participating themselves and by being skilled in what they were doing, the SAs encouraged the participation by YSs in activities:

...they are good at helping them to make the models - they have good skills – because she (SA) was doing it it made them want to do it – they were sitting down with her doing it (young female Asian teacher)

There was little from the responses of younger students that I spoke to, however, to suggest that they viewed the SAs as aspirational 'role models' themselves.

One student recalled the presentation one SA gave of how she changed her life by going back to university and subsequently getting a 'great job'. Though not entirely accurate as Gill is still at university and has not yet applied for jobs, this student does describe this as having 'influenced' her:

yesterday we had a careers talk – they were talking about their experiences...that influenced me – one supervisor said when she left school she just worked but she wanted a good job so she went back to uni and now she's got a great job (AYFS)

However, it is interesting to note that even in this YS's positive account the SA is described as a 'supervisor'; indeed this YS does not appear to be aware that the SAs are students at all.

Another student explained that she knew what the SAs do at university because of the presentations they gave. Several other students were able to comment on this:

I know what the ones who gave a presentation about what they do at uni – I don't know about the rest of them (BFYS)

(re SA helping them) she is doing petroleum engineering and maths she talked about it at the presentation yesterday (WMYS)

However, these younger students and a number of others spoken to did not appear to have talked to the SAs beyond this. One student commented:

I've not had a conversation with any of them (BFYS)

While some students who had not spoken to SAs were not interested in engineering and wanted to pursue subjects at GCSE totally unrelated to engineering, one student explained that she did want to become an engineer. This lack of engagement with SAs then was not always linked to YSs lacking interest in engineering; it seemed that a number of students spoken to did not appear to feel motivated to talk to SAs outside of their official relationship as 'supervisors'.

Teacher/ not a teacher

While not explicitly identifying 'teaching' as being what they were doing with YSs, this is perhaps implicitly suggested by discursive constructions SAs used to explain their work with YSs. One SA suggested that their work was to 'motivate' and 'engage' YSs:

Antonio: Our key role is to motivate and encourage them (BMSA)

Antonio: We're here to motivate the kids (BMSA –African - Greenwich)

Antonio: you have to interact with them and engage them(Carlos BMSA)

Another SA suggested that they were 'mentoring and managing':

Emmanuel: it's more like mentoring and managing people – they have ideas and talents but we need to manage them to get them to do things(BMSE – African Ahmed - Greenwich)

These constructions all imply that the SAs are in authority over the YSs and that they are responsible for 'managing', 'engaging' and 'motivating' them. These terms are frequently used in teaching.

However, there were familiar distinctions made between the approach taken by some of the ambassadors that that taken by teachers and other supervisors on the course. YSs explained that Antonio 'explains it to us bit by bit' which perhaps echoes what would be expected from an effective teacher. However he is also identified as different in that he 'tries to have fun at the same time' and that 'he gives us ideas' but 'let us get on'. He is identified as having 'boundaries' but not being 'strict':

Janine: Carlos explains to us bit by bit (BFYS)

Anna: he got us some equipment (BFYS)

Amy: he tries to have some fun at the same time (AFYS)

Amy: he gives us ideas – he asks what we want to do (AFYS)

...

Anna: he lets us get on with our work (BFYS)

Janine: he will come for us and get us to get on with our work – he's not strict but he has boundaries (BFYS)

This approach is contrasted by two girls in the same group of YSs to other supervisors and teachers who are more directive in their approach to their work:

Janine: there are some teachers here who tell us what we can and can't do (re teacher who came with another school) (BFYS)

Carly: telling you what you're doing is wrong (BFYS)

Janine: (re smallpiece lead) he'll keep making you change it(BFYS)

Carly: cos he kept saying that I've just left it now(BFYS)

However, a number of YSs did not differentiate between the help provided by SAs and that provided by teachers:

Nigel: they seem like teachers – like fun teachers (WMYS)

This was generally viewed positively as there was less time taken up waiting for help though one student complained that 'there's always someone telling you what you should and shouldn't do'. This discursive construction of ambassadors as being there

telling YSs what to do does relate closely to YSs perceptions of the authoritarian positioning of teachers:

Rachel: I worked with a SA making a house – it's been ok. It's the same as school but there's more help – there's someone to ask but there's always someone telling what you should and shouldn't do – sometimes you want independence

...if they weren't here – half and half – they wouldn't be there to assist you and help you with ideas but it would be better cos there wouldn't be so many people to tell you what to do (BFYS)

... it would be boring without the SAs – there would just be lots of people saying 'what do I do now?' (WMYS)

compared to school there are more of them (supervisors) concentrating on one thing so you get there faster and better – you can't stay focused on one thing at school (WMYS)

One of the SAs talked explicitly about how she felt that the work she was doing was 'like a teacher':

It's like being a teacher, mentor, classroom assistant (Gill WFA)

She described how she felt she had to act like a teacher in 'running sessions'. She also described how the SAs are responsible for 'disciplining' and organizing YSs – 'rounding them up':

I guess we're teaching in the way we run the sessions ... Disciplining them – sometimes they're so stupid! (Gemma WFA)

We take a register at night – I say do what you like- you've got to wake up at 7am. They're 15, I think they should have a bit of responsibility like putting themselves to bed. I'm on guard. (Gill WFA)

I rounded up all the kids and held them in a small part of the uni and took the register ...we are organizing them all the time – doing all their time keeping (Gill WFA)

These discursive constructions of the work of SAs were echoed in the account of a teacher who was also working with YSs. She talked positively about the support SAs could provide YSs in terms of academic input

...content wise I think they are really good...I've worked with ambassadors at LSBU and they were really good at making us understand what we had to do in the projects. If the teacher gives instructions they can explain what the task is – it makes it easier for the presenter to get on with what they are doing (asian female D&T teacher)

Her emphasis in her comments on the work of SAs is on how effectively they can support the presenter and the delivery of the course content. This focus is explicitly stated in her suggestion that the SAs need 'assertiveness training' so that they can 'take on a teaching assistant role':

they may need assertiveness training – the kids think they're at the same level as them – they need training so they can take on a teaching assistant role (asian female D&T teacher)

It is evident that her own positioning as a teacher is informing her view of the work of ambassadors and how they can most effectively support the learning of YSs through maintaining order and through supporting the academic input of the teacher.

This view was, however, also echoed by YSs. A group of three boys appeared to view the SAs as there to support the less able and identified themselves as not needing such support. This reflects classroom practice where teaching assistants are often used to support particular groups of pupils who are have SENs or are not achieving as well as their peers:

Nigel: I haven't worked with any of them

Bill: they only help you if you need it (WMYS)

A few of the YSs themselves also appeared to identify the work of the SAs as being predominantly disciplinary. This was viewed with some hostility by YSs:

Janine: some of them need to change their attitudes towards us – they can be so rude. My lead supervisor (BFSA) she's so moany. In the morning she complains and moans cos I take a long time to do my hair

Carly: I don't appreciate that – knocking on your door – time to get up

Janine: she barged into my room (2 BFYS)

One SA explained that the residential course required more focus on discipline than other activities involving SAs.

Gill: We go into schools/ work on events and it's the same but this is more so as you're with them 24/7 ...In school there's someone else to stop them leaving the classroom etc (WFSA)

Gill's account suggested that she was reluctant to take on the disciplinary work of teachers:

At the same time I couldn't view myself as a teacher – I would hate to do that – when they call me miss I tell them to call me by my name – drop that barrier (Gemma WFA)

It is interesting to note that she was not alone in this; several of those spoken to involved in the organisation of activities for the Smallpeice Trust and for the LEP expressed the desire to distance themselves from the disciplinarian work of teachers but appeared to feel positioned as teachers by the students themselves. One organizer expressed some frustration about this but in constructing herself as 'other' than teacher she discursively constructed this disciplinary work as the responsibility of the ambassadors:

They think we're teachers I'm not there to tell them what to do – I'm not a teacher – that's the ambassadors' job (WF Smallpeice employee)

Friends – youth

One SA explicitly commented on the desirability of the relationship being 'like a friendship'. She suggested that this type of relationship would be beneficial because 'it would be easier to tell them stuff' and 'you understand your friends more'. However, she identified relationships based on 'friendship' as unachievable because

of the dominance of the positioning of SAs as 'teacher' and 'mentor'. She also suggests that the age gap and the transient nature of the relationships as being obstacles to the development of friendship:

Gill: I wish it was more like a friendship but because the first two are dominant (teacher/ mentor) you can't be friends ...

I would like it to be a friendship – it would be easier to tell them stuff but there isn't really any way it can be – you don't know them for long enough, I'm ten years older than them but you understand your friends more so it would be nice if it could be that sort of relationship (WFSA)

However, this SA did identify times when she talked to YSs on a one to one basis when the 'attitude' YSs have as a group was less dominant. She suggests that at she could talk about anything. It seems that humour is important in this 'having a laugh' is emphasised. This echoes YSs suggestion that SAs are like teachers but 'fun'. This element of fun appears to be considered important by both YSs and SAs:

Gill: It's easier when its one to one – in a group they want to talk about what they're doing and this teacher said... but one to one you can talk to them about anything – what to wear, what they are doing at school, joking about dressing up for the boys. We're seen as figures of authority as in the day time we are saying 'what are you doing...?' it's quite nice to be able to have a laugh sometimes. Sometimes they see that I'm smiling – but some of them have a lot of attitude no matter what you say to them they're going to argue with you – they are always testing the boundaries. When they're in a group they are really selfish – they don't have much empathy but one to one they're different. (WFSA)

Importantly, Gill also identifies the YSs who 'want to learn' as being easier to establish a rapport with than YSs who are not interested:

The kids that do want to learn you can get a rapport going (WFSA)

There were a few anecdotes from the accounts of YSs that suggested this rapport. One YS describes having a debate with the SAs and talks about how they are like 'older teenagers'. This connection appears to be one that is made partly because of the proximity of the SAs in age to the YSs but also their attitude and perhaps their orientation to having 'fun':

Amy: you can talk to him about anything – we were having a debate yesterday and they joined in with their personal opinions – it was really fun. It's kind of like they're other teenagers as well but like grown up teenagers (re Antonio SAs) (AFYS)

The importance of this proximity in age and ability to relate to YSs was explained by Gill who suggests that this enables her to be 'tolerant' of YSs in a way that perhaps older adults would not:

We are younger – we're still students and it's not all about work – I can still remember being that age – I can be quite tolerant. I don't know about procedures so I handle things in a way that I think is reasonable. (WFSA)

One YS also makes this contrast between SA and other adults on the course suggesting that it is the fact that SAs are less aggressively disciplinarian makes them more approachable - 'we will want to speak to them':

Carly:(Re the SAs) they are much nicer – they approach us in a way that we will want to speak to them. They wake up in the morning on the right side of bed – they don't shout at us (compared to other adults on course) (BFYS)

Gender/ Ethnicity

Though in the account of one SA she suggests that at she could talk about anything though it is interesting to note that the anecdotes she thinks of are gendered; 'what to wear' and 'dressing up for the boys':

Gill: It's easier when its one to one – in a group they want to talk about what they're doing and this teacher said... but one to one you can talk to them about anything – what to wear, what they are doing at school, joking about dressing up for the boys. (WFSA)

These appear to be almost stereotypically female topics of female conversation. An account from YSs perhaps implies that the relationship the YSs have with one of the male SA is equally stereotypically gendered in that they have a slight 'crush':

Anna: I love him (BFYS)

Amy: I was talking to him about who he works for – how does he find engineering and he was just telling me stuff and answering my questions (AFYS)

The male YSs orientation to SAs appeared to be somewhat different to that of the girls. It is interesting to note that several boys during different conversations talked about 'not needing help'. These boys appeared keen to emphasise this as a point of pride:

Sam: I didn't need help...' They just help out certain groups – because we're the best we didn't need any help (BMYS)

Bill: they've helped people focus (but not him)(WMSA)

The male students also appeared more indifferent to the presence of SAs. One YS commented that 'it wouldn't bother me' (WMYS) if the SAs were not present during the residential trip.

It is also worth noting that the SAs presentations about their own experiences and how they got into engineering were received differently by one male and one female student. While Nigel talked quite enthusiastically about the SA explaining how he liked to take electronic items apart, this same presentation was viewed as 'boring' by Emma. However, it is Emma who said that she wanted to study engineering at University while talked about wanting to study Psychology:

Nigel: the good thing about them was them telling us how they got into engineering. One bought lots of electronic items took them apart and put them together and that's now he got into it (WMYS) (wants to study psychology at university)

Emma: (re SA presentation) it was quite boring – one was talking about how he liked taking radios apart and stuff – I'm not into that (BFSA)

Due to the lack of opportunity for focus groups, conversations with SAs and YSs did not extend to considering gender and ethnicity specifically. However, in my field

notes I did note one SA drawing on her own Ghanaian identity and opportunities in engineering in Ghana when talking to a group of BFYSs:

Akua: whereas something like drama is not the same in Ghana as it is here...engineering you can still follow your career anywhere (BFSA (mature student))

Summary

The most prominent discourse circulating during the residential course was marketing engineering as a career. SAs discussed in some detail the strategies they used to achieve this; these included relating engineering to YSs' own interests and describing the lifestyle of engineers. Promoting university and university courses formed part of SAs constructions of their work promoting engineering. SAs' accounts suggested they were involved in conversations with YSs about life at university. There were some accounts from YSs suggesting that they had found out more about university from the SAs and one YS described how a SA had influenced her to study engineering further. However, t one YS appeared irritated specifically by the SAs focus on promoting university and it is worth noting that YSs appeared aware that SAs were marketing engineering. SAs also positioned themselves as careers advisers and described how they were providing YSs with information, advice and 'help' regarding careers in engineering.

SAs' accounts suggested that they position themselves as aspirational role models for YSs. One SA suggested that YSs could relate to her because of her background. Little from YSs accounts however, suggest they viewed SAs as aspirational role models. It is interesting to note that YSs talked about SAs as supervisors and not all appeared aware that they were students at all. A number of YSs spoken were not motivated to talk to SAs outside their official role as 'supervisors'. Another way in which SAs identified themselves as role models was in how they model the behaviour they want from YSs and encourage YSs to view the work they are doing and engineering more generally as 'fun' and 'achievable'. This interpretation of the SAs' work was echoed by a teacher present on the course who described how SAs' participation in activities encouraged YSs to join in.

Most SAs did not explicitly talk about their interaction with YSs as teaching though their discursive constructions of their approach to YSs do imply this. One SA explicitly identified how she felt 'like a teacher'. It appeared that SAs and others involved in running the course felt positioned by the YSs as teachers in terms of their disciplinary role but none of those spoken to were comfortable with this positioning. Some YSs did identify differences between SAs and other teachers and supervisors on the course saying SAs were less 'strict' and more 'fun'. However, not all YSs differentiated between SAs and other supervisors. One teacher and some YSs' views of SAs appeared to position them as teaching assistants. A few of the YSs identified the SAs as disciplinary figures and viewed this with some hostility.

One SA suggested that while 'friendship' with YSs would be beneficial to sharing information with them, this was unachievable because of the positioning of SAs during the course of SAs as 'teachers' and 'mentors'. This SA also identified the age gap between SAs and YSs and the transient nature of the relationship as problematic for the development of friendships. There was, however, some suggestion that relationships were developing between some YSs and SAs that differed to their relationships with other adults on the course. SAs and YSs accounts suggested that connections were made because of the proximity in age between SAs and YSs and

their orientation to having 'fun'. One YSs suggested that SAs are more approachable than other adults on the course because they are less disciplinarian and likely to 'shout at us'.

Some conversations female YSs have with female SAs appear to be gendered. The male YSs orientation to SAs also appeared to be different to the female students; male YSs were keen to stress the fact that they had not spoken to SAs as they were not in need of help. It is also worth noting that one WMYS and one BFYS responded very differently to a talk given by one of the male SAs. The WMYS appeared motivated by the information provided about how this SA had enjoyed taking electronic items apart while the BFYS described the same presentation as 'boring'. One SA was observed drawing on the Ghanaian identity she shared with YSs when talking about international opportunities in engineering.

The Summer School

Introduction

The summer school occurred at LSBU at the end of June/ beginning of July. It lasted five days and involved a total of 143 year 10 students. Subject related courses ran every morning and extra-curricular activities ran in the afternoon. There were six different subjects for younger students to choose: Engineering, Media, Health Care, Games Culture, Forensic Science and Sports Science. The ambition during the morning sessions was to provide students with some insight into a particular subject area; the afternoon session was to provide YS with an opportunity to mix with students from other subject areas and to illustrate a range of extra curricular subjects that students could become involved with at university. YS could join in with a wide range of activities: Bowling, Circus skills, African Drumming, Art Workshop, Drama, SAQ, Kabbadi, Street Dance, Photography Workshop, Bowling, DJ Rap workshop, Drama, Basketball, Brazilian Drumming, A taste of Japan, Games Culture workshop, Media workshop, 5 a-side football tournament, Jazz Dance, Photography workshop, singing workshop, Taekwondo. The YS also had lunch in the student cafeteria and had some free time in the student union after lunch. The large scale of the summer school at LSBU has been a deliberate strategy; one manager (Mark Ellis) explained that his previous line manager had said 'if you are going to run a summer school that really shows YS what it is like to be at university it has to be big'. The students were expected to move around the whole university to get to different lectures, activities and for lunch and other social activities. The SAs were constantly present in large numbers to guide them around the buildings and to help.

The participants

During the morning academic activities I worked exclusively with the Engineering students. The engineering students were an ethnically diverse group with the largest group being black. There were 4 white students in the group though none of these students were of British origin. There were also 3 Asian girls and a Chinese student as well as a number of students from mixed race backgrounds.

The group consisted of 16 male students and 9 female students. It is worth noting that of the female students only one had selected engineering as their first choice, whereas 8 male students had done so.

The students worked in groups and there emerged a number of coherent groups who worked together in a lively and coherent way. However there were other students who appeared to be more marginalized and isolated.

Table 1: List of students enrolled on engineering course with their gender, ethnicity and choices of summer school course

Gender	Ethnicity	First Choice	Second Choice	Third choice
F	Other black background	Forensic Science	Media	Engineering
M	Black or black British/African	Engineering	Games Culture	Media
M	Black or black British/African	Engineering	Games Culture	Media
M	Black or black British/African	Engineering		
M	White/ British	Engineering	Forensic Science	Games Culture
M	Asian or Asian British/ Indian	Engineering	Games Culture	Health Care
F	Other mixed background	Media	Games Culture	Engineering
F	Other mixed background	Games Culture	Engineering	Sports Science
M	Black or black British/ Caribbean	Games Culture	Engineering	Media
M	Black or black British/African	Engineering	Games Culture	Media
M	White/other	Games Culture	Forensic Science	Engineering
M	Black of black British/ African	Games Culture	Engineering	Forensic Science
M	Chinese	Games Culture	Engineering	Health Care
F	White/ other	Engineering		
F	Black or Black British African	Forensic Science	Media	Engineering
M	Black or black British/ Caribbean	Games Culture	Engineering	Sports Science
M	Black or Black British African	Games Culture	Engineering	Sports Science

F	Mixed white and black African	Media	Forensic Science	Engineering
F	Asian or Asian British/ Indian	Forensic Science	Engineering	Games Culture
M	White/ British	Media	Sports Science	Engineering
F	Black or Black British/African	Media	Forensic Science	Engineering
F	Other mixed background	Media	Sports Science	Engineering
M	Other mixed background	Engineering	Games Culture	Media
M	Other Asian Background	Forensic Science	Engineering	Sports Science
M	White/ other	Engineering	Media	Games Culture

There were seven student ambassadors who worked with the group all week. Four of these were black male students; two were black female student and one a white female student. The Student ambassadors varied in age. Two of the black male students were thirty; the other students were younger, aged between twenty-two and twenty-four.

Table 2: List of student ambassadors with their age, ethnicity and gender:

Name	Gender	Age	Ethnicity
Dan	M	30	Black British
Adam	M	30	Black African
Robert	M	22	Black
Gill	F	24	White British
Qadira	F	24	Black African
Freya	F	22	Black
Ahmed	M	22	Black African

Focus group: younger student contributors

Sas (BMYS)

Joe (BMYS)

Dina (WFYS)

Stacy (BF)

Sarah (BF - Nigerian)

Michael (WM)

Focus Group: student ambassadors

Qadira (BF)

Adam (BM)

Emerging Discourses

The mixing up of YS from different schools across the different activities and subject areas enabled younger students to initiate new relationships during their time at the summer school. During my observations it became obvious that new friendships and even romances were developing. The students were clearly excited by the opportunity to meet so many new people and enjoyed the social aspect of the summer school. However, my focus is not the relationships that they developed with each other but in how the SAs were positioned by this event and by WP discourses circulating within the institution as a whole and how this impacts on the relationships that they were able to form with the YSs. Though observations and the focus groups I held with younger student and student ambassadors, it has been possible to identify a number of emerging discourses relating to student ambassadors during this event.

Customer services/ tour guides

There were discursive constructions of SAs during the focus groups that could be related to 'tour guides' or even 'customer services', though they are terms widely used in other contexts. The SAs also work for 'Marketing and Recruitment' in these sorts of capacities: dealing with inquiries, working on the front desk and showing visitors and prospective students around. Both SAs referred to how they had been 'showing (YS) them around'. The YS talked several times about how the SAs 'help them: '...they are very, very helpful'. Both the SAs made several references to their work 'assisting' the YSs, a term often associated with retail (though also used in education specifically to describe 'classroom assistants'). It is possible to suggest that YS and SAs drew on discourses related to customer services as they were all (SAs and YSs) aware that the SAs were being paid specifically to help the YSs; positioning the YSs to some extent as consumers of HE and the SAs as marketing the university.

Role models

Another discursive construction that the SAs frequently drew upon was of themselves as role models. This representation draws heavily on WP discourses circulating both in politics and in the media. One SA explicitly used this term early on during our conversation:

They see us as a role model – they want to do it – like two of the students actually told me that (Adam-BMSA)

This interpretation of their work featured heavily, though more implicitly, throughout the interview. Their view of themselves as 'role models' appeared to have two explicit facets: one was to promote university and the other to promote engineering:

we assisted in the activities as in we partook ourselves, which was really fun. Yeah, I think when they see us having fun doing it they'll be like – I think - you know what engineering is actually not that bad. (Qadira-BFSA)

I say what I do is I do design and I have to tell my lecturers what I do and why I'm doing it and they are like – yeah, I want to be an architect! (Adam-BMSA)

However, the use of the term role model also appeared to be used in a different and perhaps more explicit way: SAs had been asked to provide the YSs with models of behaviour as a way of ensuring their engagement with activities and to encourage positive behaviour amongst YS during the summer school. Adam describes how he models the behaviour he wants from younger students to encourage their participation during the afternoon DJ/Rap session. He describes how his involvement enables the younger students to overcome their self-consciousness and participate:

We just encourage them. Because the DJ rap session was like two days ago in the afternoon session, they didn't want to do that – they didn't even want to do it because they had things written down that they couldn't say and I was like – okay, fine if you don't want to say it I'll say it for you and they got encouraged.

Acting appropriately as a good 'role model' was seen by the SAs as important and was clearly something on which they had been told explicitly to focus by the WP team during briefing before the start of the summer school. During a conversation with Qadira on the first day of the summer school, she explained how the YS 'copy everything we do'. She said that they had been told during briefing that they must 'pretend to like' what they are doing during the afternoon activities as it makes such a difference to the YSs. It was apparent from her account that she found this constant display of enthusiasm quite difficult to maintain: 'we have to be on our best behaviour – it's quite hard for us'. Qadira again emphasised this aspect of her work during the interview, stressing the importance of the engagement in activities by the SAs as a way of encouraging younger students:

Qadira:...and getting involved with the activities that they do as well so they can be encouraged at the same time 'cause if they don't see us doing it then they'll be a bit discouraged. (Q-BFSA)

These different interpretations of the work of a 'role model' converged in some of the descriptions provided by the SAs. Adam identifies the work he does modeling appropriate behaviour as being part of engaging the YSs and consequently facilitating his own position as a 'role model' that YSs will aspire to be like:

Adam: In summary I can see that they actually want to get to uni because they can see me do it. We are just trying to be like them – trying to relate to them, trying to get them to do things and they've got this *pilot* - like I really want to go to uni. I want to be like these guys.

During the afternoon sessions on the first day of the summer school, I worked with an Art group. They were creating a design and then using the design to decorate T-shirts. The ambassadors sat with the younger students and designed their t-shirts. The activity was not difficult to access and all were engaged and focused on their t-shirt designs – there was little interaction between ambassadors and younger students. Adam few of the ambassadors were involved in helping the younger students cut out their designs and spray the paint onto the t-shirts; others were focused on their own designs. On the afternoon of the first day I also spent a few minutes observing circus skills and a drama workshop. In the circus skills class the SAs and YSs worked on their skills in separate small groups and pairs. The ambassadors appeared engaged and laughing as did most of the YS - though some were not so involved and standing around the edges of the room. There was more interaction during the drama workshop as SAs and YSs were jointly involved in role plays however, when YS moved into groups to work on a scene,

the ambassadors talked amongst themselves. During both these sessions the ambassadors were 'being like' the younger students. They were, in both instances, providing models of ideal behaviour for the younger students to see: engaged with, focused on and enjoying what they were doing.

Promoting university

The SAs frequently referred, both implicitly and explicitly, to their responsibility to promote university. This positioning of SAs as working in marketing may well be appealing to SAs; marketing jobs have a glossy and well paid status, a positioning that does not appear to be so readily available in education. Adam describes how conversations he has with younger students result in their wanting to study his course; he appears here to be constructing himself as successful in the marketing process. He was aware, during the interview conversation, that I am studying the SAs, what they do and how they work with younger students; in terms of action orientation, he appears keen to present himself as successful, but it is interesting that success, to him, is effectively marketing his own course:

Adam: How is uni? How did you get into architecture – 'cause I told them I studied architecture and they are like – Adam what do you do in architecture? Then I keep saying every Monday I do a presentation up here and they keep saying – what presentation are you doing? I say what I do is I do design and I have to tell my lecturers what I do and why I'm doing it and they are like – yeah, I want to be an architect! (BMSA)

It is also interesting to note that it is not just the SAs who are aware of their responsibility to 'market' university. This is an awareness shared by the YSs. One YS explains, uncritically, that the SAs are there to 'try to make' university 'seem ok':

Dina: ...they tell you about their experiences like during their time in university-like the boys – like they're trying to make university seem okay – like it's not that bad – it's not as scary as it seems. (WFYS)

This suggests an understanding on the part of the YSs that SAs are there as marketing tools to encourage them to progress to university. Being positioned as consumers in this way, however, appears to be so familiar to the YS that it seems not to be viewed as explicitly noteworthy.

It was, however, evident from both my own observations and the comments made by both SAs and YSs that YSs are interested in finding out about being at university from the SAs and are interested in listening to the information that they provide; that they are willing participants in this marketing process:

Qadira: They do ask questions about like – what do you do? (BFSA)

The SAs described providing YSs with some detailed information about how they work at university. Qadira describes conversations she had with YSs about lectures and other modes of teaching that occur in university settings. She also mentions the catalyst to these discussions as being the YSs own attendance at a lecture that they perceived to be really 'long and boring':

Qadira: They do ask a lot of questions about lectures. Remember when they were asking about lectures because of that lecture that we had they were like – oh wow that's really long and boring. We had to explain to them that that's how some lectures are but once you get to a certain stage where you actually want to know the information you don't find it boring any more and then we try and explain to them the differences between like seminars, lab sessions, lectures as well so they wanted to know basically like what university is like - a lot of questions about that. (BFSA)

Other exchanges SAs described included information about where students live. Adam described Ys as being drawn to the idea of staying away from home

Adam: They want to see how much they can get comfortable around uni as well. I can remember yesterday one was asking me –can I stay at home or do you come from home or do you stay in halls of residence? Lots of questions like that. ...Most of them want to stay away from home. They want to go in the halls of residence.

Qadira described Ys repeatedly asking her questions, regardless of the activity they were engaged in, about what she studies and how university is different to school:

Qadira: For me it's the same actually. They always ask the same type of questions whether we're in the afternoon activity – it's even more funny because in the afternoon activities we've got students from different strands and they're always – oh what strand are you on – like what do you do – and I'll start explaining again and they'll be asking – do you like this uni, how's the uni like, is it like school, do you have to do this, so you have to do that? It's the same questions

Adam: Pretty much the same. It's usually the same questions – its like – what do you do?

As well as general questions about university life, SAs also described being asked specific questions about LSBU – 'do you like this university?' and 'how's this university?'

The focuses of conversation identified by the SAs were reflected in the Ys accounts. They described talking to SAs 'about courses that they do at university'; 'their experiences like during their time at university' and comparing university to school:

Interviewer: What do you talk to them about? I mean can you run me through – obviously you don't have to go into any personal details if you've been having personal conversations - but what kind of things have you talked about?

Sarah: About courses that they do at university and like

Michael: The last of the small talk

Sarah: No, like big talk but I can't remember all the places to go to the university 'cause it's really big – cos it's bigger than school.

Dina: Oh yeah, and they tell you about their experiences like during their time in university- like the boys – like they're trying to make university seem okay – like it's not that bad – it's not as scary as it seems.

Promoting Engineering

As LEP ambassadors the SA were clearly aware of their responsibility to promote engineering and STEM subjects. Again discourses related to marketing appear to be present in these accounts. Qadira described the training they had received from the LEP as focusing on 'getting the students to think about engineering subjects like science and maths...*promote* it in a good way'. She also described the process through which this could be achieved:

Yeah, I think when they see us having fun doing it they'll be like – I think - you know that engineering is actually not that bad. (Qadira-BFSA)

The SAs were also clearly aware of the aim of the LEP to promote engineering courses to girls:

Adam: But I think they are more focusing on young people, especially females to get into engineering so they are laying emphasis on females to get more into engineering. (BMSA)

The YSs often talked about the SAs who worked with them on the Robotics course as 'engineering ambassadors', demonstrating a conscious awareness that the SAs working with them during morning sessions were engineers:

Michael: ... we have more conversations with the student ambassadors in the mornings. ' Cause then they are like the engineering ambassadors

The group of YSs spoken to during the focus group were able to identify what particular subjects some of the ambassadors working with them were doing, though not all:

Michael: One was doing explosive stuff....

Dina: He's doing fire and explosives.

Joe: Science and engineering

... it's like forensics or something. Most of them are doing engineering.

Sas: Yeah and one of them - Dow was doing chemical engineering.

Sarah: Someone was doing architecture.

Interviewer: And what is Adam doing?

Sas: I think he is doing architecture.

Sarah: That's my Nigerian homie.

Interviewer: And do you know what the others do?

Michael: They are all doing something related to engineering.

Interviewer: Engineering - Freya is doing petroleum engineering isn't she?

Sarah: Don't know

Michael: Only a few of them told us what they studied.

As discussed, one SA explained how she had talked to younger students about studying at university; the course she describes to them is her own engineering course:

Qadira: They do ask a lot of questions about lectures. ... we try and explain to them the differences between like seminars, lab sessions, lectures (BFSA)

Both SAs identified being asked about their course as a common question. Qadira explained that girls were particularly interested in what engineering course she is studying:

Adam: Pretty much the same. It's usually the same questions – its like – what do you do?

Qadira: A lot of the girls say – oh so what engineering do you do?

Michael also talked with admiration about the fact that the SAs study 'engineering':

...they study engineering here so we know they are much smarter than us and I think that we did. (WMYS)

Indeed there were some suggestions from YSs' accounts that they perceived engineering and robotics in particular to be difficult - 'hard work' and 'complicated'. A particular lecture and their own experience attempting to programme a robot appeared to have contributed to this perspective:

Is there anything you've enjoyed more or less?

Sarah: The lecture was – that killed me. That killed me.

Dina: I liked the videos.

Michael: It was because he didn't put any enthusiasm into it, you know. He didn't have any charisma at all.

Interviewer: Does it appeal to you making robots? How does the whole thing make you feel?

Michael: Seeing how hard it was to programme it I don't think I really want to try. All talk together

Dina: Yeah, he was saying for the arm it took them like – what was it – five years to build it and that's just the arm.

Sarah: that's long

Sas: Personally I couldn't be bothered with all that work. My view of life is to grow up and make my money.

Sarah: And the thing is if you make a mistake you won't know what you've done 'cause it's so complicated and you'd have to get it right to make sure it doesn't malfunction and stuff. It's just like so complicated.

The YSs came to the summer school with ideas about subjects they want to do after their GCSEs. Two of the YSs in the focus group were interested in engineering related subjects at university but the others had not selected engineering as their first choice for the summer school and clearly had interests elsewhere. The summer school had evidently not switched their focus to engineering but, equally had not put them off. One YS interested in Media Studies courses at university said when asked if she was interested in engineering: 'I'm young to decide so I'd never say never'.

'Like a friendship', 'distant cousins' and youth culture

During the interview/ conversation I asked the YSs what other people in their lives the SAs were most like.

Clare: If you were to describe the ambassadors – to compare them to another adult that you've worked with or spent time with, who do you think they're most like?

Michael: What – to an adult we know?

Interviewer: Yeah

Sarah: We don't know them long enough to say they're like an older brother or sister but maybe like a distant cousin.

Dina: Yeah like an older cousin that you can just talk to yeah.

Sarah: Older people wouldn't really like find the humour in some of the things that we might find funny but because we have that kind of thing here.

Clare: So a distant cousin – anybody got anything else? You're with the distant cousin. Is that how everyone would describe them?

All: Yeah

Sarah: Not distant like far, far away but like – not like a cousin that you really talk to but like a cousin that's like yeh at a family reunion or something

Joe: Just like a friendship

Sarah suggests that the SAs are like family members. She discusses the possibility of their being like 'an older brother or sister' but immediately dismisses this on the grounds that they do not know the SAs 'long enough'. She then suggests that ambassadors are like 'a distant cousin'. These discursive constructions of the SA are revealing. A key factor in the SAs success in building relationships with the YSs appears to be that the YSs view them as comparatively close in terms of age. This was referred to many times during the interview. Sarah suggests that it is this proximity in age that enables the SAs and YSs to relate to each other; humour appears to be central to this as 'older people wouldn't ...find the humour in some of the things that we might find funny'. It is also implied here that this proximity in age enables the YSs to talk to the SAs more easily than they could older adults. Dina and Michael make this point more explicitly later on in the conversation:

Dina: The fact that you can just talk to them – they are easier to talk to than our teachers. (WFYS)

...

Michael: And if you want to talk to them about a problem or you need advice or anything, because they've been there and they're doing that now only on a larger scale so it's not like with the parents or older adults. (WMYS)

Indeed, Michael stresses the importance of the SAs' proximity in age to himself and their positioning as a fellow student – 'they've been there and they're doing that now only on a larger scale' – as enabling them to provide advice and information that is worth listening to. This positioning of the ambassadors is juxtaposed against that of 'teachers' and 'parents and older adults' who appear to be viewed as less able to help in the same way. What is interesting is that two of the ambassadors were actually thirty years old; older, I suspect from my experience of working in schools, than a number of their teachers.

However, it does not only appear to be the advice and information that ambassadors provide that the YSs value them for. YSs also talked about 'things': these appeared to be lighthearted conversations that YSs also have with peers. The subjects identified particularly relate to youth culture – music and fashion and it is perhaps this knowledge – which may also be linked to racial identities – that were important to the younger students.

Sarah: You can just ask them like things like – how was your day – or my god did you see that girl's hair (BFYS)

...

Interviewer: Anything else you talk about?

Stacy: Music (BFYS)

Perhaps it is these apparently more trivial exchanges that contribute to Joe's description of his relationship with SAs as 'just like a friendship'.

A shared knowledge of music featured a number of times in the exchanges between SAs and YSs that I heard and that YSs reported during the focus group. During the morning of the second day when the students were discussing robotics I overheard one YS (Hispanic) telling Adam (BMSA) about his music – they were talking about the DJ/Rap activity that was going to happen during the afternoon. The YS was keen to share his music with the SA saying 'I'll show you my little concert thing I did as well'. Adam replied 'alright – no problem'.

Dina also refers to this afternoon activity during the focus group. She describes how 'getting to see' the SAs involved in rapping was 'really good'. Her use of the phrase 'getting to see them' is interesting here; it appears to position her as a voyeur (though she too was involved in the activity) – this suggests that she is consciously watching the SAs and what they do. Dina then goes on to describe how one of the SAs was positioned as an outsider; unlike the YSs and other SAs. The reason Dina provided for Mary being an outsider was that her age precluded her involvement:

Dina: And drama and when people were rapping and we got to see them – like all the ambassadors and everything and it was really good but then one of them kind of stood out and looked really uncomfortable. Do you know Mary, the older one, 'cause everyone was really getting into it and she was on the side.

This emphasis on the importance of the age of ambassadors was also suggested by Qadira, one of the younger SAs. However, what is stressed as being more important still by both ambassadors is their positioning as students. The following conversation followed the SAs' describing their positioning as role models for the younger students:

Clare: Yeah so you think they rate you very much as a role model...

Qadira: Yeah I think the same thing because we're students as well and they're students so they still think okay well they're still students as well so it's actually more – because usually when you've got teachers it's like - oh we've done our schooling ages ago but

Adam: and they can still do what we can do

Qadira: We're so close to them it's like - after them – it's us – we're the next step so it's more closer for them to imagine themselves in uni because we are more close in age to them so it's like we're all students together.

Qadira describes here how the YS can 'imagine themselves in uni' because the SAs are 'more close in age to them'. Qadira also stresses their shared student identity as being important to YSs – 'we're students as well'. It is these perceived similarities in age and status that Qadira identifies as enabling YSs to see becoming a university student as a logical 'next step'. Qadira here seems to be positioning YSs as apprentice university

students who are learning how to be university students through interaction. This shared sense of identity was again suggested when, at the start of the summer school, one YS, when introducing one of the SAs to the group, commenced by saying that 'she goes to school here'.

I observed a number momentary exchanges that, while apparently insignificant in themselves, when collated do present a picture that suggests that a shared knowledge of youth culture and of expectations of interactions is important in supporting the development of relationships. My field notes reference a number of such instances. During one of the engineering sessions Michael celebrated having successfully programmed his robot; he turned to one of the black male SAs (Dan) who happened to be walking past. The black male SA smiled and they gave each other a high five. Another group of YSs programmed their robot to stand up. They looked around to see if the SAs were watching, keen to share their success; the two SAs nearby cheered and clapped. During a session in the Student Union after lunch on the second day of the summer school, I observed a number of SAs playing games with the YSs (including snooker and table football). One example was a game of table football between a black male SA and white male YS. The game was very noisy and competitive; younger students were watching, engaged, laughing and cheering. Another instance involved SAs playing a drama game with YSs while they were preparing for their final presentation at the end of the summer school. There seemed to be a genuine warmth between SAs and YSs who were really laughing together as they played.

Also worth noting was the physical interaction between YSs and SAs. Examples of YS and SAs exchanging high fives is one example. There were many other gestures. One such gesture involved a BFYS (Venda) and a BFSA. Venda tripped Fizzy up; she immediately hugged her as she said that she was sorry. I also noted an exchange between a Hispanic male YS and black male SA. The younger student was cross and frustrated as the batteries in his robot had run out and he could not continue to program it. Dan checked that this was true; the younger student watched, frustrated saying 'no, it's out of batteries'. Dan responded by laughing and massaging the younger student's shoulders saying 'it's alright, it's alright'. This diffused the situation and the younger student looked up at Dan and smiled. It was also noteworthy that I only noted physical exchanges between YSs and SAs of the same gender.

The award ceremony at the end of the week paid testimony to the warmth of the relationships that SAs had established with YSs. The ambassadors had been nominated for a number of awards by the YSs. The cheers for the SAs at the ceremony were deafening; louder than those where the YSs had been given awards themselves. The Younger students stamped their feet and wolf whistled. After the ceremony I overheard a conversation between one of the YSs and Adam. The younger student was apologizing for not having nominated Adam for an award; he sounded genuinely upset that he had not thought to do so. During the photo shoot outside the building, a group of YSs picked up one ambassador and carried him around. At the party at the end of the summer school, I encountered Qadira serving pizza. She was dressed as a fairy in a white sparkly dress with wings and was laughing and joking with the YSs. The enthusiasm from the YSs for the ambassadors during this last afternoon was exuberant. I found it difficult to imagine these relationships being easily replicated by older adults; as Q identified, the YS and SAs seemed to be able to share their identities as students and as young. However, it was perhaps due to the SAs' skill at relating to the younger

students despite, in some cases the gap in age, that enabled this shared sense of identity to develop.

However, it is important to note that, while their identities may have been shared to an extent, there was a clear separation between ambassadors and younger students. The SAs and YSs worked and played together when there was an activity that required their joint participation. However, when this was not the case they separated. At lunch they sat apart in their friendship groups. The YSs frequently approached the SAs for information but did not choose to sit with them, preferring the company of their peers. This was also the case for the time in the SU after lunch where again, SAs played games with YSs but those not involved in an activity sat apart.

Learners

One clear discursive construction of the ambassadors was as learners who were academically ahead of the YSs. Michael describes the SAs as academically 'smarter' than himself. Indeed, I overheard an exchange between this YS and Adam where Michael was asking about what Adam was studying and responded with enthusiastic respect when Adam told him he was studying architecture: 'Oh cool!'. This YS explains that the position the SAs hold within the university - as students who are academically 'smarter' than the YSs - is the reason that the YSs are prepared to 'listen so well'. He appears to imply here, that such academic achievements should be respected:

Michael: I think the reason why we probably listen to them so well is because they study here –they study engineering here so we know they are much smarter than us and I think that we did. (WMYS)

This suggests this YS's own positive orientation towards academia; perhaps he is even positioning himself here as an 'apprentice' university student.

During the focus group, a conversation about a lecture that the YSs and SAs had attended led to conflicting discursive constructions of the SAs as learners. There were echoes of Michael's construction of the SAs as 'smarter' but there was also agreement amongst the younger students that the ambassadors could relate to the younger students' lack of engagement with a formal lecture about robotics. Sarah viewed the SAs' tolerance for the YSs lack of interest in the lecture as that they were being 'very nice' and that 'they don't really care'. This view was qualified by Stacy, who suggested that the SAs 'understood that it' was 'boring' for the younger students. Michael suggests that the SA were equally as 'bored' by the lecture. However, the reason he gave for their boredom appeared to be rooted in an understanding that they are experienced at attending lectures and so 'had probably heard it a million times before':

Sarah: But the ambassadors were very nice as we all walked in – they were just like quiet – they would like whisper and we were just like writing on our note pads and drawing – they don't really care.

Stacy: Some of them do care but

Michael: I think it was probably they had heard it a million times before.

Stacy: And they understood that it was boring for us.

Clare: Yeah, they could relate to your

Michael: They felt bored as well.

Though Joe does not complete his statement about one of the SAs saying they would listen to similar lectures during their course, it was evident that he found this prospect daunting. Sarah responds by suggesting that she could record the lectures; though it is clear that she does not currently like the idea of listening to her recordings:

Joe: One of them said that was the kind of thing she'd listen to and take notes on so that's quite like

Sarah: I'd record it then play it back when I need to – which is never.

I then asked the YSs directly how they felt about the fact that SAs have to listen to lectures like the one they had heard.

Interviewer: You were just saying that they said you would have to listen to that – that's what they listen to – how did that make you feel?

Dina: But you're probably more into it by then I guess. It would be just like – it's boring but you have to do it so you may as well just get on with it.

Interviewer: So you accept that?

Joe: Yeah

It is interesting to note how closely Dina's account of how, 'you're probably more into it by then' fits with the account Qadira provided, during my conversation with her, about what herself and other SAs had said to YSs to reassure them when they found the lecture 'long and boring'. It seems likely that Dina heard this explanation of how the SAs reach a different stage as learners and are consequently able to cope with the format of a lecture:

Qadira: They do ask a lot of questions about lectures. Remember when they were asking about lectures because of that lecture that we had they were like – oh wow that's really long and boring. We had to explain to them that that's how some lectures are but once you get to a certain stage where you actually want to know the information you don't find it boring any more

The YS seem to find the prospect of listening to lectures, like the one they heard during the summer school, a challenging one. They contradictorily construct SAs as being like them and finding the lecture equally as boring; as being bored by lectures as they have heard so many and as being at a different stage of learning to the YSs and so able to cope constructively with the length and tedium of lectures. It is also interesting to consider how the YSs position themselves in relation to the lecture and the SAs in the context of this lecture. While Sarah jokes about 'never' wanting to play back the recording she makes of lectures, that she is thinking about recording them implies that she is considering what support strategies she could draw upon. Dina uses the second person in her explanation of the process of reaching a stage where 'you have to do it so you may as well just get on with it'; in doing so she seems to have assimilated this view as her own and is positioning herself as a future university student. While the YSs undoubtedly found the lecture disconcertingly dull, their accounts suggest that it does not deter them from thinking of themselves as university students. It is possible to suggest that the presence of the SAs mitigated against the potentially alienating impact of a lecture that they found very difficult to access: that the YSs relate so closely to the SAs appears to enable them to view being like the SAs and being able to access such a lecture as possible. Michael's construction of the ambassadors as 'smarter' and therefore worthy of being listened to suggests a positive orientation to the ambassadors

and a desire to align himself with them. However, it was evident from talking to all the YSs at the summer school that this alignment with university was not a new one and that their ambition to progress to university superseded the summer school.

Teaching and not like teachers

That the SAs keep the YSs 'on task' were discursive constructions used by both the YSs and the SAs themselves. Indeed this was one of the first observations about the ambassadors made by the younger students during the focus group.

Michael: And they keep us on task all the time

The SAs also stressed how they 'keep' YSs 'on task':

Qadira: Even in the afternoon you still have to keep them on task because even – in our briefing – even for the morning session, even though we've got certain strands we have to keep them focused but even afternoons as well we still need to keep the focus there.

This 'keeping on task' was also evident in observations of the ambassadors working with YSs. I overheard many conversations where ambassadors were directive in what YSs were doing. Imperatives were frequently used by ambassadors to instruct YSs during activities. When the YS were preparing for their presentation about engineering on the last morning of the summer school, Adam was working with a quiet group of boys. In this instance he directed them: 'You go there; over here; stand here'. (However, the SAs only seemed to take on this directive stance when the YSs were not taking control of the situation themselves. Where this did happen the SAs had a lesser role and were even directed by the YSs themselves.)

While these approaches do seem closely associated to the positioning of teachers in a classroom, the YSs were keen to identify the differences between the SAs and teachers. A key difference the YSs identified was in the 'authority' of the ambassadors. This appeared to be twofold. When Michael first identified that the ambassadors were 'not ...allowed to tell us what to do', his peers interpreted this in relation to how the SAs had worked with them during the project to support their learning.

Michael:...and they take part in the activities as well but they're not really allowed to tell us what to do so

Sarah: They hint yeah

Michael: They hint -that's how they keep us on task

Interviewer: By hinting

Sarah's suggestion that the ambassadors 'hint' rather than tell the YSs what to do is taken up and discussed by the whole group. The YSs particularly discuss how this lack of 'telling' enables them to learn more independently; using their own 'initiative' and allowing for individual interpretation – 'allows everyone to do things differently':

Michael: I think it is good because then the course wouldn't be as challenging

Joe: And we have to think for ourselves.

Sarah: Otherwise we would just be using what they say.

Joe: What they know- so we use our initiative

Sarah: ...but school is different.

Clare: How is it different?

Michael: If you ask the teacher then they'll just tell you like and save you having to figure it out.

Dina: But then it depends what teacher.

Michael: Okay, let's not go into this. I think it's like the learning environment is like we have fun -whilst you're learning and allows everyone to do things differently – you see how people can interpret something that they're told to do differently to everyone else

However, as Dina suggests, this approach to facilitating learning is not necessarily unlike what a teacher does in a classroom. Other differences mentioned by YSs included the focus on 'fun' and the lack of 'drilling'. In the context of the summer school the ambassadors are not responsible for ensuring that the curriculum is adequately covered and so the emphasis of activities is clearly different to the emphasis in school. These differences seemed to be appreciated by the YSs who discussed how any lack of understanding is treated differently by SAs than by teachers in school and how the lack of pressure and emphasis on fun make the learning easier and even more accessible:

Joe: we don't realise that we're doing something that we're learning at the same time. It's not like in school where it's like if you don't get something you're feel like it has to be drilled into your head. It's like you understand it easier (BMYS)

Michael: It's that there's humour in learning the stuff – like half of us here – maybe some of us have chosen engineering but some of us got put into engineering because we didn't get our first choice so it's like – we're doing stupid things and we don't know what we're doing but it's made ... funny (BMYS)

Following this discussion, Michael again mentioned the SAs lack of authority; on this occasion he explicitly referred to SAs not having the authority to discipline the YSs. Indeed, Michael described this as the 'best thing about them':

Michael: I also think that the best thing about them is that they have no authority. I mean they can't tell you to stand outside in the hallway or something.

Dina: Yeah it's like it's discipline like and it's easy to do and it's easy – not to respect them like we respect our teachers but like, you just understand they're not like teachers

Michael: You do it because you want to be nice – you want to return the favour to them not because you have to do it.

Interviewer: How – I mean, that is an interesting one isn't it?

Joe: Feel more comfortable

Interviewer: Yeah, everyone's quite at ease.

Dina: They're not patronising – that's why – teachers are extremely patronising
Michael: They can't be because they're only like five years older – maybe ten actually.

Sarah: Yeh but they still have authority over us

Interviewer: So because they're only a little bit older they're not patronising.

Michael: I just remember one – I was doing jazz dance and there was one that tried to say I'd kicked someone on the head but I didn't so – and then she tried to

exercise her authority over me and I thought – oh forget that– it’s not going to work.

The focus group consisted of a group of teenagers who did not all know each other well. Michael was in a minority as a white male student in the whole engineering group and was the only white male in the focus group. During the week, I observed him working hard to establish and maintain positive relationships with the black male students while always choosing to work in a group with predominantly female students. During this discussion, Michael appears keen to position himself as independent and not willing to conform. He appears to want to make an impression on the other students in the group; it seemed to me that he was keen to impress both the girls and the male students. Although his positioning within the group may have contributed to his focus on the ‘authority’ of the SAs, this does appear to be an issue for him and is interestingly picked up and discussed within the group. Dina described the relationship as ‘easy to do...you understand they’re not like teachers’. This ease appears to be important to the students and is echoed in Joe’s contribution that he ‘feels more comfortable’ with them than with teachers. Dina identifies that the SAs are not ‘patronising’ as being important. The root of this is perhaps that the SAs in this context are not responsible for the event or for the YSs’ learning. This enables them to develop relationships that are not restricted by the status driven positionings of YSs and teachers in schools.

The SAs were also aware of the difference between themselves and teachers and were very clear in their accounts of their work that they were ‘not like a the teacher’:

Clare:...If you were to compare yourself to another adult in the students’ lives who do you think you would be?

Qadira: ... just in between – like the assistants or just there to help – like not the teacher – so they can kind of get away with stuff with us around that they wouldn’t if a teacher was around – so I don’t know – just a role model I suppose – just a young girl- they still call us Miss.

Clare: So somebody in between?

A: In between – a teaching assistant.

Qadira: They know the boundaries – they do know the boundaries but they seem to be more comfortable with us so still keeping the ...

A: We are learning mentors as well learning mentors

As with the YSs, Qadira describes the difference as being rooted in the SAs’ lack of authority – ‘they can get away with stuff with us...’. She also identified her similarity to the YSs in that she is ‘just a young girl’. However, Qadira is also aware of difference; the fact that the YSs refer to the SAs as ‘miss’ implies that the YSs view them as having some authority. The SAs suggest that they are like other adults ‘in between’ such as ‘teaching assistants’. Adam identifies the SAs as ‘learning mentors’ which again suggests difference and status - though different to that of teachers. Early in the discussion Qadira described how they were ‘... yeah supervising –it’s mainly supervising’, which again suggests a status that is different to the YSs but not necessarily like that of a teacher. Like the YSs, Qadira suggests a difference between the SAs and teachers as being that the younger students ‘are more comfortable with us’. At another point in the discussion Adam compares the SAs work to ‘coaching’; Qadira later also relates the work the ambassadors do to her own experiences of being coached by young players from Millwall:

Clare: ...If you were to compare yourself to another adult in the students' lives who do you think you would be?

Qadira: Well when I was in school we had people who were kind of similar but they used to help us with sports so they weren't teachers but they weren't us either they were like in between so just remembering what they were that's like what I try to be... They used to come from Millwall but they were players themselves but they were young – that was the only difference.

In this account Qadira uses the description 'in between' again in her account of the position these young people had. Their youth and their status 'in between' - not a part of school - appears significant in Qadira's account. She describes how the experience of working with these young people had influenced how she works with YSs herself – 'that's like what I try to be'. The context of sport, like that of the summer school, appears to be different to school per se. Sport provides a freedom from the constrictions of curricular assessment and the pressure on teachers to instill curriculum knowledge in their students: there is perhaps more freedom and opportunity to learn without the pressure of constant monitoring.

About Gender

There were various discursive constructions of the SAs and YSs as gendered by both SAs and the YSs. The SAs talked about the training they had received to raise their awareness of the current gender imbalance in engineering and issues relating to stereotypes:

Adam: But I think they are more focusing on young people, especially females to get into engineering so they are laying emphasis on females to get more into engineering. (BMSA)

...

Qadira: The LEP one was more about gender training because of the stereotypes of girls and engineering.

When asked directly about whether the gender of ambassadors affected how they relate to them the younger students were almost unanimous in saying this does not make a difference. However, it was apparent from their responses that they were highly aware of the gender of the SAs. Michael immediately demonstrated this through talking about how unavailable SAs are to YSs:

Clare: ... Does it make a difference for you if they're male or female how you relate to them?

Axel: Not really – if you have a crush on one of them – they're way too old anyway.

Interviewer: Yeah, so you know they're way out of reach.

Sarah: Oh my God that's so true.

This suggests immediately that YSs are intensely aware of the gender of SAs. This was also demonstrated through the ways in which YSs related to SAs. During the week I observed YS (particularly YFS) being slightly flirtatious with the SAs. During the introductory session on the morning of the first day when YS and SAs were circulating (in speed dating scenario) finding out about each other one YFS after questioning one of the male SAs called after him laughing flirtatiously 'no wait, wait – I haven't finished'.

During the discussion with YSs about gender, I reminded one of the YSs that she had talked about having conversations with SAs about hairstyles. I asked her if these were the types of conversations she had with male ambassadors.

Clare: You can't fancy them because they're too far away – okay – but you don't talk to them differently – like you said a bit 'cause you said you talked about hair. Do you talk about hair to the male ambassadors?

Sarah: No – the female ambassadors but with the male ambassadors you just talk about stuff – like general conversation – like just stuff – like what football team do you support – you argue with them 'cause they probably say Manchester United and I say Arsenal and then I argue.

It is evident through her response that in her attempts to talk to ambassadors she appears to have resorted to almost stereotypically gendered areas of interest: hair for girls and football for boys. This very gendered focus of conversations was also evident from the notes I made during observations. I overheard some exchanges during the Art activity (on the first day). Two BFSAs and two YS (1 BF, 1 WM) were talking about how easy it was to spend credits on their mobile phones. One SA said that she had spent all her wages 'on a dress and some shoes'; she said to the YS 'that's what students spend their money on'. On the morning of the second day the YS were working in groups discussing ethical issues related to robotics. SAs were sitting with the groups or circulating. One BFYS (Vanessa) initiated a conversation with one BFSA (Fizz) about her looks. V said that F looks young 'the way you do your hair' and said that she was 'really surprised' to find out that she was older. She said that the other SA and adults in the room dress older. These gendered topics of conversation are perhaps an important part of the SAs and YSs negotiating ways into relating to each other.

When I asked the YSs a very leading questions about gender – whether it would matter to them if there were no females/ males in a job they were interested in doing – their responses were again conflicting. Sarah continues with the earlier discussion initiated about having a 'crush' on ambassadors. She continues with this, even saying that she would 'love' to be in an all male environment. However, Joe and Dina, when prompted by another question, appear to view this as potentially off putting. It is worth observing that Dina and Joe were the only two students that had chosen engineering as their first choice and so view themselves as potential engineers. This may explain why this question is treated more seriously by them than the others in the group:

Clare: If you've never seen anybody doing that job it might put you off. That's why I said does it matter if it's girls or boys – do you know what I mean? Does it make it more possible to do it if you saw a girl doing it?

Sarah: If you've got a crush on one of the boys – but overall it doesn't matter really.

Clare: So it doesn't matter for you if they were all male engineers – would that make you think – oh, this is a boy's job?

Dina: Yeah

Sarah: No 'cause I would be the first girl to become the best engineer person.

Joe: It can influence you...

Sarah: I would love for it to be all male and no female (laughter)

Unlike the YSs, the SAs were adamant in their view that gender was important. This view appeared to reflect the awareness they had developed through their training. However, Qadira also described how female younger students respond to her with interest and surprise; she illustrated this with an account of how one of the YSs had even asked if she was in the 'right room' at the start of the summer school:

Clare: I was going to say do you think it matters that you're a girl – you know, do you think gender and race matter to the kids because they always deny it – they say 'no it doesn't matter, it doesn't matter'.

Qadira: It does matter

Adam: It does matter.

Qadira: Lots

Adam: That's why the child protection has come in, the gender training has come in as well.

Qadira: A lot of the girls say – oh so what engineering do you do? Always, always, always, always – because they always have it in their mind ah that it's just guys. Being a girl there it always seems to get them like interested. Immediately they always think to themselves – on Monday somebody asked me – are you meant to be in this room? I was like – yes.

Interviewer: One of the students?

Qadira: I'm trying to remember who it was now. Yeah, one of the students in our room.

Clare: Was it a boy or a girl?

Qadira: It was a girl.

It is also worth noting that there appeared to be a split in opinion that divided the male and female YSs in terms of which sessions enable YSs to bond with SAs. Dina argues that the afternoon sessions provide a better opportunity as the YSs and SAs share a common interest. Sarah agrees with her. However, this view is refuted by Michael who views the longer term relationships, that have developed through seeing the same ambassadors every day, as better facilitating conversations. Joe agrees with Michael.

Interviewer: You know in the morning – you do the work with them do you have different conversations at different times of the day?

Dina: Yeah, when we do our chosen activity you bond more with people because they are doing that activity that you have chosen to do so you have more in common 'cause you know that you both have ...

Sarah: oh yeh that makes so much sense

Interviewer: So in the afternoon session – go on say that again

Dina: In the afternoon you bond more with them as you have both chosen to do that activity – they are like, leading it so you have a bond – a common

Sarah: You know that they enjoy the same thing

Dina: Yeah, so you can start a conversation whereas on this one you don't know particularly if they have chosen to do it or...

Interviewer: So you have more - you know you talked about the different conversations you've had – do you have more conversations just about life and stuff in the afternoon.

Dina: Yeah where in the morning ...

Michael: What, with the student ambassadors? I think we have more conversations with the student ambassadors in the mornings. 'Cause then they

are like the engineering ambassadors that we saw every day – ‘cause like at this jazz dance one yesterday there was some really some idiot ambassadors.

Dina: You’re not happy are you? Get over it.

Michael: I think in the morning we do more bonding.

Interviewer: So you’ve had more conversations in the morning?

Joe: Yeah

Both of these concerns reflect my previous findings. Younger students appear to find it easier to develop relationships with SAs if they have a common interest/ shared goal and the SAs are able to provide support that facilitate younger students (Gartland and Paczuska, 2007). Longer term relationships also facilitate the development of trusting relationships (Gartland and Paczuska, 2007). However, what is interesting here is that these are prioritised differently by the male and female members of the group. This reflects my previous suggestion that boys are less likely to initiate conversations with ambassadors than their female counterparts but are keen to develop relationships with them, whilst girls appear to find it easier to initiate and build up a relationship with SAs relatively quickly (Gartland and Paczuska, 2007).

About Race

As with the question of the importance of SAs gender, so the question of whether their ethnicity is important was also met with denial by YSs. However, it is interesting how vehement Michael’s response was to the question of whether the racial identities of ambassadors matter. This perhaps reflects his own anxiety about being one of only two white males in the entire engineering group – including SAs - and even suggests that, to the contrary, race does matter a lot to Michael:

Clare: We talked about male and females – does it matter if they’re black or white?

All: No

Michael: Why would it do that? We’ve been brought up in a society where we’re so scared to be racist – where we have been so educated not to be racist that everyone lives in fear of finding out if they say a small comment that anyone else could interpret to be racist – some people would kill themselves.

Stacy: It doesn’t matter if they’re black, white or Asian ‘cause like as far as ...

...

Sarah: The majority of people here are black anyway

It is however interesting how multiculturalism is accepted by some of these students as the norm. Dina points to how she has not met anyone on the summer school who is ‘proper British’. Sarah talks about Britain as being a ‘multicultural country’.

Dina: The thing is – I haven’t met anyone here who is proper British ...

Sarah: But that doesn’t matter.

Dina: That’s what I mean, it doesn’t matter ‘cause at the end of the day it doesn’t really exist.

Sarah: It’s like the whole British thing – it is a multi-cultural country now so it’s like – yeah get used to it.

It may be this experience of living in a multicultural area – where their own ethnic group is fairly dominant - that prompts some of the YSs to view their ethnicity as irrelevant.

Sarah describes how her sister has a new job where she is 'the only black person' and where the rest of the workforce is 'Chinese'. While this is clearly an exaggeration, Sarah seems keen to emphasise both that she would not mind being in a minority and that the workforce for large companies like KPMG are not white anyway. This statement appears to also serve the purpose of underlining the point she had made before about Britain being a multicultural society. It is interesting to note that Sarah, a Nigerian student herself, refers to one of the SAs as 'my Nigerian homie' which indicates an awareness of a shared sense of ethnic identity.

Dina's accounts of positive discrimination practices appears to reflect a discourse circulating within the press and socially depressed white communities that it is the white population who are the objects of discrimination not their multicultural counterparts:

Clare: So generally you would just – 'cause when I said that you were going to say something – no. So it wouldn't matter to you at all

Stacy: No

...

Sarah: I don't think it's such a problem 'cause one of my sisters has started a university course a year ago and she is going to be working with KPMG and she is actually the only black person there and everyone else is Chinese but that doesn't stop her from getting the job. At the end of the day – she's going to get her money and

Dina: maybe when it's all predominantly one sort of race or something maybe they want different person

Joe: It can influence you. If you do see it on – an occupation of people that, say – black men, yeah- that's a job you would think, ah I would easily fit into but if you see a job with all white women I would think – that's not my place.

Dina: They're so not racist they are racist if you know what I mean. Like the police force don't take any white people in any more because they want more Asian and black people– do you know what I mean?

Unlike the three girls, Joe appears to have been considering the question I posed about being in a job where he is out of place because of gender and ethnicity, and he acknowledges that some environments would make him think 'that's not my place' though it is clear that I led him to this with my questioning about the topic.

Observations of the interaction between students during the morning sessions of the summer school also serve to underline how important racial and gender identities are to YSs. Michael worked hard to ensure positive relationships with the black students but never seemed at ease with any one group and, as discussed, tended to seek out a group of girls, including one white girl when asked to work in a group. Dina formed a friendship with the black girls in the engineering group and stayed with them during the morning sessions throughout the week. The black and students from mixed backgrounds worked in groups together and socialized in large groups during lunch. However, there were other students who seemed marginalized and isolated as my observation notes reflect:

During lunch (day2) YSs sit on their own in large groups. There is one small group which includes one very quiet white boy and a Chinese boy. There is also a group of 3 muslim girls who sit apart. Sarah, a Moroccan girl, is wearing

western dress the other 2 are wearing head scarves. This group are quiet and ignored by the other girls in the engineering group.

It seemed to me that despite their protestations, racial identities were evidently important to YSs and particularly so if they found themselves in a small minority. This view was reinforced by the comments made by the SAs. As with the question of gender, the SAs' response to the question of whether their race matters offers a contrast to the views expressed by younger students. The SAs were clear about the importance of this:

Qadira: Yeah I think it is really important and I think it must be the first thing they must pick up on when they meet us for the first time. They must look at us all together and think okay.

Adam: There's a mix

Qadira talks specifically about how this is different in different contexts and how, in London, being black 'would help' the 'black youngsters' but she also talks about the need for a mix of ethnicities so that the YSs can see that 'anyone can go into it':

Qadira: In London, since there's loads of ethnic groups so the fact, I don't know, being black would help... the black youngsters as well - but I think it is just good to have a good mix of different ones because it shows that, you know, anybody can go into it.

Summary

Discursive constructions were used by SAs and YSs that related to tour guides and customer services. SAs at this event also worked for the Marketing and Recruitment Department within the university in these sorts of capacities. This positioned YSs as potential customers of HE and SAs as marketing the university. SAs themselves referred implicitly and explicitly to their responsibility to promote university to YSs and appeared keen to present themselves as effective marketers of university. YSs also seemed aware of the SAs' positioning as marketing university though they were still interested in finding out about university from them. As LEP ambassadors, SAs were evidently aware of their responsibility to promote engineering and STEM subjects, particularly to girls. There was some suggestion from YSs' accounts that they admired the SAs for studying engineering but viewed it as a difficult subject – particularly robotics.

Another discursive construction used by SAs was of themselves as aspirational 'role models' for YSs. The term role model was also used in a more explicit way. SAs had been asked by the WP team at LSBU to provide YSs with models of behaviour to encourage the participation and engagement of YSs. SAs viewed this 'performance' as important and their focused engagement with tasks did appear to actively encourage YSs to participate themselves.

YSs suggested that SAs were like distant cousins in relation to themselves which suggests that SAs had effectively developed trusting relationships with the YSs. YSs commented that proximity in age of SA in relation to themselves is important as is their positioning as fellow students. YSs also referred to conversations with SAs relating to youth culture, particularly music and fashion. One SA suggested that this shared identity as young and students is important in enabling YSs to see themselves at university. SAs were identified as learners academically ahead of YSs and this positioning appeared to

contribute to YSs perceptions of themselves as learners who would, in the future, also be able to cope with the level of learning required of them at university. However, YSs attending the summer school were all already positively orientated to university.

SAs were described by both SAs and YSs as 'keeping' YSs 'on task' a phrasing that appears to relate closely to teaching and school. YSs were though, keen to identify differences in terms of the SAs' emphasis on fun and their less disciplinary role. One SA suggested that SAs have a different status to those found in schools she suggested that SAs fit somewhere 'in between' and so are not part of the official life of school.

YSs claimed the irrelevance of gender to the relationship they have with SAs, however, they were, in fact, intensely aware of the gender of SAs. Unlike the YSs the SAs themselves were emphatic about the importance of gender identifying the presence of female ambassadors as challenging YSs preconceived ideas about the gender of engineers. It is also worth noting that male YSs were more positively orientated to SAs that they had worked with everyday than girls, who happy to develop relationships relatively quickly, especially if they had a shared interest. YSs also denied the importance of the racial identities of SAs and YSs. However, YSs' accounts suggested that racial identities were important to them.

SEAs (know called STEM Ambassadors)

This report is based on observations and conversations held with SEAs and YSs during four different days involving SEAs working with young students. The first day was a STEM day run by LEP fieldworkers at LSBU. Two days were run by TFL at their depot and one run by Tubelines at one of their offices in the city.

Participants

All conversations/ interviews that are used in this report were held with SEAs and YSs during activities. YSs range from Year 7 students to Year 10 students. An interview was also held on a separate occasion with the LEP fieldworker.

STEM day

During this event four ambassadors were working with Year 8 students from two South London schools. The morning session was organised and led by an LEP fieldworker. YSs were designing cars that they were going to present in the afternoon to a panel of Science and Engineering Ambassadors in the format of the television programme 'The Dragons' Den'. Two SEAs arrived for the afternoon to participate as 'Dragons'.

Promoting engineering careers – teaching students about engineering?

The LEP fieldworker was clear that one of the functions of SEAs was to 'market engineering'. This was also echoed by the SEAs themselves; one said that he hoped that through participating in The Dragons' Den he hoped that students 'get the idea that engineering can be fun and about every day life'.

This SEA discussed the appropriateness of the day's activities in terms of encouraging them to think like engineers. As an engineer himself, he had focused on this while interacting with YSs in 'the Dragon's Den':

I like the practical focus of the day – they come across problems and have to find a solution. One group had thought about steering and they enjoyed it – they've got to enjoy it to encourage them to do it again (black male SEA)

Another aspect of engineering the other SEA was keen to encourage YSs to consider while talking to them in the Den was the financial implications of decisions and an understanding of the market:

The Dragons' Den – they should understand something about money – it's close to my heart helping businesses set up – know your competition and know what your customer really wants' (Asian male SEA)

It's about the job market – mixing technology and business – but it's fundamental to understand something about technology and engineering (Asian male SEA)

Another aspect of learning from the project that one SEA was keen to identify and that was, again, a focus of questions in the Den was about teamwork:

Hopefully some of them will understand that they have to work as part of a team (Asian male SEA)

Indeed, this was a particular area of expertise for one SEA who focused on this in the workplace. He explained how he was interested in how the YSs managed this:

I am interested in working out how students overcome difficulties when they are working in a team – designer, manufacturer, fault team etc. – how they coordinate their work (black male SEA)

The SEAs also both talked about the benefits to Ys of having to present to them in a new and challenging context. He stressed the importance of these communication skills in adult life:

Schools should be teaching kids about life and communication skills are essential they need to be promoting themselves. This day has involved them getting out of school and going to a big building – it's intimidating and it must feel to them as if they've come in to where the real dragons would be. That's what they will have to do when they are meeting a new employer – it is intimidating

It's important for them to keep on doing it so that by the time they are thinking of leaving school their presentation skills will be really highly developed. So many adults – you tell them you want them to do a presentation and they are a bag of nerves (black male SEA)

Role models

The fieldworker responsible for the SEAs was keen to emphasise their presence as role models. Unlike the SAs who have a more multifaceted role, she suggested that the SEAs are there predominantly as 'role models':

They are not like there to monitor – not so much to assist. They're there to act as role models and experts - a lot of the time they will be talking about their experiences (fieldworker)

The SEAs acting as Dragons certainly positioned them as experts and their judgements were clearly valued by the students and taken very seriously. Perhaps undermining this positioning however, was that the SEAs did not introduce themselves and their backgrounds to the students - though this was planned. However, these SEAs were only with the students for a maximum of two hours and there was very little opportunity for informal interaction; the interaction the SEAs had with the students was in the very formal capacity of Dragons. Indeed, one of the SEAs commented that he would have 'liked the opportunity for informal interaction' (black male SEA). Ys were also not provided with information about the professional roles of the SEAs present so were not aware of this.

The fieldworker suggested that having SEAs from different ethnic backgrounds was important in enabling the students to perceive engineering as a possible future:

Lecturers are mostly middle class white males so it's good to cater for BME and women – it's important for students to be able to look up to someone and to see that 'I could do it' (fieldworker)

One of the SEAs also commented on this explaining that his motivation for becoming a SEA was his own concern that there were so few positive 'role models' for young black people. He discussed how he had worn a suit purposely as he felt that the black figures in the media that students aspire to be do not encourage them to aspire to professional roles. He hoped that by presenting himself in this way, he would demonstrate to them that this was a possible future for them:

I am really concerned about the lack of positive role models available to black kids ... it's important that they know how to present themselves (black male SEA)

TFL 500 days

The two days run by TFL were both attended by SEAs. During the first of these events two SEAs attended the first part of the morning with one senior figure from TFL giving a presentation at the start of the day. During the second event, the same senior figure again provided an introductory talk; this was followed by three SEAs giving presentations about their own jobs. These SEAs were all male, two were Asian and one white, and in their twenties. The Ys attending the second day were then divided into two groups: Ys remained in their original school groups. One Asian male SEA then remained with the group of twelve Year 10 BMYSs observed for the rest of the day which involved a tour and Ys engaging with two practical engineering related activities. It is worth noting that a teaching accompanying the group identified this group as some of the most challenging students he had taught.

Promoting Engineering

When asked about what they had learnt about careers in engineering, students from both days commented on an introduction to engineering and TFL by a senior figure in the company. A number of students talked about what they had learnt from this talk; it was interesting to note that the messages drawn appeared to vary depending on the focus and interests of individual students. A large number of the group were impressed by the potential salary of an engineer:

you can earn a lot, you can earn 100k (WMYS)

they give you a lot of money' (WFYS).

One student asked specifically about whether the apprentice salary was available to 16 year olds:

Can you earn that money (£11500 - £12850) at 16 when you leave school?
(BMYS)

Another student, when asked about what he had learnt from the day responded:

I've learnt about the money you can get paid as an apprentice at the age of 16 (BMYS)

A few students commented on the availability of jobs:

There's a lot of jobs (WMYS)

A few students had engaged with the diversity message in the speech; interestingly these comments came from black and female students:

Engineering is suitable for anyone – all ages and women and men and that
(BMYS)

Now girls are getting into engineering cos women have good ideas as well
(BFYS)

Teaching Strategies

On the first day observed there were several presentations made by SEAs at the start of the day. A group of year 10 boys became restless as the introductory sessions progressed. Several students echoed the view that the talks became 'boring':

The first guy was alright but I didn't really like the rest it was boring (BMYS).

I don't really like talks – it was like a lecture (Yr 10 BMYS)

Several students described being more interested in what particular individuals had to say based on how effective they were as speakers:

The first guy was interesting and the guy talking about the traffic lights – they were good talkers (Yr 10 BMYS)

One teacher explained that he felt the SEAs had not pitched their talks at their audience and that the information provided by the SEAs was 'more addressed to me as an adult'. He felt it was useful that the SEAs 'explained the routes they had taken individually' but that the lack of time available to them and the fact that the students do not like to sit and listen to talk for very long meant that 'they didn't have an impact'. He made the suggestion that the potential jobs in engineering available to students could be made more explicit and visual:

They could have drawn out more about what is associated with the roles and how to get there – a chart to show the children career paths would have helped (teacher)

A problem with the day of the 17/12/09 identified by one teacher was that the initial talks were then followed by a further talk as students were guided around the depot and then another talk introducing them to the practical task. These 'talks' started at 10.40 and ended at 12.45.

I thought the balance was good but that it was too long for them to be spoken to – they were spoken to when they arrived, on the tour and then given an introduction to the activity – three talks it's just too much for them (teacher)

Another issue identified during the day was that some of the Ys were off task while others were dominant. One SEA talked about the need to engage the whole group and to encourage them to work together and share ideas:

They know each other so well they tend to talk off task ... we need to keep them focused...there are some dominant characters and we need to do more to ensure that all of them are participating – we need to find ways to draw people out (Asian male SEA)

The teachers and SEA identified that some students were engaging with the activities conceptually but others were not and this level of thinking was not being effectively communicated across the teams:

Some of them have got it – they are trying to get their team to think about how to do it but haven't got the communication skills to get that across (Asian male SEA)

Role models

The students themselves and the SEA working with the group during the day, talked about how difficult it was to have conversations. Indeed students' lack of engagement with the SEA could, at times, have been interpreted as rudeness but appeared to

actually be more rooted in a lack of confidence. One student explained to me that he would never ask a SEA a question: 'I'm too shy to talk to them – I would never start a conversation'. The SEA who spent the day with the group also explained how difficult it was to initiate conversations. This lack of conversation meant that the SEA did not have the opportunity to talk to the students on a one to one level about engineering:

It's difficult to have conversations...they get into groups...there's safety in immersing themselves in the activity...I've talked to them about the activities but I've not talked to them about careers or answered careers questions...I would have expected more questions (Asian male SEA)

The SEA identified the need to find a way to break down the barriers and initiate conversations with the students. He made the suggestion that students should work in groups to interview SEAs to find out specific things about their routes into engineering:

Maybe you could increase the level of interaction by getting them in groups to find out about the SEAs and get them to do a presentation (Asian male SEA)

Tubelines day

After initial presentations by SEAs and LEP staff students were divided into groups of 3-5 and worked on designing stations, trains or tracks. Students ranged in age from year 7 to 10. Students had a budget and had to buy equipment. The initial idea was for them also to have to buy time with consultants (SEAs) but due to time constraints (the start of the day was delayed because of problems with the Jubilee Line) and the age of some of the groups, this was abandoned. There were 7 teams in total.

As well as 6 SAs (4 FSAs and 2 MSAs) there were 6 SEAs: three were white males, one Asian male and two white women. All SEAs were in their twenties to late thirties.

Promoting engineering careers

When asked about what they had learnt during the day, the students talked a lot about practical engineering related skills they had learnt through working with the SEAs:

S1: he talked about how to make a light bulb work

S2: he taught me how to strip a wire

S3: how to wire up a light bulb

S1: we've been talking about lots of different stuff – talking about what we are doing (Yr 9, WMYS)

The SEAs also commented that the practical focus of the day was positive for students; providing them with an understanding of how things work:

It's practical – fantastic – they see the mechanisms and see how things work (white male SEA)

One of the students talked about how he had learnt to work as part of a group and to 'interact with people'; his comments suggest that he felt he had developed in confidence as a result of the work he had done:

I've learnt how to take an individual role and how to interact better with people (WMYS)

One SEA who spent the whole the day with one group of year 8 students appeared to have developed a relationship with these YSs that enabled him to talk to them on a different level to some of the other groups. He discussed how he had talked to them about their interests and plans and about the importance of their thinking carefully about their choice of subjects and how their subject choice relates to what they do when they leave school:

We had conversations about what it's like after school... I think it helped them realise that they have to think about what subjects they should do...it was something they need to start thinking about (white male SEA)

Other SEAs talked about conversations they had had with students specifically about working as an engineer. Students particularly asked about income. One SEA discussed students asking about the hours she works as an engineer

(I was asked about) ...how much money I earn, what car I drive, how many hours you work (white female SEA)

We talked about what I do what they do – one said I'd like to do engineering if there's any money in it (white male SEA)

One student articulated that something he had learnt about engineering through the day was the range of 'different types of jobs available':

There are all different types of jobs – electrical engineer, civil, mechanical – there's loads...I didn't really know that before...I definitely want to go into engineering wither mechanical or civil...they're both hands on and you're always busy and always doing something that you like (Yr 9, WMYS)

One student commented that he had learnt that in engineering there are different possible answers to problems presented:

There's more than one way to improve something (Yr 7, AMYS)

Two of the SEAs commented that the day's activity facilitated students learning about multifaceted nature of engineering and the different roles within it:

The day seems really challenging there's electrical, mechanical bits and designing and budgeting... they're working with cams (sets of gears) – they're not just cutting stuff out of plastic (white female SEA)

It's a good task – it demonstrates the multi discipline aspects – tunnel/ track is all engineering and they probably wouldn't be aware of that (white male SEA)

One SEA commented that when she explained to students her job as a geotechnical engineer, they were 'genuinely surprised' as they had not realised that there was a need for such work:

What I do is so specialist no one has ever hear of it...the students are genuinely surprised they didn't know anyone does it (white female SEA)

Another SEA commented that the students would certainly now be more knowledgeable about Tubelines as a company and would probably look at stations and the tube differently to before:

It's raised awareness of tubelines – they'll think more about stations and things (white male SEA)

Also discussed was how one SEA had drawn on his own engineering experience of building tube stations and related this to the task in hand:

I gave them examples from building the stations we build... I told them what we do (white male SEA)

The location of the day at the Canary Wharf Offices of Tubelines was commented on by one SEA as being positive for students as it provides them with an insight into an office where some of the SEAs really work:

It's good it's on site – it makes it easier for us and kids get to see what it's like where we work – this is an office...everyone's keen on the building (Canary Wharf site) (white male SEA)

The fact that the day was at the Canary Wharf site was viewed positively by SEAs and as, perhaps, challenging student' views of engineering as being a 'dirty job'.

While a few of the SEAs talked about having had conversations about students' futures and their own work as engineers, this was not true for all the SEAs:

They've not asked me about my job or anything ... (white male SEA)

From observations and discussions with all those involved in the day, it was clear that the majority of conversations with younger students had been focused on the activity itself and how to achieve the task in hand. One SEA commented that as a single activity it was unlikely to raise awareness of engineering careers but may well do so if students subsequently continued with engineering orientated activities:

(re. whether day has raised awareness of engineering careers) probably not – when you're at school you do things and this is quite a fun thing but if this is the only thing they do – but if they do a lot it builds and builds (Asian male SEA)

Teaching Strategies

There were different opinions among the SEAs themselves about how best to interact with the YSs. While one SEA worked exclusively with one group, others moved around more. One SEA commented:

Going around works better than staying with one group – if you stay with one group they expect you to do it and you end up cheating (Asian male SEA)

The mixed age groups in the room did pose some difficulties for students; particularly the younger age groups. One SEA, who worked exclusively with a year 8 group, explained how he had to explain the worksheets to students, as they did not read them themselves:

I had to tell them what's written down on their sheet...they ask lots of simple questions that I should know the answer to (white male SEA)

The observations made by one SEA suggests that he had to work in a similar way to a teacher, facilitating the students in engaging with the project:

The team were very young and didn't know where to start – so I had to get them started – I tried to get a logical thought process going – I was troubleshooting (white male SEA)

This group did struggle at the onset of the project and needed a lot of support; the fact that there were enough adults present for one SEA to work with them throughout appeared to be paramount to them being able to successfully engage with the project. The conversations held with the SEA were initially focused completely on how to approach the task – though as discussed, conversations did progress onto more career related themes. The SEA explained how he used questioning to attempt to facilitate the students to work out how to do the work themselves (they were making a model of a station):

They were slow to start but once they got started they didn't want to stop...I asked them lots of questions to try to get them thinking about it (white male SEA)

Role models

The students were given a lot of information at the start of the day about the task and about tubelines itself. The information about the SEAs themselves was brief and it is difficult to know how much of it students absorbed. One teacher commented that he felt it was difficult for the SEAs to become role models for the students as to be role models students would need to know more about them:

To be role models you need to know a lot about them – if you know them, the way you look at people is completely different (teacher)

However, it was evident from the comments of the SEAs themselves and from the young people that some students were interested enough in the SEAs to ask about their lifestyles and the work that they do. What was very evident from the students' accounts was that they enjoyed working with the SEAs and they enjoyed the opportunity to have the attention and the expertise that they were able to provide. When asked about what had been good about the day a number of students responded 'the help'. One year 7 student explained that 'meeting new people' had been one of the best things about the day:

...meeting new people...they're very nice – if you tell them a joke they'll laugh (Yr 7, AMYS)

As with students' accounts of working with the student ambassadors, there is a suggestion in this account that a positive aspect of working with the SEAs was the informality of the way in which they work and the fun nature of the tasks they were working together on. This perhaps facilitates a different type of relationship to that that students have in schools; one where there can be 'jokes' and where the SEAs can be perceived to be 'very nice'. The SEAs commented on how the students changed towards them over the course of the day, with students being 'quite shy' at the start of the day 'but getting really into it' (white male SEA) as the day progressed.

It is worth noting that there was one group that did not work with any of the SEAs or SAs because they had an adult from their school working with them so were not seen to need support. When I spoke to this group, this lack of attention was a source of real consternation. They seemed quite upset that they had not been helped; one student said 'there should be a person to each team', another 'we want them to help us'. Indeed, conversely this lack of attention was given as the bad thing about the day and had clearly spoilt the day for this small group of young people.

It is interesting to note that one of the female SEAs on the Graduate Training Programme at Tubelines commented that the format of the day had been much more enjoyable for her than other days she had been involved with. She described how

younger students had viewed her with suspicion in the past because of her gender and how she had found it difficult to work with them:

It has happened before that kids say – you're an engineer but you're a girl!
...male staff find it easier with the kids cos kids think they're engineers – its
not the same for women – kids are sometimes suspicious (white female SEA)

Because the focus of the day had been so practical and was not so much on her and her job but on working collaboratively with the young people, she had found the day much more enjoyable and had been able to work more easily with the young people:

Today was more about working together and so you forget it's about your job
– it's fun (white female SEA)

Summary

STEM day

- Promoting engineering careers/ teaching students about engineering: the coordinator expressly identified 'marketing engineering' as being a focus of SEAs working with YSs. This was echoed in the account of one SEA. Both SEAs also explained how his interactions with YSs in 'The Dragons Den' related to focuses in real engineering contexts such as problem solving, costing and understanding the market and technology and teamwork. Both SEAs talked about the benefits to YSs of presenting to them in a new and challenging context and how this relates to experiences that they will have in their adult lives.
- Role Models: the coordinator identified the SEAs as 'role models' for YSs. This view was shared by one SEA who discussed how he had dressed smartly in order to present young black students with a positive 'role model'. The role of Dragons taken on by the SEAs effectively positioned them as experts and their judgements were taken seriously by YSs. However, they were not formally introduced so YSs were not aware of their working identities. The SEAs were also only with the YSs for a short time so there was little opportunity for YSs to interact with the SEAs.

TFL days

- Promoting Engineering/ learning about engineering: YSs appeared to have learnt about engineering careers on both days from an introduction given by a SEA in a senior position at TFL. YSs talked about learning about salaries, the availability of jobs and the opportunities for 'everyone' – including 'girls.'
- Teaching strategies: on one of the days several presentations were made by SEAs one after another. One group of Year 10 boys became bored and restless during these talks. Several students commented on the skills of the SEAs as speakers. One teacher commented that the SEAs had not pitched their talks at their audience and were too long. He suggested that the talks could be made more explicit and visual. One teacher and one SEA identified that some YSs were engaging with activities conceptually but that other were not and this level of thinking was not being effectively communicated across the teams.
- Role Models: the lack of interaction between SEAs and the group of yr 10 boys during one day was problematic. YSs appeared to lack confidence to initiate interactions and there was none built into the activities during the day. As a result there was no opportunity for the SEA present during the day to talk to this group on a one to one basis. This SEA made the suggestion that students should work in groups with SEAs to find out about their routes into engineering as a way to break down the barriers between SEAs and YSs.

Tubelines day

- Promoting Engineering/ learning about engineering: students talked about the practical engineering related skills they had learnt through working with SEAs. One YS also commented on how he had learnt to 'interact better with people' as a result of the day. One SEA, who had worked with one group of YSs for the whole day, appeared to have been able to provide YSs with advice about their own future plans. Other SEAs said they had talked to YSs about working as an engineer: YSs had asked about income and the hours SEAs work. YSs commented that they had learnt about the different types of jobs in engineering and that there are different ways of solving problems. SEAs also commented that the day's activities had facilitated YSs in learning about the multifaceted nature of engineering and different roles within it. SEAs also commented that YSs will have learnt about Tubelines and that the office venue at Canary Wharf was useful in challenging YSs preconceived ideas about engineering. It was clear that the majority of conversations YSs had with SEAs had focused on the activity itself and how to achieve the task in hand. One SEA commented that alone the day would not raise awareness about engineering but this would develop if YSs repeatedly attended other engineering related activities.
- Teaching strategies: SEAs had developed different approaches to working with groups of YSs during the day. One SEA explained that he felt working with different groups was preferable to avoid providing YSs with too much advice whilst another SEA explained that the group he had worked with needed support in accessing the task. The age group of the YSs appeared to be significant in this with younger students requiring more support.
- Role Models: One teacher expressed doubts as to whether the SEAs could become role models for YSs when the time available for interaction was so

limited. However, there was evidence to suggest that for the YSs spoken to, working with the SEAs and the 'help' they provided was highly valued. The informality of the working relationships between YSs and SEAs appeared to positively orientate YSs towards the SEAs. One female SEA also explained that the practical focus of the day and working collaboratively with YSs had enabled her to develop more positive relationships with YSs than she had on previous days where she felt that because she was female she had been viewed with suspicion.

Evaluation of Live Journals ementoring website

Academic Year 2 - September 2008 to June 2009

Executive Summary

The Live Journals ementoring pilot website (www.livejournals.org) was launched in September 2006, as a partnership between the educational charity The Brightside Trust and the Royal Academy of Engineering. Live Journals aims to uncover effective ways of increasing participation in engineering HE¹ by increasing the awareness and aspirations of non-traditional HE entrants in choosing engineering as a career.

This evaluation report focuses on the feedback from 31 mentees who took part in the Live Journals programme between September 2008 to June 2009. Though the sample size is not statistically valid, it provides a good indicator of the impact of the Live Journals ementoring programme for this academic year.

Key findings

The main aim of Live Journals was to increase participation in engineering HE by increasing the awareness and aspirations of non-traditional HE entrants and currently under-represented groups in choosing engineering as a career. Noticeably, the majority of mentees (97%, 81/83) were considered to be socially disadvantaged (as defined by HEFCE)² and 80% of mentees stated they had already decided to go to university (25%;7/14) or that their mentor had inspired them to think about going to university (55%;17/31) at pilot completion.

The Live Journals programme also potentially helped encourage more young people to study engineering, with 100% (28/28) of mentees agreeing that an **engineering degree offers many interesting career options** and 30% (6/20) of respondents (excluding diploma students) reporting that they were **more likely** to study engineering at the end of the pilot. This aspiration was also supported by 70.5% (12/17) of year 10 and 11 students intending to study for a science and maths AS and A level. This data indicates Live Journals played a role in helping widen participation to engineering HE.

Live Journals also seemed to help mentees make an **informed decision** about their future. 100% (10/10) of year 12 and 13 students reported a good understanding of the choices open to them once they left school. Nearly half of all mentees (48%; 15/31) felt that ementoring had directly provided a greater understanding of university life and the various careers available.

Mentees (31%;9/29) also felt that ementoring had directly increased their confidence to attend university, and had found it a useful source of information as no-one in their family or group of friends knew anything about university.

¹ HE – Higher Education

² http://www.hefce.ac.uk/pubs/hefce/2007/07_12/07_12.pdf.

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The potential impact on mentees confidence in their abilities and motivation for school work was difficult to measure as both parameters were very high at the start of the pilot. Encouragingly though, high confidence and motivation was maintained with pilot completion showing:

- 97% (30/31) of mentees felt confident in their abilities;
- 94% (29/31) of mentees felt motivated by their school work.

65% (20/31) of mentees also agreed or strongly agreed with the statement *"I have a good understanding of the options open to me once I leave school"* and 61% (19/31) of mentees agreed or strongly agreed with the statement *"I feel well prepared for the future"*.

In summary, this data suggests that Live Journals e-mentoring is an effective tool to help, support and encourage students to make informed choices about school, university life and possible career choices. Through providing this information, Live Journals plays a role in helping to raise aspirations to university and engineering of non-traditional HE entrants.

Key data

- 87% (27/31) of mentees reported that they were happy with the ementoring experience and would recommend Live Journals to a friend or sibling.
- 80% (25/31) of mentees reported that they had found the ementoring experience rewarding.

Conclusions

As with previous findings, Live Journals demonstrated that rewarding relationships seemed to correlate to high engagement. Mentee relationships with the highest levels of interaction and satisfaction seemed to be the more conversational, wide ranging and unstructured relationships. Live Journals relationships generally lasted from two months to two years. A successful relationship was very much on the onus of a mentor to develop and maintain over time through posting long, regular and open-ended messages to generate useful discussions. Mentee relationships with the highest levels of interaction and satisfaction seemed to be the more conversational, wide ranging and unstructured relationships. Good training of mentors and mentees was essential in providing high quality ementoring relationships.

Live Journals had a high level of engagement (71%) which may reflect the integration of ementoring with other face-to-face LEP³ activities and the strong relationships built with the LEP schools over the course of the three year pilot. Pleasingly many of these schools are keen to be involved in Live Journals post pilot. One teacher is particularly keen to link the Live Journals ementoring with a STEM⁴ club as an extra tool to enthuse young people.

Supporting previous year's findings, Live Journals found that female mentees were more likely to engage or highly engage (greater benefit) than their male counterparts, of particular importance as female students are currently under-represented in engineering degrees at universities. Female mentors (78%; 71/91) also seemed to provide more effective mentoring relationships than male mentors. This may support the role of female mentors providing a higher level of psychosocial support to their mentees⁵, and thus developing stronger relationships with their matched mentee. In addition, as female mentors were usually matched with the same sex mentees, this may have also played a role as to why proportionally more female mentees than male mentees engaged in the scheme. These

³ LEP – London Engineering Project

⁴ STEM – Science, Technology, Engineering and Mathematics

⁵ Syvante DJ and McChystal E. Refining Familiar Constructs: Alternative Views on OB, HR, and I/O 2007. Chapter 3: An Empirical Test of Gender-Based Differences in Ementoring: 27-43.

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conclusions, suggest an important role for female mentors and mentees in helping to overcome the current gender imbalance seen on engineering degrees.

Counter intuitively there was a reduction in the number of Diploma students who intended to study engineering in the future with 50% (3/6) appearing to be less interested in studying engineering at the end of the pilot. This was also matched by an increased fear that A-level Maths and Physics would be difficult, their interest in engineering reducing and a less strong belief that their parents would like them to study engineering. It is unclear why this happened and potentially can be linked to 'teething problems' with the engineering diploma in its first year, students applying to the diploma without full knowledge of what it entailed, the economic recession's negative impact on some of the high profile engineering companies or the fact students were sitting exams in engineering when filling out the second survey. Noticeably, high engagement for the diploma students was achieved despite poor training due to technical difficulties. This may reflect the fact that mentees studying the diploma had a greater need for an engineering mentor and the wealth of information related to the diploma found on the Live Journals website.

A committed teacher was also found to be essential for a successful ementoring programme. However, as with any type of school outreach activity, the input of the teacher is an independent factor. Encouragingly, the Live Journals pilot has enabled the development of a good interactive mentee training session, mentee guidebooks, password cards and targeted follow-up support for each mentee to help overcome the variability in teacher input.

The website was, as per previous ementoring programmes, highly appreciated. Though website hits are still lower than Brightside would like, it is clear that direct contact with teachers during recruitment months increased page views and hits, strongly suggesting that teachers were utilising and/or promoting the website to their school students (not just mentees). Articles supporting the 14-19 engineering diploma have been popular with mentees, mentors and teachers alike and Brightside are currently exploring routes to further promote this unique engineering content within and beyond LEP schools.

Live Journals to date has been highly effective at demonstrating the type of activities which aid engagement and impact. Critical factors include a well planned ementoring programme with a strong network of schools, universities, and company ambassadors. However, to provide a scalable, cost-effective, long-term model, further work needs to be undertaken in this area. We are confident with continued funding, the lessons learned and benefits from Live Journals has the potential to evolve into an extremely valuable and high impact intervention for encouraging widening participation in STEM and engineering.

"My mentor is super cool and I have learned so much about myself, what I want to do in the future. I've learned about how to prepare myself for what comes next, including uni and college, the different opportunities there are out there for me and my possible career choices. Ementoring has really helped."

Live Journals Mentee - June 2009

Evaluation of Live Journals ementoring website Academic Year 2 - September 2008 to June 2009

1. Background and Targets

1.1 Background

Live Journals (www.livejournals.org) is part of the pilot LEP⁶, a determined attempt to widen participation in engineering HE⁷. The project brings a partnership of national organisations and 50 London schools together with a view to discovering the mechanisms for getting more women, more BME students and more students with unskilled parents to opt for engineering degree courses. People from these groups are the most under represented in engineering HE and securing their participation is vital to the future health of engineering if we are to see the number of engineers increase to meet demand.

Live Journals aims to address this need by uncovering effective ways of increasing participation in engineering higher education by increasing the awareness and aspirations of non-traditional HE entrants in choosing engineering as a career.

Live Journals is a unique structured and content focussed engineering ementoring scheme for students in schools and colleges. This structured ementoring model provides:

- a recruitment and training process to increase the likelihood of engagement in the ementoring process;
- an option for group or individual ementoring to enhance participation;
- website content to support the programme objectives and to encourage meaningful communication.

The Live Journals evaluation in July 2008, though not statistically valid, provided some insightful information in to what makes engineering ementoring successful:

- rewarding relationships seemed to correlate to high engagement. Mentee relationships with the highest levels of interaction and satisfaction seemed to be the more conversational, wide ranging and unstructured relationships;
- a successful relationship was very much on the onus of a mentor to develop and maintain;
- good training of mentors and mentees was essential in providing high quality ementoring relationships;
- students from more socially disadvantaged backgrounds seemed to have a greater need for a mentor especially if they were a non-traditional HE entrant;
- year 9-11 students required more support with study/examination techniques whilst Years 12-13 years required more advice on HE;
- females were more likely than males to be effective mentors as they provided a higher level of psychosocial support to their mentees³;
- ementoring seemed to be more effective and add value to the impact of other LEP outreach activities from teacher feedback and mentee posts.

This evaluation report will aim to draw on these previous years findings to help us understand whether these trends have continued.

⁶ LEP - London Engineering Project

⁷ HE – Higher Education

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1.2 Mentors

The Live Journals programme aimed to train 50 mentors by March 2009 and a further 50 by June 2009 from the target region of London. Mentors were recruited either through the STEMNET SEA's programme or through the Live Journals website. Mentors recruited from the Live Journals website were given a Criminal Records Bureau check and registered with the LEP STEMNET SEAs⁸ programme.

In total 90 mentors took part in Live Journals from September 2008 to June 2009. Total targets were lower than expected because:

- encouragingly more mentors (46) continued into the next academic year than anticipated;
- the previous year's evaluation demonstrated mentors should be matched with at least two or three mentees to ensure each volunteer mentor would have at least one successful mentee relationship;
- project partners did not want to recruit a surplus of mentors who would then not have the opportunity to be matched with a mentee.

With this in mind the number of new mentors recruited was matched to the requirement from mentees rather than initial targets, ensuring that mentors were only recruited when needed and so reducing the likelihood of mentor disappointment.

All mentors posted at least once and while 80% (72/90) posted more than five times, 52% (47/90) posted more than 10 times. Some mentors posted only in response to mentee questions however all mentors were encouraged to make regular posts on their own journal even if they did not see their mentees regularly posting. Based on the previous year's lessons learned, it was hoped that mentees would read regular mentor posts and benefit from the mentoring experience even if they did not feel able to reply.

No target was specifically set for the number of female and BME mentors recruited to the Live Journals programme. Recruiting was carried out through the LEP STEMNET SEAs and focus was given to recruiting under-represented groups; female and BME mentors. The percentage of female mentors on Live Journals by March 2008 was 41% (37/90). No data is available at this time for the percentage of BME mentors; however revisions have now been made to the ementor application form to collect ethnic background data.

1.3 Mentees

The Live Journals programme aimed to train between 240 and 360 mentees and engage 200 mentees by March 2009 from the target region of London.

Mentees were recruited to the Live Journals programme through:

- LEP target schools with teacher assistance
- through London secondary schools that were not already involved in the LEP but that had expressed an interest to participate
- through a coordinator based in the Widening Participation department of Southampton university.
- through teachers delivering the new 14-19 engineering diploma.

⁸ SEAs – Science and Engineering Ambassadors.

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Where possible female mentees were matched with a female mentor with the intention of providing positive role models for young women enrolled on the site.

It was envisaged that half of these mentees would be recruited by March 2009 and the following half recruited by July 2009. Due to the difficulty of recruiting and engaging students during the exam period of May and June, focus was given to recruiting the majority of students by the end of March 2009. In total, 319 students registered to the Live Journals programme by July 2009, however only 242 mentees took part in a training session and of these 171 mentees engaged (71%; 171/242) on Live Journals. Brightside usually expect to see a participation level of between 60-70% for ementoring schemes; participation to the Live Journals programme was therefore high.

1.4 Participation in other LEP activities

A key aim of the Live Journals programme was to assess the added benefit of integrating e-mentoring with other LEP interventions versus a standalone approach. Though no data is available to understand the direct benefit to mentees, table 1 shows the number of respondents that participated in other LEP activities. As mentioned above, Live Journals had a high engagement rate and this may directly relate to the integrated approach of the LEP programme. It is envisaged that the long-term relationship of an ementor will have also added value to the linked LEP activity as seen with other schemes⁹.

LEP activity	% participated
Engineering club at school	43% (13/30)
Visited a university engineering department	36% (11/30)
Engineering residential course	33% (10/30)
School engineering degree	30% (9/30)
Engineering team challenge	26% (8/30)
Engineering summer school	23% (7/30)
Engineering conference	13% (4/30)

Table 1

1.5 Task-based ementoring – the sustainable energy scheme and the Greenpower Challenge (Southampton)

Following a successful trial during 2007 and 2008 in which a joint endeavour¹⁰ was found to enrich the ementoring relationship, Live Journals was again used as part of a task-based ementoring scheme in which a team of mentees worked with mentors in both an online and face-to-face environment to research and develop ideas for sustainable energy production and to build a Green powered car. Through working in partnership with Southampton University, six Southampton schools put forward two teams of four pupils to take part in this exciting competition.

⁹ The University of Warwick. The Big Deal National Enterprise Competition – Final Report. September 2007.

¹⁰ The University of Warwick. The Big Deal National Enterprise Competition – Final Report. September 2007.

1.6 Supporting the 14-19 engineering diploma

In September 2008 the 14-19 engineering diploma was launched and several schools in the LEP catchment area were offering this new course. Live Journals ementors were matched with pupils studying the engineering diploma since it was hoped that these students would benefit from the opportunity to discuss their studies with a professional engineer. In addition a set of mentoring activities and articles supporting and enhancing the 14-19 engineering diploma curriculum were written. Teachers were also notified of this content.

1.7 Live Journals website

The table below shows the status of the Live Journals website versus intended deliverables by July 2009:

Item	July 2009 Target	June 2009 Actual
News and resource articles	560	656
Polls and Quizzes	30	31 (20 Polls and 11 Quizzes)
Ask an Expert	12	6
Site visits/month	1,500	1523 (month of March)
Page views/month	15,000	7277 (month of March)

Table 2 – Detailed findings of the Live Journals website.

Though page views per month is lower then the suggested target, these figures do demonstrate encouragingly each unique user viewed 5 pages per visit, similar to the average pages viewed per visit on the BBC website¹¹.

¹¹ http://www.alexa.com/data/details/traffic_details/bbc.co.uk

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2. Introduction

The Live Journals pilot website (www.livejournals.org.uk) was launched in September 2006, as a partnership between the educational charity The Brightside Trust and the Royal Academy of Engineering. Live Journals aims to uncover effective ways of increasing participation in engineering HE by increasing the awareness and aspirations of non-traditional higher education entrants in choosing engineering as a career.

This evaluation report focuses on the feedback from the academic year three cohort of mentees. The first part of the evaluation survey (part one) was carried out between September 2008 and March 2009 with the second survey (part two) carried out in June 2009. This evaluation therefore monitors the effect of ementoring over a four to five month period and includes the usually quiet period over the summer exams.

In total 81 mentees completed or partially completed part 1 of the baseline survey. As the follow up survey was not mandatory, a diminished number of mentees (31) completed part 2. This number is not representative of the number of mentees who engaged with the programme, as survey completion was voluntary. A response rate of 38% to part 2 can be considered as high, especially when taking into account the part 2 survey was undertaken during the summer exam period.

In order to gain responses for part 2, the following tasks took place:

- Survey link was emailed three times to mentees;
- Mentors emailed directly to ask them to remind their mentees to complete the survey;
- Phone calls made to mentees who had not completed the survey and had provided their mobile phone number;
- A £5 WH Smith voucher offered to all mentees who completed both the first and second surveys.

For online evaluations a response rate of 10% is generally acceptable. From September 2008 to June 2009 there were 242 matched mentees, so a 13% (31/242) response rate for the whole programme is acceptable. Though the sample size of 31 mentees is not statistically valid, it provides a good indicator of the impact of the Live Journals ementoring programme for this academic year. In addition to the online survey, selected mentee journals will be analysed to support survey findings and trends. Due to budget constraints mentee journals can not be analysed for the full cohort of mentees.

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3. About the respondents

In total there were 31 respondents who completed both parts of the evaluation survey. Mentees were grouped together depending on their age and whether they were studying for the 14-19 Engineering Diploma:

- 8 mentees from the Diploma cohort;
- 17 mentees from Years 9 to 11;
- 6 mentees from years 12 and 13.

In order to reduce the length of the evaluation questionnaire, found to be a disincentive for mentees to engage in the ementoring programme in previous years, deprivation data was collected in the online application form. It was intended this information would also aid coordinators when matching students to their mentors. In practice the online mentee application form proved difficult to complete as different students than planned, often attended mentee training events and all Greenpower students completed an alternative form specific to that programme. As a result, of the 242 mentees taking part in Live Journals only 83 completed the initial application form.

3.1 Levels of disadvantage

Within each school the mentees either self selected or were selected by their teacher to take part in the programme. Schools in the London area were targeted specifically with the intention of reaching socially disadvantaged students while schools in Southampton were recruited by the Widening Participation department coordinator. Unfortunately since mentees from Southampton did not complete the Live Journals application form we have no deprivation data available. Past evaluations demonstrated a lower level of deprivation, reflecting the different deprivation levels in the Southampton region to those mentees from the LEP schools.

Levels of disadvantage were measured using three key indicators.

- The postcode of a mentee's main residence;
- Whether a mentee's parents had attended Higher Education;
- Whether a mentee qualified for Free School Meals or the Education Maintenance Allowance.

97% (all but two) mentees from the LEP cohort were considered to be disadvantaged using at least one or more of these indicators. It is interesting to note that 37% (31/83) of respondents qualified as disadvantaged on not one but all three indicators.

Overall, over half of respondents, 54% (45/83), are the first generation in their family to consider going to university and 40% (34/83) of mentees are currently in receipt of Free School Meals or Educational Maintenance Allowance. In addition 76% (63/83) of mentees live in areas that are ranked below the national average for levels of deprivation.¹²

Of the 203 mentees who responded to the survey, 42% (85/203) were female of which 46% were fully engaged (see Appendix 1 for definition of engagement).

The above data indicates that the Live Journals programme targeted students from socially disadvantaged backgrounds who are the first in their generation to think about entering HE. In addition, within this cohort there is a high proportion of the type of students who are currently the most under represented in engineering HE.

¹² Using the Office of National Statistics on-line database each Post Code can be ascribed a level of deprivation. The scale runs from 1 to 32482, with 1 being the most deprived, and is based on 7 different classifications of deprivation.

4. Findings

4.1 Interest in engineering

Live Journals was targeted at Year 9 to Year 13 students with a potential interest in engineering. Pleasingly, the data demonstrates that teachers recruited the correct students, with 89% (25/28) of mentees disagreeing with the statement “I am not interested in engineering” suggesting an interest in engineering at the start of the programme. Pleasingly, 100% of all respondents registered on the 14 - 19 Engineering Diploma (8/8) and pupils in years 12 and 13 (6/6) reported an interest in engineering.

Interestingly, over the course of the ementoring, 28% (4/14) of students from years 9-11 became more interested in engineering. In addition, students from years 12 and 13 became more polarised in their opinions of engineering with four stating that they were *very* interested in engineering and two stating that they were not interested in engineering. This may be a sign that respondents had a better informed opinion about the nature of engineering after taking part in Live Journals.

In contrast, 62% (5/8) of respondents studying the diploma became less interested in engineering. This maybe a reflection of ‘teething problems’ with the engineering diploma being in its first year, students applying to the diploma without full knowledge of what it entailed or the fact students were sitting exams in engineering when filling out the second survey. This would naturally lead students to being less positive about the subject when compared to their reactions directly after enrolling on an exciting new course.

4.2 Perception of engineering, maths and physics

100% (28/28) of respondents agreed or strongly agreed that an engineering degree offers many interesting career options both at the start and end of the pilot, while 50% of students thought that their parents would like them to study engineering. The majority of students 96% (27/28) felt that engineering was relevant to their life although this majority decreased to 82% over the course of the mentoring.

This positive perception of engineering is further supported by the positive image of both maths and science held by most mentees. The majority of students (19/28) found maths and science more interesting than other subjects they were studying even though half of respondents thought that maths and science were harder than the other subjects.

Mentees generally had a very positive perception of boys and girls in engineering both at the start and end of the programme. At the end of the programme, most mentees (89% 25/28) felt that girls were able to do just as well as boys in engineering and only a minority of mentees (28.5% 8/28) felt that boys were better suited to engineering than girls. Interestingly a significant number of respondents agreed that more boys than girls study engineering (60% 17/28) and girls are less likely than boys to study engineering (53% 15/28). This suggests that young people are aware of the current gender imbalance seen in the engineering industry but most do not see this as a reflection on the ability and potential for young women to excel in the field of engineering.

Overall, as with the previous year’s findings, these results suggest that mentees perception of engineering was already quite positive at the start of the pilot, which may reflect the targeted outreach work of other LEP activities within these schools.

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4.3 The effect of ementoring

Aspirations to HE and engineering

One of the core aims of the LEP programme was to increase participation in engineering HE by increasing awareness and aspirations of non-traditional HE entrants and currently under-represented groups in choosing engineering as a career. However, to understand whether Live Journals helped encourage more young people to apply to study engineering at HE is complex. As we work with students from Year 9 to Year 13, a large majority of them are not at the age of applying to university so often have not made the decision of which university to go to and which course subject to study. We have therefore analysed trends in aspirations to HE and interest to study engineering in the future as an indicator of their future choices.

At the start of the programme 100% (31/31) of mentees agreed or strongly agreed with the statement "I want to go to university" and 96% (30/31) of mentees agreed or strongly agreed with the statement, "I think I will go to university". Encouragingly by the end of the ementoring experience 100% of mentees agreed with both these statements and it is positive to note that the one student who changed their answer to this question was very highly engaged with the programme and had several conversations with her mentor about studying at university and applying for jobs after.

These high aspirations are further supported by 80% of mentees stating they had already decided to go to university (25%;7/14) or that their mentor had inspired them to think about going to university (55%;17/31) at pilot completion.

"He seems to have really enjoyed uni so it inspired me to go!!!"

Pleasingly, mentee comments do highlight a role for an e-mentor in making mentees more prepared for the challenge of university.

"[ementoring] has influenced me to begin working harder at school to achieve what i really want out of life."

"I've always known that I've wanted to go to uni, however my ementor gave me a great view on how uni life is and what I can expect."

To understand whether Live Journals helped encourage more young people to specifically study engineering, we have measured their interest to take engineering forward in the future. Interestingly, 30% (6/20) of respondents who were not studying the diploma reported that they were more likely to study engineering at the end of the pilot. There was a specific increase (18%;3/17) in Year 9-11 mentees who were now considering studying engineering at the end of the pilot. One mentee commented:

"it has made me think about studying engineering but i was already planning to go to university"

In contrast, there was a noticeable drop in the number of diploma students who intended to study engineering in the future with 50% (3/6) appearing to be less interested in studying engineering at the end of the pilot. Interestingly, this was matched by an increased fear that A-level Maths and Physics would be difficult, their interest in engineering reducing and a less strong belief that their parents would like them to study engineering. As mentioned above, this maybe a reflection of 'teething problems' with the engineering diploma being in its first year, students applying to the diploma without full knowledge of what it entailed or the fact students were sitting exams in engineering when filling out the second survey.

Year 10 & 11 students were also asked what they intended to do after their GCSE's as this has a major impact on their ability to study engineering in future. Positively, the evaluation showed that 70.5% (12/17) of mentees intended to study for AS and A levels including a science or maths A level and only 13.5% (4/17) intending to study for AS or A level excluding a science A level.

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A significant number of mentees 32% (10/31) also reported that talking to their mentor had influenced them in other ways. One mentee wrote *"Helped me with mathematics, which I regard as my weaker subject."* Another said their mentor had given them a greater idea about *"The aspect of engineering career"*

Confidence in their abilities, motivation to school work, feeling prepared for the future and understanding of all the choices available to a mentee after school.

Another key target for the Live Journals programme was to support and encourage these students in their future choices. Reported increases in confidence and motivation as well as a greater understanding of the choices available to a mentee after school or a feeling of preparedness for the future were used as a marker that a respondent was developing the soft skills needed to succeed in the future.

Overall respondents from all groups were confident in their abilities and felt motivated by their work both at the start and end of the pilot. On pilot completion:

- 97% (30/31) of mentees felt confident in their abilities
- 94% (29/31) of mentees felt motivated by their school work

65% (20/31) of mentees also agreed or strongly agreed with the statement *"I have a good understanding of the options open to me once I leave school"* and 61% (19/31) of mentees agreed or strongly agreed with the statement *"I feel well prepared for the future"*.

4.4 The ementoring experience

Impact of ementoring

After taking part in the ementoring programme, the most significant areas of impact were shown to be an increased understanding about university life, an increased understanding of the various careers available and support choosing a career.

- 48% (15/31) of students felt that the ementoring had provided a greater understanding of university life.
- 48% (15/31) of students felt that the ementoring provided information about the various careers available

In addition mentees reported receiving help with study and exam techniques, greater confidence to attend university and a greater understanding about college or university life:

It is worth noting that 29% (9/31) of respondents reported that their mentor was an additional source of information because no-one in their family/group of friends knew anything about university.

Many mentees reported that their mentors had also influenced them in other ways. Several felt that their mentors had increased their confidence and motivation, while others found that their mentors challenged them. One mentee felt her mentor had reminded her *"to not only have a social life but to think of academic life as well."* In addition many mentees were able to chat to their mentors about a range of subjects and one mentee mentioned that Live Journals had been a chance for *"Interesting scientific discourse"*. Older students from years 12 and 13 were especially appreciative of the information that mentors could provide about university life, supporting the previous years findings.

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4.5 Is ementoring rewarding?

- 87% (27/31) of mentees reported that they were happy with the ementoring experience and would recommend Live Journals to a friend or sibling.
- 80% (25/31) of mentees reported that they had found the ementoring experience rewarding.

As would be expected rewarding relationships seemed to correlate to high engagement.

5.0 Detailed use of Live Journals

5.1 Website Activity

A key objective of the Live Journals programme was to determine the importance of the website content for both mentees and the general public in helping young people make an informed decision about a career in engineering.

The most popular pages on the Live Journals website were articles:

- supporting the 14-19 engineering diploma containing information for mentees and mentors;
- case studies of real engineers which aimed to give pupils an insight into the daily life;
- informative resources on career paths taken by different engineers.

In addition, fun stories about gadgets and robots as well as the environment were always well-viewed. Themed weeks in which a series of articles would be written each day proved to be very popular and the most viewed series were “Weird Science” which covered the more unusual side of science and “Bond Gadgets” which looked at new inventions that could have appeared in films.

Month	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Average page views per visit	3.36	5.66	6.57	5.70	6.55	4.69	4.78	3.16	2.83
Page views	2381	5284	6050	4694	6565	5556	7277	4343	3788

Table 3 – Average page views per visit on the Live Journals website in academic year 3.

As per previous years, average page views by mentees ranged from between 3 to 6 views per visit depending on the time of year. Noticeably, in the month of March 7,000 page views were achieved, which was the month that a large amount of mentee recruitment and training took place in local schools.

The above data suggests that for young people who visit Live Journals, the website content is exciting and engaging to help young people explore and learn more about engineering and related careers.

Over the last year, Brightside has worked hard to further promote the Live Journals website through LEP partners within schools and within the education community. Noticeably, to accompany the recent introduction of the 14-19 engineering diploma Brightside added a suit of articles aimed at students studying the engineering diploma (<http://www.brightknowledge.org/search/?q=14-19%20engineering%20diploma>). These articles included case studies relating to diploma modules, course outlines and guidance for mentees and their mentors to explore diploma topics further. A teacher guide to using these articles in the classroom was then produced and distributed to a wide range of teachers taking part in the 14-19 engineering diploma

5.2 Mentee engagement

One of the core aims of Live Journals was to enhance the ementoring experience and improve mentor and mentee engagement through the use of structured conversations, managed projects and regular prompts. Encouragingly the data suggests that the changes to the recruitment linked with other LEP activities, training and monitoring process piloted over the past year improved mentee engagement and a project-based activity such as Greenpower was further enriching to the ementoring relationship.

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A total of 319 students registered to Live Journals of which 76% (242/319) were matched with a mentor. Noticeably, 78 mentees were provided with login details but failed to attend the training session thus were never matched with a mentor.

A total of 171/242 (71%) mentees were engaged or semi engaged (see Appendix 1 for definition of levels of engagement) on the Live Journals website between September 2008 and June 2009. Though no target was set for participation, in most Brightside ementoring programmes we predict 60-70% participation (engagement). Participation of mentees to the Live Journals programme was therefore high.

Status	Non-engaged	Semi-engaged	Engaged	Total	% who engaged ¹³ with programme by cohort
LEP cohort	35	71	60	166	78%
Sustainable Energy Scheme	36	22	18	76	52%
Male	54	58	33	145	63%
Female	17	35	45	97	82%
Total	71	93	78	242	71%

Table 4 – Engagement levels shown in the LEP and Greenpower Cohorts. Mentees are classed as never trained if they never logged in or posted on the site.

Some interesting gender findings:

- Female mentees were more likely to semi-engage or fully engage with their mentor than male mentees;
- Engaged male mentees were more likely to engage for a short length of time.

This data supports the previous year's findings that female mentees are more likely to have highly successful mentoring relationships.

Noticeably engagement was higher for the LEP cohort than the Sustainable Energy Scheme group. This is unexpected since in previous years very high engagement was seen in this cohort of pupils. As part of the Sustainable Energy Scheme mentees worked in teams and each team was assigned one mentor. Mentees met their mentors face to face several times during the school year and worked with them to produce an energy saving idea and build a battery powered car. In contrast to the previous years, mentees attended two rather than one competition events and so met their mentors and other mentors more often than in previous years. We suspect this greater face-to-face interaction resulted in less need for the online element resulting in lower online engagement than expected. In addition, some teams preferred to elect one or two team members to use the site to contact the team mentor leading to low website usage by other members of the team.

¹³ Engagement here includes semi-engaged mentees.

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Table 4 also shows that 29% of mentees (71/175) were non-engaged. Non-engagement is usually the result of computer technical failures, limited mentee access to the internet, poor training, allocated mentors not posting an immediate introductory message or leaving large gaps between messages, or simply a mentee deciding that ementoring was not for them.

Both male and female mentors were shown to be able to provide effective mentoring relationships however female mentors (78%; 71/91) had slightly more engaged mentees than male mentors (72%; 75/104). This may support the role of female mentors providing a higher level of psychosocial support to their mentees¹⁴, and thus developing stronger relationships with their matched mentee. In addition, as female mentors were usually matched with the same sex mentees, this may have also played a role as to why proportionally more female mentees than male mentees engaged in the scheme.

5.3 School recruitment and lessons learned

A key aim of the Live Journals programme was to assess the added benefit of integrating the Live Journals ementoring programme with other LEP interventions versus a standalone approach.

Table 5 lists the engagement rate for the schools that participated in Live Journals. Pleasingly the majority of schools on average achieved high engagement rates (over 60%). Engagement was higher in schools already taking part in additional LEP activities. This reflects the impact of the strong relationships built up with science and engineering teachers within these schools over the course of the three year LEP pilot.

School recruited from	% engaged
LEP School	
Teacher at Bacons College	86% (25/29)
Bow Boys School	42% (3/7)
Mulbery Girls School	58% (7/12)
St Thomas the Apostle Boys School	100% (5/5)
St Martins in the Fields School	86% (13/15)
Lillian Baylis	80% (8/10)
Little Ilford School	83% (5/6)
Non LEP school	
Paddington Academy	62% (5/8)
John Kelly Boys School	60% (3/5)
Diploma Class	
Lambeth Academy	61% (11/18)
Kingsdale School	88% (16/18)
Stockwell Park High School	81% (18/22)
Sustainable Energy Scheme Schools	
Up to 12 mentees from 7 southampton schools	76% (55/76)
Other	
Mentees still on site from 2008	100% (12/12)

Table 5 – Schools taking part in Live Journals

¹⁴ Syvante DJ and McChystal E. Refining Familiar Constructs: Alternative Views on OB, HR, and I/O 2007. Chapter 3: An Empirical Test of Gender-Based Differences in Ementoring: 27-43.

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One teacher (St Thomas the Apostle Boys School) was so excited by the possibilities of Live Journals, she has engaged the existing mentees to help recruit new mentees in the coming year and is providing access to school PCs during lunch hours to encourage pupils to take full advantage of the resource in the coming year.

The high engagement seen at both St Martins in the Fields and Bacons College is notable due to the larger class sizes involved. As before, this is likely to be due to the positive actions of the link teacher in;

- actively encouraging pupils during their training session to make the most of their mentor,
- allowing mentees to self select rather than putting forward chosen pupils to take part;
- prompting pupils to log in following the initial training session.

Due to a number of school delays, it is anticipated that the late recruitment and training of Mulbery Girls School mentees resulted in the lower engagement, even though the teacher was very active. Students were trained at the start of the summer term close to exams and thus students were unable to devote the required free time to extra curricular activities. This teacher is keen to link the Live Journals ementoring with the school's new engineering club in the coming academic year as an extra tool to enthuse young people.

Schools offering the 14-19 Engineering Diploma in Southwark and Lambeth were given the chance to match pupils with a Live Journals ementor. Three schools took advantage of this opportunity with largely high engagement. A large number of resource articles were added to the Live Journals Library to support both mentees studying the diploma and their mentors. These were promoted to Live Journals users and diploma teachers to refer to with great success. Once again the high engagement seen in Kingsdale School is in part the result of the enthusiasm and encouragement of the teacher involved.

Noticeably, high mentee engagement was achieved at Lambeth Academy and Stockwell Park High School despite technical difficulties and poor facilities. This may reflect the fact that mentees studying the diploma appreciated the support of a mentor and the wealth of information related to the diploma found on the Live Journals website.

Although online engagement was lower in the Southampton Sustainable Energy cohort, examination of mentee posts showed that many mentees were actively engaged with their mentors offline and so used their Live Journals account less often to catch up with their mentor between face-to-face meetings.

The above results and feedback from both teachers and mentees (analysis of posts) supports the use of ementoring adding value to the impact of other LEP outreach activities and specialist subjects such as the 14-19 engineering Diploma. We therefore recommend that further work is piloted in this area in the coming year.

As with any type of school outreach activity, the input of the class teacher is an independent factor. Encouragingly, the Live Journals pilot has enabled the developed of a good interactive mentee training session, mentee guidebooks, password cards and targeted follow-up support for each mentee to help overcome the variability in teacher input.

6. Mentor/ mentee narratives

6.1 Less valuable mentoring relationships

Mentor does not respond promptly

Mentors on Live Journals all attended a face to face or phone briefing session and were reminded of the importance of logging into the site regularly and responding to mentee posts where possible within a week. Where mentors were not able to respond to mentee posts within a week, a large negative impact could be seen on the standard of the relationship and the depth of topics discussed. This can be seen from the dialogue below. Although the mentee initially appeared to be keen to take the mentoring further over time the mentor started to take longer to reply to each post. The final mentor post was sent almost three months after the mentees post. The mentee did not respond to this post and the mentor did not send any further posts to encourage his mentee.

hey there, i am really interested about engineering and i plan to go into a job involving electronics or mechanics. **Mentee** -- Fri Jan 9, 2009

Hi, Great to hear from you. I understand you've just started the engineering diploma.How are things going with that? What sort of things are you doing at the moment? As you probably know from my profile, i'm a mechanical engineer and have been working about 2.5 years out of uni. Engineering offers a lot of different opportunities including foreign travel and working on forfrontal research. What sort of aspects of electronics/mechanics are you interested in. Speak soon **Mentor** – Sat Jan 10, 2009

Things are going fine with my engineering diploma and we are currently learning about Digital Circuits. **Mentee** -- Fri Jan 16, 2009

Electronics! Not really my speciality but have their uses all the same. Which parts of your diploma are you enjoying the most? **Mentor** -- Wed Jan 28, 2009

I am finding the practical part of the diploma the most enjoyable as i like doing things and not just watching them. **Mentee** -- Fri Jan 30, 2009

How are things going? Have you found any more out about possible career paths in electronics or mechanics. If you need any guidance then feel free to drop me a message. **Mentor** -- Wed Apr 29, 2009

6.2 Valuable mentee/ mentor relationships

Mentee and mentor focus on Science and engineering

The mentor and mentee were matched in 2007 and after a slow start both began sending regular messages and this continued through 2008 and 2009. Both the mentee and mentor appeared keen to discuss Science and Engineering but were happy to explore many different topics allowing the mentee to widen his horizons considerably. The conversation below evolved from a discussion about carbon footprints and nuclear power.

There is a lot of science still to be done on nuclear fusion. The main focus of work is in the South of France. The project is called ITER and involves scientists and engineers from around the world. What area of science do you find most interesting? **Mentor** -- Sun Nov 30, 2008

I am do not have a specific area of science, that I am interested in at the moment. Sadly for me science has simply become about passing my science exams. **Mentee** -- Sat Dec 6, 2008

Although the mentee is initially rather negative the mentor is not deterred and looks at the lighter side of science.

Pity, but then an appreciation of Science can be very useful... even as a side interest to other activities! Did you watch that programme recently by Prof Brian Cox about Time? - Brian Cox was once a musician with D:Ream but became a particle physicist.... Did you know that Brian May, the lead guitarist with Queen is also a PhD astrophysicist... and from my old College - Imperial. Do you listen to the Royal Institution lectures at Christmas? **Mentor** -- Mon Dec 8, 2008

Im sorery but I didn't, however I do beleive that as you say there is a strong link between mathmatics (or its application in physics) and music, my younger sisster for example is both mathematical and musical, and so is my friend. Also I believe that I have found and area of science that I am interested in, Biology. **Mentee** -- Sun Feb 1, 2009

When the mentee mentions his interest in Biology the mentor immediately makes the links between Biology an Engineering and sparks the mentees interest in reading more about engineering

Excellent! Just read my Engineering & Technology journal: a lot of exciting developments in bioengineering...**Mentor** -- Fri Feb 6, 2009

How do I get to said journal, please tell me. **Mentee** -- Fri Feb 20, 2009

It is the monthly journal of the Institution of Engineering and Technology (IET). Anyone may join the IET and they would be very pleased with young students joining but it does mean a yearly subscription. I cannot remember the cost. However, as an alternative it may be possible for your school or library to get hold of a copy. It is also possible that your science teacher may be a member. I shall have a word with the IET. **Mentor** -- Thu Feb 26, 2009

Thankyou, I will look into it. **Mentee** -- Sun Mar 1, 2009

From an initially negative start the mentee later shows that he is interested in learning more about Science and Technology and is in fact eager to explore the subject outside of his exams. The mentor's advice and recommendation of the IET journal is a chance for the mentee to gain benefit from the mentoring which has the potential to last long after the mentoring relationship has ended.

Variation of subject matter

Many mentors and mentees adopted an informal, friendly style of writing sometimes swapping chatty information about their lives and day to day worries. This appeared to strengthen the mentoring relationship, making it more resilient and more likely to last over time. This can be demonstrated as one mentor and mentee discuss the snowfall and music taste alongside recent news stories and school work and subject choices.

It sounds like you've got the right idea with your school subjects. I did 9 GCSEs - pretty much the same mixture as you, and 3 A levels. When I chose my A levels I didn't have a clue what I wanted to do at University, so I chose Physics, Maths and French. My Dad thought it was an odd combination, but I enjoyed all three. It was a slight problem not having Chemistry when I went to apply for Mechanical Engineering, but not a biggie. It was more important to have Physics and Maths and a decent grade in my third subject. Generally it's only Physics and Maths that are needed - unless of course you fancy Chemical Engineering.

I'm a bit of an 80s rock-chick, I guess you'd say. I like Bon Jovi, Aerosmith etc. Also female artists - Christina Aguilera, Kelly Clarkson, Shakira. (I was learning Spanish a couple of years ago and enjoyed singing along in Spanish!). McFly are great!

It sounds like you're getting a taster of Engineering already - have you enjoyed the activities you've done? I must admit I didn't have any burning desire to do Engineering, I chose the degree more to keep my options open. I figured I could always go back and learn languages, or English or whatever, but that once I'd left the Sciences I'd never go back. Having said that, I don't regret it in the slightest. Which are your favourite subjects at the moment, and which do you think you're best at? Are they the same as each other?

Best wishes, **Mentor** -- Mon Feb 2, 2009

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i've been doing jujitsu for about 2 and a half years....

erm my favourite subjects at the moment would probably be art and textiles just because they're relaxing and french but i did enjoy biology last term but i've swapped biology and chemistry to physics and coursework to focus on exams. i did enjoy the engineering i have done but i'm not as enthusiastic to get involved with it now as i dont partially enjoy staying after school without friends

were you effected by the snow today i had the day off school so i was really happy and had a large snowball fight with my neighbours

Speak soon **Mentee** -- Mon Feb 2, 2009

I'm jealous about you having time off because of the snow. I had to come to work because I only live three miles away so it's hard to justify not coming in! Did you build a snowman? I made a really tall one yesterday morning before coming to work but he'd fallen over by the time I got home :-)

I understand your feelings about not wanting to stay for after school activities if your friends aren't interested. It's not always a lot of fun if you're the only person you know that wants to do it. I think that's a problem we girls have more than boys in engineering type subjects.

Did you hear on the news about the plane that crash landed in the Hudson River in New York? I heard the voice recording from the cockpit on the news last night - I can't believe how totally calm the pilot was! Crazy.

Have a great weekend, **Mentor** -- Fri Feb 6, 2009

i had two days off, that i really enjoyed i made a snowman but i was confined to a small area of where live as the buses weren't working so i couldn't visit school friends. i had a huge snowball fight with my neighbors though and really enjoyed it.

boys don't really care whether their friends stay after school as they just get on with things but girls wont stay unless there is someone to go home with

I haven't heard the news about the plane crash in new york , but i think i'll look it up when i get home. It's devastating to hear about the fires in Australia and the possibility that it could have been an arsonist- so many people have died. I have a Science in the News task the week after next but i don't find out the topic until thursday. This kind of worries me as it could help my grade but take it down.....

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I have have three different tests for it but not all at the same time one for Biology, one for Chemistry and one for Physics have a nice week. **Mentee** -- Wed Feb 11, 2009 08:59

Mentees engaged but leave very short posts

Some mentees only left very short and quite limited posts but appeared to engage with the programme fully as their posts were relevant and were left regularly. The success of these relationships was due to the dedication of the mentor who would make an effort to answer the mentees short posts with longer engaging and more informative posts on engineering. An example of this kind of relationship can be seen below. Although the mentee posts are very short and do not show much enthusiasm for the mentoring, the mentee obviously reads the mentors responses carefully, replies regularly and keeps the conversation going over a period of several months. Crucially, the mentor helps increase the student's interest in engineering.

why did u choose your job?
is it good?
is the power station big? **Mentee** -- Tue Mar 10, 2009

I chose my job because I get to work with huge pieces of kit, I get to help provide an essential service to the UK and I am passionate about the environment which I can have a part in helping in my job. I am one of the lucky ones because I love my job, everyday is something different, everyday is a challenge and I enjoy the work I get to do. I work on a 1500MW station, that probably doesn't mean a lot to you but the station can provide power for approximately 1.2million homes in the UK. It's coal fired which means it is pretty big because of new laws we have had to add some cleaning plant to reduce pollution and that is pretty big as well. **Mentor** -- Thu Mar 12, 2009 10:14

could you tell what types of engineer there is. **Mentee** -- Sun Jun 28, 2009

To answer your question engineers usually fall under the following categories:
Mechanical
Electrical
Civil/Structural
Chemical

Within these categories there are many more types of engineers, to name a few:
Marine
Aeroneautical
Boiler
Turbine and generator

Although to be a doctor you must go through all your schooling you don't necessarily have to have a degree to be an engineer. For example I am a boiler engineer which means I work on a big power station boiler, but the gentlemen that comes to your house to fit your boiler can call himself a boiler engineer aswell. I hope this helps. **Mentor**-- Tue Jul 14, 2009

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hi

is being a boiler engineer hard, your job. **Mentee** -- Tue Jul 14, 2009

Sometimes yes, I enjoy my job and I also enjoy a challenge so when work gets difficult it can be hard going but the satisfaction at the end is amazing. To me there is no bigger high than seeing something you have spent so much time on coming together and working correctly. I suppose it's hard because I have a lot of responsibility and the final decision on things usually rests with me and my manager.

Mentor -- Fri Jul 17, 2009

Mentee is rematched

In the example below the mentee was initially matched to a mentee who did not reply to her initial post

Hi i'm interested science and i went to cern last year and have a real curiosity towards nuclear engineering and physics in general. WHAT ARE YOU INTERESTED IN? **Mentee** -- Thu Apr 2, 2009

Welcome to LiveJournals!

It is good to see that you are interested in science, especially nuclear engineering and physics. Both are very important and will become more important in the future, especially nuclear engineering as the government looks to replace old nuclear power stations and reduce the UK's carbon emissions.

There is a shortage of nuclear engineers in the UK, and the problem is getting worse as old engineers are retiring. With new nuclear stations being planned, however, demand for nuclear engineers is going to increase massively in the next decade so it could be a very exciting time to get into the nuclear industry if you choose to do so. There is also a shortage of physicists... In fact there is a shortage of scientists in general so if you pursue a career in science and engineering you will certainly be in demand!

I have also written a few articles for the LiveJournals library: three articles in the Mechatronic Engineering section and 'What Did You Do For Your Degree Project?', which is accessible via the search function. Please keep me up to date with what you are doing, and any thoughts you may have going forward. Have a good week! **Mentor** -- Mon May 11, 2009 11:57

Hi, thankyou for replying. Wind farming really interests me as i care about the environment and i do alot of stuff at school to help stop global warming. Anyway, i wanted to tell you about an article i recently read that was designed to persuade young people to look into astro physics, and i'm kind of swaying toward it now. However i'm really undecided because i've always been keen to take on nuclear physics, but now astro physics also interests me. can you help with advice and information? Thankyou, Good night **Mentee** -- Wed May 13, 2009

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Regular informative mentor posts.

A proportion of semi-engaged mentees log on far more often than they post, suggesting that they are interested in reading their mentor's posts and Live Journals articles on the site but are not writing messages themselves. In the posts below it can be seen that the mentee has read the mentor's post and taken note of the information but is not able to or does not wish to continue the conversation further. Unless mentees gain the confidence to start posting less passive messages the relationship will begin to wane.

Hi! I'm new on here. I was waiting at the bus stop today and a boy was blowing bubbles with one of those bubble blowing bottle things. Basically i was wondering why do the bubbles turn out spherical. Its not really engineering so its ok if you don't know. **Mentee** -- Wed Mar 11, 2009 11:35

Hello! Bubbles - interesting question. Having done a fair amount of science over the years, I hope I can answer that question. Its all about surface tension, and the bubble 'skin' attempting to make itself smaller. Basically, having trapped the air, the bubble tries to contract (due to the surface tension). Contract means making the surface of the bubble, smallest. But the air is trapped, so what you end up with is a shape which for a particular amount of air (i.e. volume) - minimises the surface area. The shape happens to be a sphere. I'm sure its tricky to prove - but it can be demonstrated against a couple of other shapes:

Can I challenge you to try some maths. To calculate the ration of surface area to volume for

1 - a sphere

2 - a cube

3 - a stretched square (depth and height the same, but length being twice the depth)

I'll do it as well, and post the answer's that I get for each - i.e. the ratio of surface area / volume (but volume will always be 1cm cubed). So, what year are you in? What do you like to do for fun? Tell me a little about yourself, ok? **Mentor** -- Fri Mar 13, 2009

ok thanks i will do at some point . im in the middle of alot of revision work. do you know of any industries that use computer based systems in the production of consumer products. (if you could provide some links it would help) **Mentee** -- Fri Mar 13, 2009

Most industries will use computer based systems to help design consumer products. I think you'd be hard pressed to find any who don't to tell the truth. I design computer systems which need to operate in a robust environment - so we do lots of mechanical analysis (predicting how the items survive shock and vibration mostly) using computer modelling, and also such things as heat flow models. What kind of computer based systems are you thinking about? CAD design programs? modelling programs? Stick with the revision work - it really pays dividends spreading revision over as long a period as possible - to avoid cramming at the last moment. **Mentor** -- Sat Mar 14, 2009

7. Key findings and conclusions

7.1 Key findings

The main aim of Live Journals was to increase participation in engineering HE by increasing the awareness and aspirations of non-traditional HE entrants and currently under-represented groups in choosing engineering as a career. Noticeably, the majority of mentees (97%, 81/83) were considered to be socially disadvantaged (as defined by HEFCE)¹⁵ and 80% of mentees stated they had already decided to go to university (25%;7/14) or that their mentor had inspired them to think about going to university (55%;17/31) at pilot completion.

The Live Journals programme also potentially helped encourage more young people to study engineering, with 100% (28/28) of mentees agreeing that an **engineering degree offers many interesting career options** and 30% (6/20) of respondents (excluding diploma students) reporting that they were **more likely** to study engineering at the end of the pilot. This aspiration was also supported by 71% (12/17) of year 10 and 11 students intending to study for a science and maths AS and A level. This data indicates Live Journals played a role in helping widen participation to engineering HE.

Live Journals also seemed to help mentees make an **informed decision** about their future. 100% (10/10) of year 12 and 13 students reported a good understanding of the choices open to them once they left school. Nearly half of all mentees (48%; 15/31) felt that ementoring had directly provided a greater understanding of university life and the various careers available.

Mentees (31%;9/29) also felt that ementoring had directly increased their confidence to attend university, and had found it a useful source of information as no-one in their family or group of friends knew anything about university.

The potential impact on mentees confidence in their abilities and motivation for school work was difficult to measure as both parameters were very high at the start of the pilot. Encouragingly though, high confidence and motivation was maintained with pilot completion showing:

- 97% (30/31) of mentees felt confident in their abilities;
- 94% (29/31) of mentees felt motivated by their school work.

65% (20/31) of mentees also agreed or strongly agreed with the statement "*I have a good understanding of the options open to me once I leave school*" and 61% (19/31) of mentees agreed or strongly agreed with the statement '*I feel well prepared for the future*'.

In summary, this data suggests that Live Journals e-mentoring is an effective tool to help, support and encourage students to make informed choices about school, university life and possible career choices. Through providing this information, Live Journals plays a role in helping to raise aspirations to university and engineering of non-traditional HE entrants.

¹⁵ http://www.hefce.ac.uk/pubs/hefce/2007/07_12/07_12.pdf.

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7.2 Key data

- 87% (27/31) of mentees reported that they were happy with the ementoring experience and would recommend Live Journals to a friend or sibling.
- 80% (25/31) of mentees reported that they had found the ementoring experience rewarding.

7.3 Conclusions

As with previous findings, Live Journals demonstrated that rewarding relationships seemed to correlate to high engagement. Mentee relationships with the highest levels of interaction and satisfaction seemed to be the more conversational, wide ranging and unstructured relationships. Live Journals relationships generally lasted from two months to two years. A successful relationship was very much on the onus of a mentor to develop and maintain over time through posting long, regular and open-ended messages to generate useful discussions. Mentee relationships with the highest levels of interaction and satisfaction seemed to be the more conversational, wide ranging and unstructured relationships. Good training of mentors and mentees was essential in providing high quality ementoring relationships.

Live Journals had a high level of engagement (71%) which may reflect the integration of ementoring with other face-to-face LEP¹⁶ activities and the strong relationships built with the LEP schools over the course of the three year pilot. Pleasingly many of these schools are keen to be involved in Live Journals post pilot. One teacher is particularly keen to link the Live Journals ementoring with a STEM¹⁷ club as an extra tool to enthuse young people.

Supporting previous year's findings, Live Journals found that female mentees were more likely to engage or highly engage (greater benefit) than their male counterparts, of particular importance as female students are currently under-represented in engineering degrees at universities. Female mentors (78%; 71/91) also seemed to provide more effective mentoring relationships than male mentors. This may support the role of female mentors providing a higher level of psychosocial support to their mentees¹⁸, and thus developing stronger relationships with their matched mentee. In addition, as female mentors were usually matched with the same sex mentees, this may have also played a role as to why proportionally more female mentees than male mentees engaged in the scheme. These conclusions, suggest an important role for female mentors and mentees in helping to overcome the current gender imbalance seen on engineering degrees.

Counter intuitively there was a reduction in the number of diploma students who intended to study engineering in the future with 50% (3/6) appearing to be less interested in studying engineering at the end of the pilot. This was also matched by an increased fear that A-level Maths and Physics would be difficult, their interest in engineering reducing and a less strong belief that their parents would like them to study engineering. It is unclear why this happened and potentially can be linked to 'teething problems' with the engineering diploma in its first year, students applying to the diploma without full knowledge of what it entailed or the fact students were sitting exams in engineering when filling out the second survey. Noticeably, high engagement for the diploma students was achieved despite poor training due to technical difficulties. This may reflect the fact that mentees studying the diploma had a greater need for an engineering mentor and the wealth of information related to the diploma found on the Live Journals website.

A committed teacher was also found to be essential for a successful ementoring programme. However, as with any type of school outreach activity, the input of the teacher is an independent

¹⁶ LEP – London Engineering Project

¹⁷ STEM – Science, Technology, Engineering and Mathematics

¹⁸ Syvante DJ and McChystal E. Refining Familiar Constructs: Alternative Views on OB, HR, and I/O 2007. Chapter 3: An Empirical Test of Gender-Based Differences in Ementoring: 27-43.

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factor. Encouragingly, the Live Journals pilot has enabled the development of a good interactive mentee training session, mentee guidebooks, password cards and targeted follow-up support for each mentee to help overcome the variability in teacher input.

The website was, as per previous e-mentoring programmes, highly appreciated. Though website hits are still lower than Brightside would like, it is clear that direct contact with teachers during recruitment months increased page views and hits, strongly suggesting that teachers were utilising and/or promoting the website to their school students (not just mentees). Articles supporting the 14-19 engineering diploma have been popular with mentees, mentors and teachers alike and Brightside are currently exploring routes to further promote this unique engineering content within and beyond LEP schools.

Live Journals to date has been highly effective at demonstrating the type of activities which aid engagement and impact. Critical factors include a well planned ementoring programme with a strong network of schools, universities, and company ambassadors. However, to provide a scalable, cost-effective, long-term model, further work needs to be undertaken in this area. We are confident with continued funding, the lessons learned and benefits from Live Journals has the potential to evolve into an extremely valuable and high impact intervention for encouraging widening participation in STEM and engineering.

“My mentor is super cool and I have learned so much about myself, what I want to do in the future. I've learned about how to prepare myself for what comes next, including uni and college, the different opportunities there are out there for me and my possible career choices. Ementoring has really helped.”

Live Journals Mentee - June 2009

9. Appendix 1: Definitions of engagement level

The Brightside Trust have developed a more comprehensive definition of engagement which is now used across all ementoring programmes. The new definition of engagement captures the impact of the website content as well as the ementoring functionality.

Engagement Level	Number of posts
Not Engaged	0-1 posts
Semi-engaged	2-5 posts inclusive OR between 1-3 hours on the website OR logged in over 10 times
Engaged	More than 5 posts OR over 3 hours on the website OR logged in over 20 times



Present to

UK Resource Centre for Women in SET

An Evaluation Gender Mentoring within the
London Engineering Project &
Stimulating Physics Project

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1. Executive Summary

Background to SET and the UKRC

The Science, Engineering, Technology (SET) and Built Environment sectors are amongst the most highly gender segregated with women still representing a minority at every level within these occupations. The UK Resource Centre for Women in Science, Engineering and Technology (UKRC) was established in 2004 to deliver a substantial part of the Government's Strategy for Women in SET (2003).

The aim of the UKRC is to increase the participation and position of women in Science, Engineering and Technology. UKRC has been contracted as a gender mentor to the London Engineering Project (LEP) and the Stimulating Physics Project (IOP).

LEP and IOP are two distinct projects. They are both pilot projects – the LEP pilot is due to end in April 2008 and IOP is due to end in May 2008. Both pilot projects have now been extended to July 2009. It is intended that this evaluation report will inform the continuing activities of UKRC input into these pilot projects and identify which approaches, structures and delivery methods would be most effective for UKRC to use in the potential national roll-out in July 2009.

Methodology

In order to evaluate each project we studied a wide variety of reports, working documents, minutes of meetings and feedback/action points generated at each of the Gender Equality training events and conducted focus groups or structured interviews with all key stakeholders.

Findings

As a result of conducting the evaluation of UKRCs contribution to the London Engineering Project (LEP) and Stimulating Physics Project (IOP) we conclude that UKRC has a vital role to play in any National roll-out in raising the importance of gender inclusivity and diversity within partner organisations, schools and HE. Information and examples of the impact of the UKRCs gender equality input described by the UKRCs employees have been fully corroborated by the people we interviewed. The credibility and professionalism of the UKRC has definitely been established and the people involved in the delivery have played a major role in this achievement. The excellent relationships which UKRC representatives are forging with these and other organisations makes it most likely that there will be far reaching influences and further opportunities to deliver the message and provide the necessary help and support.

The approaches, structures and delivery methods adopted by UKRC for use in a potential roll-out should continue to reflect the strengths of the work carried out to date. Namely it should:

- Create a strong driving force which has clear roles and responsibilities across the UKRC team
- Retain its reputation for quality i.e. “doing it properly”.
- Be relevant to a wide audience
- Clearly inform all partners about the support available to them
- Provide context in which to develop activities
- Provide a benchmark for partners
- Create confidence in the abilities of all the partners
- Provide a level playing field – providing GE Training and support to all
- Provide Gender Equality training days – they are extremely useful and informative and make a tremendous impact on the delegates including providing credibility for the role of UKRC

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- Build upon and share the already established good practice ideas, activities and scenarios
 - Introduce a way of standardising GE messages and ensure everyone operates to a high standard e.g. process and the experience and expertise of UKRC employees and representatives
 - Ensure UKRC representatives are available for face-to-face discussions with partners and schools
 - Conduct follow up visits to partners and advisors
 - Conduct observations of partners and advisors
 - Consider the development of an in-house champion within partner organisations who could then take over from UKRC within their own organisation
 - Set agreed KPIs and activities for providers and monitor them, including the completion of agreed activities/KPIs.
 - Engage the Head Teachers - show how the work being carried out links to the school's curriculum as this is the Head Teachers area of focus.
 - Ensure advisers to schools are credible in the science field
 - Put more emphasis on providing schools with information, perhaps more technology driven
 - Develop Ambassadors from among the schools

In addition there are also some common themes that have been identified:

In order to be seen as a significant contributor to the roll-out UKRC should be on the strategic board. This would signal to all partners the significance and importance given to gender equality at a strategic level. It is also important that UKRC are involved in the project from the beginning to ensure all partners understand their role and involvement.

Partners should be compelled to follow an agreed formal GE development process to ensure consistency, compliance and ownership of good practice, with UKRC support. If partners are not compelled it will make them slow to start

and they can ignore any feedback. As a result of attending Gender Equality Training people realise that there is a gender inclusivity problem, which enables the change process to start, it causes them to think differently and is 'mind shifting'.

There should also be Service Level Agreements with specific requirements for gender inclusivity – as a minimum it should include how many girls should be included in an activity, a requirement that partners attend gender equality training and a requirement that all reports will include information regarding girls e.g. numbers and activities.

It is clear from feedback that processes need to have a practical application and should be developed as tools to drive change and to capture changes made and why. They enable people to identify and record what worked and what didn't and provide opportunities for stakeholders to discuss tools with 'experts' for a significant period of time. Where formal processes and agreements exist they have proven to be significantly more successful and enabled faster change.

The UKRC approach of discussion and negotiation has been an effective way to ensure stakeholder buy in to the concepts being put forward and their informal meetings provide stakeholders with practical advice.

Feedback indicates that the change in behaviour is brought about by a constant drip feed of information and support. This is not a quick fix process but rather one that requires constant support and reassurance and the continued input of 'expert' advisers over a long period.

2. Introduction

Chrisalys has been contracted to conduct an evaluation of UKRC's role as gender mentor to the London Engineering Project (LEP) and the Stimulating Physics Project (IOP). This report will introduce both projects and will then evaluate the London Engineering project concluding with an overview of the whole activity. A separate report will be produced in relation to the evaluation of Stimulating Physics. A third report will provide the complete evaluation of both projects.

LEP and IOP are two distinct projects. They are both pilot projects – the LEP pilot is due to end in April 2008 and IOP is due to end in May 2008. Both pilot projects have now been extended to July 2009. It is anticipated that in July 2009 a national Science, Technology, Engineering and Maths (STEM) project will be rolled out nationally, which will be a combined programme of the LEP and Stimulating Physics, together with the pilot Maths and Chemistry projects. UKRC has not had input to the Maths and Chemistry projects.

It is intended that this evaluation report will inform the continuing activities of UKRC input into these pilot projects and identify which approaches, structures and delivery methods would be most effective for UKRC to use in the potential national roll-out.

3. Background to SET and the UKRC¹

The Science, Engineering, Technology (SET) and Built Environment sectors are amongst the most highly gender segregated with women still representing a minority at every level within these occupations. It is clear that the under-participation of women and black and minority ethnic (BME) people in SET is damaging the UK's supply of scientists and engineers and this loss in turn

¹ As described in the tender brief

impacts on the UK economy and its global competitiveness. The Science and Innovation Investment Framework 2004 – 2014 (2004) sets out a strategy for the UK indicating the areas of scientific growth and the need to recruit and retain women and men in scientific research and development. The skills of the labour force, which includes the untapped and often undervalued contribution of women scientists and engineers, are vital to the economic success of the UK.

Although the representation of women SET graduates has increased over the last ten years, they still account for just 18.7% of those employed in SET. Only 25% of women with SET degrees are working in SET occupations, and each year out of around 24,000 women with SET qualifications who return to work, only a third return to SET. It is therefore estimated that 50,000 SET women graduates do not work in SET occupations. Since the early 1980s there have been numerous initiatives aimed at understanding and addressing women's under-representation in SET, which persists in spite of girls' high performance in science at school. Much of this work has concentrated on improving access and equipping women to fit into existing SET culture however the high drop-out rate of women who have entered SET has prompted an examination of SET culture itself.

The UK Resource Centre for Women in Science, Engineering and Technology (UKRC) was established in 2004 to deliver a substantial part of the Government's Strategy for Women in SET (2003). Originally funded from the science budget of the Department of Trade and Industry (DTI), the UKRC reports into the Office of Science and Innovation, now part of the newly established Department for Innovation, Universities and Skills (DIUS).

The aim of the UKRC is to increase the participation and position of women in Science, Engineering and Technology. It provides information and advisory services to industry, academia, professional institutes, Research Councils and other organisations within the SET and built environment professions, whilst supporting individual women entering, returning and progressing in SET careers.

The UKRC also compiles information and statistics on women studying and working in the fields of SET and the Built Environment and commissions research projects on specific areas relating to women in SET. The UKRC also funds a number of smaller, pilot projects, which are delivered by partner organisations.

4. Focus of the Evaluation

The key aim of the evaluation is to identify the impact and outcomes of UKRC input to LEP and IOP. Since each project has differing structures, methods and approaches to widening participation in STEM, this evaluation offers UKRC an opportunity to identify its impact in these differing situations. As a result of our activities we are in a position to provide the following information in regard to each project:

- The impact UKRC has had on increasing gender inclusivity and the changes that have been made to materials, delivery, approaches and policy as a result of UKRC input
- The impact UKRC input has had on increasing gender inclusivity within partner organisations including changes to practice and policy as a result of UKRC input
- The processes, approaches and structures used by UKRC that have been effective in increasing gender inclusivity
- The impact UKRC input has had on mainstreaming gender equality
- The changes UKRC could make to the design and delivery of its gender mentoring role to increase impact
- The approaches, structures and delivery methods that would be most effective for UKRC to use in the potential roll-out

This information is provided in the 'Findings' sections within this report (LEP findings Pages 9 to 33 & IOP findings Pages 37 to 58).

5. Methodology

In order to evaluate each project we studied a wide variety of reports, working documents, minutes of meetings and feedback/action points generated at each of the Gender Equality training events and conducted focus groups or structured interviews with all key stakeholders. The majority of the interviews lasted at least an hour and participants were asked specific questions designed to elicit the maximum information in the areas outlined above.

All the people contacted were made aware of the reason for the interview and that information they provided would be used to inform this evaluation report. They were also aware that direct quotes from their answers would be used in the report, where appropriate, but that these quotes would not be referenced to an individual. Extracts from these discussions are provided as Appendix 1.

We would like to take this opportunity to thank everyone who took part in the evaluation for the frank and very useful information they provided.

6. London Engineering Project Overview

The London Engineering Project, led by The Royal Academy of Engineering (RAE) and funded principally by the Higher Education Funding Council (HEFCE), aims to increase and broaden participation in engineering higher education. It particularly seeks to increase Science, Technology, Engineering and Mathematics (STEM) attainment and progression amongst women, BME students, adult learners and those from families with no previous history in higher education. Through a partnership of schools, universities, STEM organisations and industry, students from thirty schools across South London are engaging in STEM enrichment activities. Higher education partners – London South Bank University (LSBU), University College of London (UCL) and University of Sussex – are developing and enhancing degree courses aimed at

attracting and retaining a broader range of engineering students. This evaluation will cover the period from February 2006 to March 2008.

Work with schools is delivered by a LEP project team, who are based in LSBU. This includes fieldworkers from key partner organisations – LSBU, University of Sussex, StemNet, Smallpiece Trust, Young Engineers, The BA and UKRC. Each partner organisation delivers an agreed range of activities with schools including STEM enrichment activities in school and LSBU, Science and Engineering clubs, residentials and mentoring.

Work with HEIs is co-ordinated by an HEI working group and delivered by members of the group, which includes engineering academics from the partner universities, representatives from the RAE, the Engineering Professors' Council, Widening Participation Advisors, experts in science teaching and UKRC. Each of the universities has a specific remit within the LEP to develop or enhance Foundation, BEng or MEng courses with a common theme of widening participation.

An LEP steering group, led by RAE and including senior representatives from each partner organisation, governs LEP.

The UKRC contracted activity is as a gender mentor to the LEP, delivering advice, training and hands-on support aimed at ensuring that all LEP activities, materials and approaches are inclusive to girls/women. Areas of work were expected to include:

1. Offering advice and expertise through mentorship to the LEP project team, HEI working group and Partners steering meetings.
2. Delivery of hands-on advice and support to LEP fieldworkers on activities, approaches, materials and mentoring – informally and through the formal DRIVE process.
3. Delivery of advice and support to HEI partners on developing inclusive engineering courses.
4. Developing good practice guidance materials and disseminating best practice.

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5. Delivering Gender Equality Training to LEP fieldworkers, Partners and facilitators of LEP activities.

The UKRC input is managed by:

- A UKRC fieldworker (based in the fieldworker project team offices within LSBU)
- A Strategic Manager who is a UKRC associate represents UKRC at the LEP and HEI steering group meetings and offers consultancy support to stakeholders/partners
- A (UKRC) senior manager who is responsible for the overall delivery of the contract

Our evaluation found that the activities described in 1 – 5 above were carried out in a number of ways as follows:

1. The LEP Strategic Manager sits on the LEP Board and steering group and the HEI working group. This enables her to contribute to discussions regarding key issues such as HEFCE funding for the next round, gender and ethnicity and to influence the outcomes. She has formed excellent working relationships with the individuals involved in the working/steering groups and is often involved, outside the meeting, in informal discussions around how their activities in regard to gender and ethnicity could be applied back in their workplace. She also acts as a consultant and a sounding board to a wide range of other senior managers from stakeholder organisations.
2. The UKRC fieldworker provides advice and expertise regarding gender and ethnicity issues on a day-to-day basis to the other fieldworkers. This advice can be formal i.e. in response to a DRIVE form submission (Appendix 2), although the conversations are conducted informally and in a supportive manner. Alternatively the advice can be as a result of informal discussions conducted on a day-to-day basis within the office, where someone sees the UKRC fieldworker and this prompts a

discussion about something that has occurred or something that they are, or are going to be, involved in.

3. With the help of the UKRC Strategic Manager the HEI working group have worked together to develop a checklist (Appendix 3) and a supporting guidance document (Appendix 4) to promote inclusive engineering courses within Higher Education establishments.

The Strategic Manager presented an academic paper (Appendix 5), written by Dr E Read, Education Innovator, RAE and herself, at the Annual Conference of the Society for Research into Higher Education (December 2007) entitled 'Delivering Inclusive Engineering: a practical tool to promote best practice when developing and enhancing engineering courses'. This was developed with a view to ensuring that the academic community would value that which is being presented in the checklist documentation.

The UKRC fieldworker has been involved in developing good practice guidance materials. For example she has developed and produced a leaflet for parents. She is also heavily involved in supporting her colleagues to develop good practice guidance material.

The dissemination of 'best practice' threads through all the activities delivered by the UKRC team and in particular colleagues talked about learning how to practically apply what they had learned, the quality of the materials used and how the UKRC representatives always 'set a good example' in their day-to-day activities and interactions.

4. All LEP stakeholders confirmed that they had received Gender Equality Training. Some organisations had taken this further and invited UKRC to deliver training to employees within their individual organisations.

7. Findings (LEP)

This section of the report concentrates on identifying how UKRC has impacted upon the gender inclusivity of the London Engineering Project, specifically. It also identifies the changes that have been made to materials, delivery approaches and policy within the project, as a result of UKRC activity.

7.1 Impact

UKRC is involved in LEP at a strategic level. The UKRC Strategic Manager has developed extremely effective working relationships with other members of the Partnership Board, providing an opportunity to influence and impact upon a range of organisations. The Partnership Board is fully supportive of the work that the UKRC has done since being involved with the LEP. They appreciated what they and their staff had learned as a result of attending the Gender Equality Training and being involved with the UKRC team. They have also introduced further developments into their own organisations for example through additional Gender Training events, through the development of their internal strategies and systems or through the content and inclusiveness of their programmes and marketing materials.

The UKRC Strategic Manager is also on the HEI working group and her role at a strategic level within HE is seen as important in relation to credibility within this group “where a hierarchy exists”. There are regular curriculum development meetings where she has helped the HEI working group to develop practical tools which they can apply to address transitions issues from school to university e.g. checklist. Her academic colleagues have accepted her as credible, which the Partnership Board felt was very important in relation to recommendations being accepted by academic institutions. It was felt she had provided just what was required i.e. “this role required someone who could command academic colleagues, provide credibility to work in often difficult circumstances”. It was felt she had the “credibility, tact and experience needed” for this role.

The UKRC fieldworker role has also been a great success and having her involved in the day-to-day activities of the fieldworkers has proven to be a highly successful method of working. It was felt that in addition to being available for comment and training on a day to day basis the UKRC fieldworker role had been successful in helping the fieldworkers make the small 'detailed' improvements to image, message, colour, font, when, how and who.

There was absolute agreement amongst fieldworkers that the DRIVE process had been very successful. They did feel however, that it would not have worked so successfully without the Gender Equality Training that they had all received and that had been adapted to their specific needs. They felt that access to expertise in the gender area had created "massive mind set changes"

Most importantly fieldworkers felt that in most instances they could now examine their own and other organisations activities and marketing materials and identify what could be better and how to fix it. They felt that they now instinctively choose inclusive colours, images, and participants with just a formal check required from the UKRC fieldworker. They also felt however, that the DRIVE process plays an extremely important role in ensuring inclusivity continues to be a focus and the fieldworkers felt they still need the reminder to consider specific gender issues "without her reminding us we would slip back into our old ways".

There were also comments about the people skills both UKRC representatives had, for example their ability to deal with potentially explosive situations well, avoiding conflict and being non-confrontational.

One of the HEIs provides Ambassadors to LEP. Ambassadors are students recruited, wherever possible, from engineering, science and technology courses within LSBU. Currently the Ambassadors are both male and female volunteers, although they aim to attract females from diverse cultures wherever possible. Their role is to attend events and activities run by LEP fieldworkers to help enthuse pupils about engineering and to act as role models by telling pupils

about their experiences e.g. creative, fun, travel etc. The Ambassadors are considered to be a great asset and they are now able to identify when girls have not been engaged and to try to improve their involvement.

A very rewarding outcome of the work conducted by LEP is that the first school to have had an Ofsted visit have had the LEP programme mentioned positively twice in their Ofsted report. This should send positive messages to schools about how useful the work of the LEP group can be and how it can benefit the schools requirements in areas such as confidence, enjoyment and enrichment activities. As there was no direct reference to diversity within these reports it is difficult to assess what direct impact diversity training has had however, it can be assumed that diversity training has had a real contribution to the whole project.

In conclusion we believe that the work of UKRC has had a significant impact, particularly in relation to partner organisations, their staff, their policies and procedures and the materials and activities they use on a day-to-day basis. Early indications are that partners are starting to see an increase in the involvement of girls and young women that are expected to make a positive difference in the recruitment of women into HE in the future.

7.2 Changes that have been made to LEP materials, delivery, approaches and policy as a result of UKRC input.

7.2.1 Changes to materials

The benefits of the DRIVE process have already been positively established and it has been re-developed several times. Fieldworkers felt it was no longer cumbersome or a burden. They also appreciated the opportunity to discuss and be involved in the changes being made as they had all been involved and they felt that this involvement had given them ownership of the process.

Marketing materials have been undergoing continuous development and there is a definite recognition that “marketing materials have definitely changed across stakeholders”. Various fieldworkers and their organisations have developed ‘good practice’ posters. There has been an emphasis on ensuring colours are inclusive to girls e.g. including pink, as this seems to trigger to girls that this information is also relevant to them. They have increased the number of images they use of female role models on posters and materials, including those from an ethnic background and from a variety of engineering occupations.

Materials also have more images of others² and they make sure they look enthusiastic, are hands on doing something and include different cultural and ethnic backgrounds e.g. wearing Habib. One organisation chose to make up a character rather than use a person but when it was passed to the UKRC fieldworker as part of the DRIVE process she pointed out that although it wasn’t a real person it still represented a ‘white male.’ This generated lots of debate and research and in the end the organisation developed lots of different characters with a multicultural theme running through and it has been very successful with the children in schools. Another person commented about comparing the difference in publications from before and after LEP, “there’s a massive difference, more people, more images, more descriptors for images – it has been very important for us and caused much greater attention to detail”.

The UKRC fieldworker has also developed and produced a leaflet for parents that has been well received by colleagues and is used a lot. As yet, there has been no direct feedback from parents.

7.2.2 Changes to delivery

In addition to using the DRIVE process to prepare for events and activities the fieldworkers also use the DRIVE process to capture/record the changes they

² pictures of people who are not white middle class males

make to delivery and materials and to record how they are received and if they have been more inclusive. They then adjust the next session based upon their findings e.g. changing the language, putting things in context. This enables them to continuously improve on their sessions. Based upon feedback generated this has been a very effective process. New scenarios have been added by the fieldworkers, which are of relevance/interest to young women, and have been designed to put the engineering in context for them. For example instead of approaching a class to tell them how to make a light bulb the fieldworkers now ask the class a question 'If there was a deaf person in the house and they could not hear the door bell how could you attract their attention?' When the class responds with 'make a light' the girls seem to engage with it as it has put the activity 'in context'. They understand the reason why they have to make the light and are therefore more prepared to step forward and take on a leading role in its development. This was felt to be particularly relevant in mixed sex schools where there tends to be a reliance on male counterparts to take the lead whereas girls from single sex schools were more likely to be participative from the outset.

The fieldworker team now automatically check the ratio of girls to boys in projects and activities and are trying to achieve as near to a 50/50 split as possible in all activities they run. During a focus group conducted with fieldworkers they told us how this is also having a knock on effect in the schools they visit. During the first visit they explain to the teacher what is expected, how they prefer a gender mix, that they require a balance in activities i.e. taking turns and that the pupils will be involved in team working and problem solving. At the second visit the teachers know what to expect, the teachers have taken this information on board and have already mixed the groups for them, ready to start. "They are more aware themselves, the teachers are also learning. The information is filtering into teaching practices and is being discussed within the schools and teachers are making links between the activities and the curriculum".

Gender Equality training delivered to the advisers has been tailored to meet their specific needs. In addition as part of the GE training and in order to embed the learning the ambassadors were involved in the activities that are run in schools to ensure they understood the need for inclusivity and gender awareness. The UKRC fieldworker also suggested changes to the power point presentation to be used in schools to ensure it was inclusive i.e. added more colours including pink. There is a sense that girls subconsciously identify that anything in pink is related to them and therefore 'pulls them in' and encourages them to investigate further. In addition training the ambassadors, who are a mixture of men and women, in gender equality helped them to realise the problems females have and so when they go to events they know how to involve them in activities and spark their enthusiasm. It also creates an opportunity to put across 'positive messages' i.e. why girls did go into engineering.

A fieldworker who had attended both Ambassador training and her own companies 'in company' training noted how different the attendees' perceptions/mind sets had been. "The Ambassadors were much more enthusiastic, they were keen and got stuck in whereas in the employee group they were more closed to the training, one man openly let it be known he didn't want to be there and thought it was stupid". However it was also explained that during the course of the training the employees became much more involved and engaged as a result of discussion, watching videos and listening to peoples experiences and then accepted that it was more important than they had realised.

The fieldworkers themselves had a one day training event where they took their own organisations marketing materials and activities to the session in order to share them with others. They found this extremely useful and the peer evaluation was very powerful.

A HEI checklist has been developed by the HEI working group and is being used to develop discussions and ideas within the Universities. There was

specific praise for the Strategic Managers subtlety, tact and experience and the supportive and inclusive approach she had taken with the group. Her approach has generated discussion among the members regarding the different practices used within the participating HEI institutions and the different problems they face. For example when Department Heads didn't or wouldn't select courses to pilot the checklist she provided advice and support which enabled them to do it themselves in order to get it underway. They also discussed ways to get the checklist into practical aspects of the course as "some staff co-operate better than others". "If we can get it into our specifications for courses - we can get it into the delivery". One member mentioned that support for the checklist/gender equality had been an uphill struggle for them, whilst someone else commented that they (meaning the staff within HEIs) "would rather embrace a prickly pear." In addition members told us they had also faced obstacles or apathy within their working environments.

On the other hand, one person indicated that the checklist had been "fantastically useful in one of the universities"; they had used it to identify pilot courses and to identify how programme guides could be presented to be more inclusive. This person also commented that "actually we are finding that what is good for girls is good for everybody" and "we found the impact of gender awareness sessions on our departments faculty has caused people to think differently, they were 'mind shifting'".

Overall the feedback suggested some progress has been made and that HEIs have already started to use the checklist to generate debate within their own organisations. One member is also developing a paper in order to help colleagues to apply the checklist to engineering courses and they are introducing pilot schemes in order to try the checklist out in the workplace i.e. in context. An interviewee concluded that they felt it was "taking longer than envisaged but we are on the road – we have a blueprint" whilst someone else commented that "it is a trickle process, requiring someone in there chipping away little by little".

7.2.3 Changes to approaches

The UKRC Strategic Manager's approach and communication skills have been very instrumental in the progress made to date. For example she recognised a need to adopt a less formal approach, meeting members of the HEI working group outside of the formal meetings to talk about their specific problems and issues and providing them with suggestions as to how they could take a different approach. The interviewees who described how they had found her advice and guidance particularly useful when trying to apply the checklist in the workplace echoed this. She has gone out of her way to develop relationships with individuals, valuing what they are already doing and making suggestions about how they can develop things further. This also provides opportunities to access other organisations and develop further relationships bringing diversity into discussions at every opportunity. In addition she and a colleague have written an academic paper in order to ensure she has credibility in the eyes of her academic colleagues.

There is no doubt that the UKRC fieldworker has done a magnificent job of supporting her fieldworker colleagues. According to them she is herself an extremely good role model, she is adaptable and reasonable and when necessary we see her "answering back, fighting for her position, this helps to give us confidence". She has become part of the fieldwork team, which has worked well. They explained to us how she had helped them change their approaches for example with the use of inclusive language i.e. Ladies and Gentlemen, hello class. She is supportive and they can "pass ideas through her". This is supported by the 'hot desking' arrangement in the fieldworkers' office, which enables the UKRC fieldworker to move around her colleagues in a natural way and to instigate conversations with different people on a regular basis. This means she gets time with them all and can generate discussions amongst different groups. As they develop their sessions they are at the consciously competent stage and they use statements like "well R won't like that" which creates a mental image for themselves about what is and is not appropriate, "you get used to her thinking" and as a result they now scrutinise

activities themselves, “we are learning”, they pre-empt her comments. It has made them aware of different approaches. They also pointed out that “girls needed to see the application” so they now put activities in context and let the pupils identify the solution. Other changes mentioned included being aware of what sponsors and other stakeholders wanted promoting whilst ensuring activities and events were inclusive to pupils and using words which are gender inclusive.

The UKRC fieldworker also introduced a new approach to meetings. She ran a session on ‘what a good Chair does and what makes a good participant’. The team then rotated the ‘Chair’ position and meetings are felt to be much better as a result.

As part of the Ambassador selection process the UKRC fieldworker was consulted about their recruitment process to ensure everything was appropriate in relation to Gender Equality. Although UKRC recommended that Ambassadors should be female this was not initially the case. The fieldworkers now recognise that female Ambassadors had an effect on female pupils “it enthuses them, gets them involved”. They have observed that the female ambassadors are particularly quick to notice inclusivity wherever they are i.e. “more aware of things going on in their groups, within their subjects and their lectures”. As a result “next year when Ambassadors are recruited we will look at ways to specifically attract female Ambassadors”. The Ambassador approach is definitely considered to be useful and it is also possible that this role will be extended in the future to enable the Ambassadors to become mentors to the female pupils.

7.2.4 Changes to policy

Matthew Harrison the LEP Director arranged a meeting to discuss diversity and agree what good practice was within LEP, providing a template to work to. The Strategic Manager successfully lobbied the Partnership Board for Service Level Agreement's (SLA) of partners to include the DRIVE process, therefore providing UKRC with greater influence regarding gender inclusivity at the contract level and providing the team with greater leverage. The fieldworkers believe that the inclusion of the DRIVE process into the Service Level Agreement is a very positive step towards ensuring everyone is accountable. It is also anticipated by some of the partners that the mix of 50/50 girls and boys' involvement requirement will be added to the next SLA.

7.3 This section of the report takes development a stage further and, building upon the benefits to the LEP, now identifies how UKRC has impacted upon the internal mechanisms and activities of the partner organisations.

Many of the organisations involved in LEP have made inclusivity a part of the whole organisation and UKRC have delivered Gender Equality training to staff within partner organisations. They are now presenting to more girls and young women outside of LEP and are following the LEP example of trying get a more equal gender split into activities wherever possible. They believe this has raised the perception of engineering and is attracting more females. In one organisation however, it was noted that although "the fieldworker is signed up, the company isn't. If the partner doesn't support the process then the fieldworker can be very frustrated".

Most of the Partner organisations have changed their own marketing materials to take on board the feedback from their internal LEP company representatives e.g. fieldworkers regarding images, colour and context. Some partner organisations have started to promote role models and most have made

positive steps to change stereotyping for example; producing posters that specifically promote women in a wide variety of STEM roles and show girls that you can “still be feminine and be an Engineer”. One of the organisations has changed the criteria it uses to assess its awards having considered that the old system was less inclusive to girls and interestingly, as a result, a girl’s team won. More discussion has been generated and they have changed the way their activities are presented in schools nationally in order to make them more inclusive to girls. They have put the activities in context and now let the young people identify the solution. They have also changed the examples and titles they use to be more inclusive to girls.

UKRC is working in partnership with RAE re their diversity strategy. This in turn enables access to new staff and networks within The Academy.

HEI working group representatives are introducing the checklist they developed into their own organisation, which is generating discussion and the sharing of ideas.

The work of the UKRC has had a significant knock on effect on the work of partner organisations in a relatively short period of time. One partner organisation reflected “although it is the nature of human beings to be sceptical about selecting the promotion of a specific group, myself and staff found the training useful and have applied it within the organisation as a whole”. This feedback was generally reflected throughout.

There has been greater/faster and more obvious influence on smaller organisations, as they are usually able to embrace change faster. There are also some significant changes starting to appear in the larger organisations and with perseverance and the right approach we believe this change will take on a much faster pace. The organisations credibility has been established and the excellent relationships which UKRC representatives are forging with these and other organisations makes it most likely that there will be far reaching influences

and further opportunities to deliver the message and provide the necessary help and support.

7.4 The processes, approaches and structures used by UKRC that have been effective in increasing gender inclusivity.

During the review two clear approaches taken by UKRC emerged

- Input to the LEP at a strategic level
- Input to the LEP at an operational level

Both approaches were deemed to be both necessary and successful overall.

The major benefits identified were:

Processes:

- The DRIVE process – used to express ideas and as a basis for meetings to “informally to talk through activities”
- After each activity The DRIVE form also captures and records the changes made during the activity and why. It enables the fieldworker to record what worked and what didn’t – all of which adds to learning and provides constant development/evolvment. However they still need the UKRC fieldworker input and advice in this process
- The HEI Checklist – provides a common purpose, gives the representatives something to aid discussion in the workplace and provides a framework for use in the workplace
- Both processes provide opportunities for stakeholders to discuss the tools with ‘experts’ and review what worked and what didn’t – gave them ownership.
- Processes used must have a practical application and as they generate debate there is a need for an ‘expert’ facilitator – someone who demonstrates tact, provides support and inclusivity – generating

discussions regarding different practices and problems stakeholders face.

- Gender Equality Training – tailored to the needs of the group – causes people to think differently and is ‘mind shifting’

Approaches:

- Providing GE Training before developing the processes
- Valuing what partners have done and then developing it further
- The collective approach of discussion and negotiation was felt to be the most effective way to ensure stakeholder buy in to the concepts being put forward.
- Using skilled communicators to build relationships rather than imposing structures - adding value to existing activities rather than introducing new schemes. Avoiding conflict/non-confrontational
- Finding a common goal to work on and to generate discussion, “We have a series of developed tools as a result of discussion and agreement”.
- UKRC representatives using their experiences to support team members – they are considered as ‘experts’ and have built peoples trust in their expertise.
- Involvement in day to day activities (as well as availability for comment and training) has been successful in helping to make small ‘detailed’ improvements
- Meeting informally to discuss issues and providing stakeholders with practical advice.
- UKRC employees professional approach to the role - supported by practical tools that could be applied in the workplace.
- Co –delivery of Gender Equality Training
- Training “focused to the audience i.e. marketing, events, teachers and ambassadors” including listening to people discussing their feedback

and experiences opens peoples minds and helps them to recognise that GE is more important than they realised

- LEP fieldworker peer evaluation of materials and activities was very powerful
- Equal gender split in activities appears to raise girls perceptions of engineering and is attracting more females
- The UKRC fieldworker knew when to challenge, and how to put things across even when they were ideas which were initially unwelcome and then followed this by ensuring that fieldworkers knew what to do
- UKRC representatives provided examples of appropriate language

Structures:

- Having someone on the Partnership Board/operating in a strategic role to act as a consultant and to have a strategic influence
- Having someone who is part of the fieldworker team, accessible on a day-to-day basis and who can provide "regular reminders as we go about our duties". Important to ensure inclusivity remains a focus – "we still need reminding re specific issues".
- Using good role models who are seen as credible and who have the tact and experience needed and use inclusive language. Access to expertise in the gender area created "massive mind set changes"
- Being able to engage with the LEP co-ordinator has been crucial and it prevents gender becoming marginalised
- Having the backup of an organisation that provides quality (UKRC) support – "info sent to us is good".

7.5 The impact UKRC input has had on mainstreaming gender equality

7.5.1 HEIs

It has opened up discussion and debates about the wider STEM areas and includes:

- The future roll-out 2009 and what it means for them long term
- Debates had led to high-level discussions within their own organisations regarding:
 - Their own marketing activities
 - Issues they need to consider when positioning themselves in what could be a diminishing market and planning to roll-out of ideas
 - Ambassador feedback regarding how gender was affecting them in University

A paper is being written with a view to raising further debate about the use of the checklist across HEIs.

Overall the University representatives also felt that although progress was slower than they would have liked at least they had established a place to start. Their main concern was in addressing the internal culture of their institutions and the tendency of senior managers to deny the diversity issues existed at all.

7.5.2 Partner Organisations

For partner organisations the impact has been:

- Fieldworkers can now examine any material, their own and others and are able to critique it.
- Fieldworkers understand what could be better in relation to both gender and ethnicity and use this knowledge to help colleagues in their own workplace
- Development of more inclusive materials e.g. use of role models and activities throughout the organisation e.g. ensuring an equal number of boys to girls in activities. This has generated discussion but still requires a gender expert to support development activities/specific tailoring
- Gender Equality training for all employees

-
- Fieldworkers use what they have been taught in discussions with partners and children, friends etc, which spreads the ideas into wide reaching areas.
 - Introduction of SLAs makes the DRIVE process compulsory

7.5.3 Schools

For schools the impact has been:

- A degree of unconscious digestion of the messages being imparted by the fieldworkers e.g. pupils separated into gender groups
- Teachers have become more aware and are also learning about gender. For example one LEP fieldworker ran a short activity about gender whilst training teachers. They did an activity considering barriers that might stop children joining science clubs, which raised issues the teachers said they hadn't really thought about before.
- The gender and race equality information is filtering into teaching practices and is being discussed within the schools as a result of developing step by step lesson plans for out of school clubs with the LEP fieldworkers.
- As a result of STEM days teachers are making links between the activities and the curriculum and are incorporating the activities. Anything that can be done to increase schools' awareness of these benefits and help them to embrace the activities would seem to be one of the ways forward.

7.6 The changes UKRC could make to the design and delivery of its gender mentoring role to increase impact

There have been some considerable successes achieved in all areas of the LEP project. There are no areas of activity that need to be stopped or seriously changed, rather there are additional activities that could be developed, many of them if or when the budget allows.

The suggestions for change are as follows:

7.6.1 Partner Organisations

- Development of quantitative as well as qualitative information and measurement
- Provide clear inputs, outputs and outcomes attached to UKRCs activities
- Develop some clear deliverables, which the partner organisations could use to understand UKRC roles and responsibilities and the links to their own deliverables

7.6.2 Fieldworkers

Feedback from fieldworkers indicates the level of importance they put on the issues of 'inclusivity and diversity' of the LEP and shows the level of trust which has built up within the team. Although the UKRC fieldworker is keen not to be seen in an assessor role, fieldworker colleagues obviously value and respect her judgement and appreciate her suggestions and would welcome her feedback. They feel they have developed skills in regard to the production of 'inclusive' activities, materials and scenarios, providing she is there to remind them and to discuss new issues with them as they occur. "Every session is updated and improved based on the experience on the day and Rachel's input".

Therefore the suggestions for change are:

- UKRC fieldworker remains a part of the fieldwork team into the foreseeable future
- LEP Fieldworkers to receive a pre and post training review i.e. what did I write then and how far have I travelled, recognition of distance travelled
- LEP fieldworkers receive feedback and action/development points in order to embed the learning. Perhaps this is an activity that could be delivered with or through the project co-ordinator and if this were to be

the case the UKRC fieldworker would need to develop a set of criteria and feedback points which the project co-ordinator could use to ensure the messages are not diluted.

As is the case with most people who are growing and developing, many of the fieldworkers would now like to become 'experts' in the way that they apply these activities, scenarios and materials in the schools and projects and would appreciate opportunities to see their UKRC diversity 'expert' colleagues in action e.g. conducting activities in the field and being involved in other activities such as 'parents evenings' in order that they can observe their approach and style. In the short term this would ensure the inclusive nature of materials, scenarios and activities is completely embedded and that the skills of the individuals are maximised for the LEP. In the medium term this could also be considered as a capacity building exercise for future growth by providing the project with a set of 'diversity and inclusivity' champions who could provide support in a number of ways during a national roll-out.

7.6.3 Gender Equality Training

Overall the Gender Equality Training received excellent reviews, there were a few minor suggestions which UKRC might wish to consider which included:

- Two people raised questions about the currency of the statistics used within the training e.g. figures from 2004. It would be useful if UKRC could identify that those figures used are the most up-to-date, perhaps in a reference in the footer of documents e.g. Figures quoted are from 2004 which were the most up to date figures available as at (date of training session). This would then dispel any doubts in the delegates' minds as to the relevance of the figures quoted.
- One person suggested UKRC must ensure that they are up to date regarding the culture in schools as it they felt that it had changed and some messages given out in training sessions may be out of date – "The

culture has changed in schools, they are much more aware and UKRC must keep abreast of what's out there”.

- Fieldworkers felt that it would be really useful if UKRC could provide them with information about all STEM subjects, rather than just engineering, as they feel it would be a great help to them in their work within schools.

7.6.4 Schools

People interviewed felt that it would be beneficial if UKRC could raise its own profile with Heads and Senior Teachers – they felt that these senior teachers would want to get involved but as yet they are unaware of the UKRC or its excellent support mechanisms.

We therefore suggest:

- Free gender training offered to schools via short sessions run on teacher training days
- A national strategy to release teachers for gender training and to provide Head Teachers with information at national and local conferences
- Approach the Engineering Subject Centre and offer to assist them in ensuring they are delivering ‘best practice’ messages regarding inclusivity and diversity into teacher training for new academics, before they embark on a career in HE.

Finally, in order to build capacity and to ensure there are no ‘mixed messages’ being given out to partners there may be some merit in creating a more obviously unified approach to gender equality amongst organisations who represent women. Some partners mentioned confusion in regard to an apparently “fragmented approach to gender equality – presently the approach seems to be fragmented with several organisations e.g. UKRC, WISE, Women in Engineering etc”. If this is not practical or feasible perhaps all that is required

is to develop some clear messages about how UKRCs role is different to that of the other organisations?

7.7 The approaches, structures and delivery methods that would be most effective for UKRC to use in the potential roll-out

As there are so many variables involved in a possible national roll-out (we do not know who the partners will actually be or how they will choose to work), it is virtually impossible to predict at this stage which particular structure would be the most effective to use.

The current structure in which the UKRC staff have been operating has worked extremely well. Whatever format the national roll-out takes it should continue to reflect the strengths of the work carried out by the UKRC to date.

Namely it should:

- Create a strong driving force which has clear roles and responsibilities across the UKRC team
- Retain strategic influence via membership of the Partnership Board to ensure everyone operates to a high standard – i.e. via SLA's
- Continue to use the UKRCs experienced Gender Equality role models such as the Strategic Manager and the operational UKRC Advisers who also have credibility, tact and accessibility, on a day to day basis, to provide the regular reminders the fieldworkers need
- Retain its reputation for being an organisation that provides quality support and materials i.e. “doing it properly” and should continue to provide practical tools that can be applied in the workplace.

The open and consultative approach to working with partners at every level has been well received and has helped to forge excellent working relationships. In addition partners found it had been useful to find something to work on in order to open discussion and create synergy. UKRC should ensure the following approaches are continued and developed:

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- Clearly inform all partners about the support available to them
 - Provide GE Training before developing processes
 - Co-deliver tailored training - focused to the needs of the audience
 - Employ credible professional GE experts
 - Build relationships rather than impose structures
 - Use informal as well as formal discussion and negotiation to obtain buy in to the concepts being put forward
 - Find a common goal to work on
 - Value what partners had done and then help them to develop it further
 - Provide access to 'expert' gender equality advice and the provision of practical tools and activities.
 - Have involvement in fieldworker day to day activities to provide the constant drip feed of advice and information required to change behaviours
 - Encourage fieldworker peer evaluation of materials as they become more proficient

The UKRC approach to Gender Equality training, which has been tailored to particular audiences, has been well received and clearly had an impact upon the success of the UKRC input to the LEP programme.

Key Recommendations:

- Basic – initial GE training as currently delivered including training tailored to specific groups e.g. marketing, ambassadors etc
- Intermediary – An opportunity to discuss experiences across the partners and to share and positively critic activities and materials they all use – peer feedback proved to be very influential
- Advanced - Training which teaches partners how to deal with particularly difficult situations or people during the delivery of an activity or event

UKRC should provide regular training to ensure any new fieldworkers etc have received the basic training. “People think they know what it is about but they don’t”.

Although the training to date has been carried out by the current UKRC representatives in the field (LEP), it could actually be delivered by any competent UKRC Gender Equality trainers however, in order to provide the added value of training that has been tailored to the specific needs of the group, the trainer would need to conduct an element of research in order to gain a thorough understanding of the delegates requirements. There should be greater emphasis on following up the action plans created at training events e.g. what and how have they changed as a result of attending? This could provide a totally new approach to ensuring the training is applied in the workplace; it would generate further debate and may also give UKRC access to a wider network of partners.

Also UKRC should continue to use and develop practical tools that can be applied easily in the workplace/classroom. These tools could easily become a crucial support mechanism in a national roll-out.

UKRC should continue to provide materials about role models in a variety of occupational roles and from a variety of cultures. It would be particularly beneficial if UKRC could develop materials that show these people at work, talking about their jobs and their lives in order for females to relate to their ‘real’ situation i.e. to show girls that these are real people doing real jobs. Wherever possible, UKRC should also include opportunities to challenge girls’ assumptions that “people like me don’t do that” in relation to moving into HE.

It is clear from feedback that the processes used to develop gender equality must have a practical application. It is also clear that there is a need for a subtle, constant, drip feed approach to the development of stakeholders GE skills. Certain processes have been particularly effective namely:

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- The DRIVE process, including the UKRC fieldworkers support for the continuous review and evaluation which takes place after the delivery of an activity or the circulation of marketing materials.
 - The continuous drip feed e.g. “How many girls went to that”? Getting the fieldworkers to a point where they are competent is a long process. This is reflected in the LEP fieldworkers’ feedback to us that they do not yet feel confident about going it alone. They feel they still need the UKRC fieldworker’s presence and support to ensure their practice and materials reflect gender equality. This has particular implications for the roll-out, as it is apparent that there is a need for a significant period of support from UKRC fieldworkers after the initial training period.
 - The development of ‘academic’ papers and papers that show the research conducted into the benefits emerging as a result of gender initiatives will raise the credibility of UKRC with the academic institutions.

It is very important to ensure that the people supporting the DRIVE process are thoroughly trained in its use and fully understand the benefits of it, as it is rolled -out.

The use of UKRC fieldworkers should be continued. They should be an integral part of any mixed delivery team (currently those known as fieldworkers). If possible the UKRC fieldworker should be based in the same office but if this is not possible they should at least have access to the team on a regular basis. Hot - desking has proved to be very successful within the pilot project as moving around the office gives fieldworkers the opportunity for new informal dialogue. Above all the success of UKRC contribution to a national roll-out will be based upon the organisations ability to continue to find and develop good calibre people and provide support structures that meet their needs for resources and information and provides development and learning opportunities.

8. Stimulating Physics Project Overview

Stimulating Physics is a pilot programme, from May 2006 to April 2008, aimed at increasing the number, and diversity, of people studying physics at A-level and degree level. Girls are one of the key target groups, currently under represented. The programme is managed by the Institute of Physics, working with a range of delivery and development partners, in the 3 selected regions of Leeds, Nottinghamshire and Oxfordshire. The programme has two strands: **Access**, working with universities to promote the appeal of physics-based degrees and **Demand**, working with schools to increase take-up of physics. UKRC input, which focuses on the **Demand** strand, started in February 2007. The evaluation will cover the period from February 2007 to April 2008.

Work of the Demand strand focuses on approximately 10 schools selected in each of the three regions. Key projects include:

- Supporting teachers of physics – Regional Advisers are delivering a programme of CPD for teachers of physics, particularly non-specialist teachers, in the pilot schools.
- Mentoring Students – The Brightside Trust is setting up an e-mentoring scheme, through the website *Big Bang Blogs*.
- Careers simulation activity – The Careers Research and Advisory Centre (CRAC) is developing a business and enterprise simulation activity, with a strong physics theme.
- Careers CPD workshop – CRAC is developing a CPD workshop for teachers and careers advisers.
- Physics in Industry – the Industrial Trust is providing a series of visits to local, physics-based industries and hospitals.

UKRCs role is that of a gender mentor to Stimulating Physics aimed at ensuring the development and mainstreaming of gender-inclusive good practice. It is contracted to do this in 3 key areas by:

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1. Offering advice and expertise through participation in the Project Advisory Group, London Schools Support Group and the three regional Schools Support Groups.
 2. Delivering Gender Equality Training to the London and regional Schools Support Groups, followed by training for physics teachers and careers professionals in the three regions.
 3. Working alongside schools and delivery partners in the Leeds region to deliver the following:
 - Ongoing advice and support to the Regional Adviser to promote gender equality in their work with non-specialist physics teachers
 - Hands-on support to specialist and non-specialist teachers of physics in Leeds pilot schools in developing gender inclusive good practice in the classroom
 - Ongoing advice and support to CRAC to ensure gender-inclusivity in the simulation activity and careers workshop
 - Ongoing advice and support to the Industrial Trust to ensure the delivery of gender-inclusive visits and materials
 - Ongoing advice and support to the Brightside Trust to ensure the development and delivery of gender-inclusive e-mentoring programmes

The UKRC input is managed as follows:

- Initially a UKRC Fieldworker, who was based in the UKRC offices in Bradford, conducted the day-to-day activities with partner organisations. That was changed at the end of 2007 and there is now a new approach to working with Partners. As of January 2008 to March 2008 there is a specific UKRC liaison person who supports The Industrial Trust and two people who are working together to support the Leeds Schools. These people are a UKRC associate who is working in a field worker role and

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- An IOP Regional Adviser (A physics teacher) who is also working as an associate for UKRC in relation to gender. Each have a number of days to conduct their work. These changes will be discussed in more detail in the findings section of the report. These arrangements may be modified in the bridging phase.
 - A Strategic Manager, who operates from home, and represents UKRC at the London Schools Support Group and the three regional School Support Group meetings. She also offers consultancy support to stakeholders/partners as required.
 - A (UKRC) senior manager who is responsible for the overall delivery of the contract.

Our evaluation found that the activities described in 1 – 3 above were carried out in a number of ways as follows:

1. The Strategic Manager does not sit on the Project Advisory Group, but does act as a gender adviser to them, and she is included in all the Schools Support Group meetings. She uses every opportunity to promote gender development across the partners for example she has encouraged links to additional projects, has lobbied for the inclusion of gender requirements within the Service Level Agreements and invited the Stimulating Physics Demand Strand manager to the national UKRC conference.
2. Both the Strategic Manager and the original UKRC Fieldworker were involved in delivering gender awareness training to London and regional Schools Support Groups, followed by training for physics teachers and careers professionals in the three regions.
3. The UKRC Fieldworker was involved in delivering training events in a variety of locations and developing relationships with partners on the ground for example working to develop the gender inclusivity of Big Bang Blogs, to support the delivery of Careers workshops and through visits and activities with schools. The UKRC liaison person who started the work in January this year has started work by observing an industrial visit

conducted with the Industrial Trust and the UKRC fieldworkers, working together (gender specialist and regional schools adviser), have helped schools to develop non-specialist physics teachers and to help to develop gender inclusivity in the classroom.

10. Overall Conclusion

Based upon the evaluation of both the LEP and IOP projects we conclude that UKRC has a vital role to play in any National roll-out. Information and examples of the impact of the UKRCs gender equality input described by the UKRCs employees have been fully corroborated by the people we interviewed. The credibility and professionalism of the UKRC has definitely been established and the people involved in the delivery have played a major role in this achievement. The excellent relationships which UKRC representatives are forging with these and other organisations makes it most likely that there will be far reaching influences and further opportunities to deliver the message and provide the necessary help and support. In addition to the previously identified project specific specialism there are also some common themes that have been identified.

In order to be seen as a significant contributor to the roll-out UKRC should be on the strategic board. This would signal to all partners the significance and importance given to gender equality at a strategic level. It is also important that UKRC are involved in the project from the beginning to ensure all partners understand their role and involvement.

Partners should be compelled to follow an agreed formal GE development process to ensure consistency, compliance and ownership of good practice, with UKRC support. If partners are not compelled it will make them slow to start and they can ignore any feedback. As a result of attending Gender Equality Training people realise that there is a gender inclusivity problem, which enables the change process to start, it causes them to think differently and is 'mind shifting'.

There should also be Service Level Agreements with specific requirements for gender inclusivity – as a minimum it should include how many girls should be included in an activity, a requirement that partners attend gender equality training and a requirement that all reports will include information regarding girls e.g. numbers and activities.

It is clear from feedback that processes need to have a practical application and should be developed as tools to drive change and to capture changes made and why. They enable people to identify and record what worked and what didn't and provide opportunities for stakeholders to discuss tools with 'experts' for a significant period of time. Where formal processes and agreements exist they have proven to be significantly more successful and enabled faster change.

The UKRC approach of discussion and negotiation has been an effective way to ensure stakeholder buy in to the concepts being put forward and their informal meetings provide stakeholders with practical advice.

Feedback indicates that the change in behaviour is brought about by a constant drip feed of information and support. This is not a quick fix process but rather one that requires constant support and reassurance and the continued input of 'expert' advisers over a long period.

11. A selection of quotes from Interviewees

11.1 LEP

“This role required someone who could command academic colleagues, provide credibility to work in often difficult circumstances” “Where a hierarchy exists” (talking about the Strategic Managers Role/expertise)

“She had the credibility tact and experience needed” (UKRC Strategic Manager)

“They would rather embrace a prickly pear” (Talking about staff within HE and use of the checklist)

“Fantastically useful in one of the universities” (checklist)

“One of the things we know is that women are more interested in bio-sciences – maybe we should look how we can develop that more” (HE light bulb moment)

“Some staff co-operate better than others” “If we can get it onto our specifications for courses – we can get it into the delivery” (re HE)

“Actually we are finding that what is good for the girls is good for everybody”

“Taking longer than envisaged but we are on the road – we have a blueprint” (Re HE)

“It’s a trickle process, requiring someone in there chipping away little by little” (Changes within HE)

“The HE sector has bloomed while the number of engineering students remains the same, which gives the departments a relatively smaller sized piece of the cake”

“It’s common for women applying for engineering to be told that they should consider construction is a bloke’s thing and are you sure you want to go into this?”

“They are more aware of things going on in their groups, within their subjects and their lectures” (re female ambassadors)

“It enthuses them and gets them involved” (Re ambassadors working with girls)

“They were keen and got stuck in” (Re ambassadors enthusiasm)

“Has created massive mind set changes” (effect of UKRC input)

“Without her reminding us we would slip back into our old ways” (Re UKRC fieldworker)

“They show girls they can still be feminine and be an engineer” (re posters)

“Although it is the nature of human beings to be sceptical about selecting the promotion of a specific group, myself and staff found the training useful and have applied it within the organisation as a whole”

“There’s a massive difference, more people, more images, more descriptors for images – it has been very important for us and caused much greater attention to detail” (re content of publications before and after GE)

“If the partner doesn’t support the process then the fieldworker can be very frustrated”

“If there was a deaf person in the house and they could not hear the door bell how could you attract their attention?” (re putting things in context for girls)

“Marketing materials have definitely changed across stakeholders”

“They are more aware of themselves, the teachers are also learning. The information is filtering into teaching practises and is being discussed within the schools and teachers are making links between the activities and the curriculum” (Fieldworkers comments re teachers)

“Answering back, fighting for her position, this helps to give us confidence” “She is supportive and we can pass ideas through her” (re UKRC fieldworker)

“I think well R won’t like that” “You get used to her way of thinking” “Regular reminders as we go about our duty” “ How many girls went to that?” (re UKRC fieldworker impact)

“Girls need to see the application”

“We have a series of developed tools as result of discussion and agreement”

“Having an organisation that was quality – info sent to us is good” (Re UKRC)

“Training was focused to the audience i.e. marketing, events, teachers and ambassadors” (Re GE Training)

“And which group will you be working with?” (Re strategies to engage teachers)

“help us to understand the processes that go on in schools and also working with parents” (re how UKRC could help further)

“People think they know what gender equality is about – but they don’t”

“Opens peoples eyes to how easy it is to be more inclusive – benefits both genders, makes it more fun and interesting all round” (Re GE Trng)

“People are set in their ways and feel stupid that they have been doing nothing over a long time” “Peoples experiences when discussed in sessions help to persuade people” (Partner re reasons for resisting GE Trng)

“If people aren’t sold on gender appropriateness it doesn’t work at all”

“UKRC are very professional about the way they do things – providing practical tools is so helpful it enables you to apply it in the work place”

“Now we look at the words, image, layout and colour”

“UKRC website and their activities very, very impressive”

“One to one outside the meeting was most valuable and welcome” (re Strategic Manager)

“What was good for gender also addressed ethnicity”

“Student ambassadors were much more open to training than partners, they were keen and got stuck in”

“One lecturer offered to help her get onto another course as it wasn’t really a relevant subject for her. He thought another, non construction, subject would be more appropriate for her”

“It now impacts on everyday articles I read in newspapers and I talk to my sisters and my mum – I discuss it in general” (re GE)

“Having an approachable presence – R is direct but not admonishing or personalised. Just being there in the office keeps you mindful of the aims and she might say ‘can I have a look at that’ (Re UKRC fieldworker)

“A catalyst that made us get moving” (Re GE Trng)

Appendix 1

Section Headings of London Engineering Project HEI checklist

Place engineering theory within its practical context
Provide opportunities for problem-based learning
Discuss engineering practice in society
Equip students with the full range of skills to become professional engineers
Support the transition from education to employment
Develop delivery strategies to include all students
Develop a positive learning environment and culture that is inclusive to all students
Offer support and networking opportunities
Emphasise links between students and lecturers
Promote co-operative working amongst students
Use a range of assessment methods
Develop mechanisms to make use of student feedback

Appendix 2

An example section of final LEP HEI checklist

Place engineering theory within its practical context

A number of studies identify that students of engineering and physical sciences fail to perceive them as relevant to their daily lives and wider goals, and this can influence how, and how well, students learn. Demonstrating the ways that day-to-day engineering practice impacts on some of the great global challenges can make a real difference to the way students engage with that practice. Moreover, an appreciation of context and purpose can make difficult concepts easier to understand, and there is substantial evidence that women, in particular, value an approach that recognises this. Finding effective ways of linking theoretical principles to real life applications requires an understanding of the ways that gender, background and ethnicity shape the perceptions and real life experiences of students. Links that seem obvious to the lecturer may not appear so to students because of those perceptions and experiences.

Actions to promote inclusion:

- Demonstrate how engineering relates to society and to a broad range of social and environmental needs.

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- Use a broad range of contemporary examples and contexts.
 - Include problems which consider human, social, environmental and global considerations.
 - Incorporate opportunities for students to identify applications which reflect their experiences, interests and aspirations.
 - Ensure the practical applications of theoretical principles are an integral part of teaching practice.
 - Build inter-disciplinary links and apply them to existing courses and teaching material.
 - Highlight, showcase and recognise the contributions of a range of cultures to the development of engineering principles, concepts and applications.

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APPENDIX 2

Activity Title:			
Activity Correspondent : (the person who submits activity for Drive and receives feedback)			
Date submitted:			
Date for return of completed drive:			
Overview of activity			
Description materials & resources used i.e. handouts/leaflets/PowerPoint			
Delivery technique			
Max No. of students per activity			
Age group(s) – please delete as appropriate		Total hours required to run activity	
Activity Plan			
Time i.e. 9-9.30	Breakdown of activity i.e. ice-breaker	Curriculum relevance & purpose of activity	Resources required

Teacher support/Staff support	
How do you get the teachers & the staff involved? How are they been briefed?	

Ambassador /SEA	
Are you using an Ambassador or SEA? In what way are they being a role-model? How are they been briefed?	

Activity Costs – please list the costs for the following;	Cost per Activity	Cost per Student
Fieldworker time (approx. £120 a day, per person) Ambassadors (£7.20 an hour, per ambassador)		
Printed Materials Other Materials Re-useable resources Logistics (e.g. travel & courier costs)		
Budget Cost	£	£
Actual Cost	£	£

Your check list	
<p>How have you included the all important engineering messages in your activity and materials? Please state where and how you think this will positively change attitudes.</p> <p>Our aim is that students want to be an engineer, to make sure they know what engineering is after completing your activity and where to get more</p>	

information about careers in engineering.	
<p>Have you worked through the LEP- Gender Inclusion/ Cultural Diversity Guidelines?</p> <p>Please outline how you've done this and give an example(s) under each heading.</p>	<ul style="list-style-type: none"> • Activity • Context • Images • Names • Language • Use of examples/reference points • Teaching methods

Gender Inclusion comment		Action Points
- to be completed by UKRC representative		
		•
Date completed:	Completed by:	
To be reviewed by:		

Cultural Diversity comment		Action Points
- to be completed by ACNST representative		
		•
Date completed:	Completed by:	

Engineering Messages, Logistics & Costs Audit comment		Action Points
- to be completed by LEP coordinator		
		•

Date completed:	Completed by:	

Sign Off - to be signed off by LEP coordinator	
	Date: Signed:

Post Delivery Evaluation	
Quantitive/ Qualitative Breakdown	Please complete as fully as possible, giving examples.
No of girls: boys ?	
Breakdown of BME students?	
Did all the students participate equally?	If yes, in what way? If no, what would you do differently next time?
Did the engineering messages work?	If yes, how do you know? If no, what would you do differently next time?
What else would you do differently next time?	

London Engineering Project HEI Guidelines to promote inclusive engineering courses:

Towards an Inclusive Engineering Curriculum

This guidance draws together current best practice within a range of university departments, in order to provide a resource aimed at enhancing engineering curricula for those who are less familiar with implementing an inclusive curriculum.

Place engineering theory within its practical context

A number of studies identify that students of engineering and physical sciences fail to perceive them as relevant to their daily lives and wider goals, and this can influence how, and how well, students learn. Demonstrating the ways that day-to-day engineering practice impacts on some of the great global challenges can make a real difference to the way students engage with that practice. Moreover, an appreciation of context and purpose can make difficult concepts easier to understand, and there is substantial evidence that women, in particular, value an approach that recognises this. Finding effective ways of linking theoretical principles to real life applications requires an understanding of the ways that gender, background and ethnicity shape the perceptions and real life experiences of students. Links that seem obvious to the lecturer may not appear so to students because of those perceptions and experiences.

Actions to promote inclusion:

- Demonstrate how engineering relates to society and to a broad range of social and environmental needs.
- Use a broad range of contemporary examples and contexts.
- Include problems which consider human, social, environmental and global considerations.
- Incorporate opportunities for students to identify applications which reflect their experiences, interests and aspirations.
- Ensure the practical applications of theoretical principles are an integral part of teaching practice.
- Build inter-disciplinary links and apply them to existing courses and teaching material.

-
- Highlight, showcase and recognise the contributions of a range of cultures to the development of engineering principles, concepts and applications.

(Jones & Smart (1995); *Land of Plenty: Diversity as America's Competitive Edge in Science, Engineering & Technology* (2000); Mills, J. & Ayre, M. (2003); Murphy & Whitelegg (2005); Nafalski et al. (2002); SET FAIR (2002); WEWIN (2006)).

Provide opportunities for problem-based learning

An approach that uses a specific, real context or problem situation as the organiser for technical learning has been found to be effective in engaging students, and particularly women. In problem-based learning, the path to a solution leads to an appreciation of underlying theory, and for a well formulated problem, an added benefit is that purpose and relevance can be self-evident. There is also consensus within industry and university engineering departments of the need for closer collaboration in order to enable students to gain experience in the application of theoretical understanding to real applications encountered in industry.

The opportunity for group work allows the development of more co-operative³ approaches which can be more attractive to, and inclusive of, women. Problem-based learning is also helpful to BME students who are more likely to start a degree with non-standard qualifications and who therefore may be relatively disadvantaged by more traditional ('chalk and talk') approaches to learning.

Actions to promote inclusion:

- Provide opportunities for project and laboratory work in which students learn theoretical principles through tackling relevant 'real-world' problems.
- Provide students with work placements and projects in industry to enrich theoretical studies by providing insight, relevance and purpose.

(Booth et al. (2007); Cronin et al. (1999); Murphy & Whitelegg (2005); Royal Academy of Engineering (2007); Viefers et al. (2005)).

³ Co-operative approaches need not exclude some element of competition, for example, co-operating within a group, whilst competing with other groups.

Discuss engineering practice in society

Engineering is often presented as the neutral, value free application of technical principles, with engineering education requiring solely the transmission of technical knowledge. In practice, since engineering decisions shape society, the implementation of positive engineering solutions requires engineers to engage with both social and technical implications. A recognition of engineering practice being open to change, being shaped by social and political factors and not necessarily involving a unique, correct answer is likely to lead to increased motivation, particularly amongst female students. For BME students, a crucial factor in their engagement is the extent to which engineering practice takes account of their own communities' values and perspectives.

Actions to promote inclusion:

- Include discussion of the social, political, environmental and cultural factors that influence engineering practice and how engineering has affected/shaped world history.
- Discuss value conflicts and uncertainties relevant to the subject and build understanding of the role that ethical dimensions have on the implementation of engineering solutions.
- Showcase engineering practice from a range of countries, including developing countries.

(Murphy & Whitelegg (2005); Roger, A. & Duffield, J. (2000); Torkington, N.P.K. (ed.) (1996); www.history.com/search.do?searchText=engineering+an+empire).

Equip students with the full range of skills to become professional engineers

The diverse work of a professional engineer requires a broad set of generic skills to support and enable the effective application of technical principles. Recognising these generic skills as a necessary part of an engineering identity, and valuing them as such will encourage students to develop them alongside their technical skills, and in so doing

enhance their effectiveness as engineers. Evidence suggests that whilst all students would welcome more training in these generic skills, and realise that employers require them, they are not always clear about how these generic skills relate to their curriculum. BME students, particularly, are less likely to feel that they have improved their generic skills at university and to understand their relevance.

Actions to promote inclusion:

- Build into the curriculum opportunities to develop general skills e.g. communication skills, social skills, problem solving, negotiation, project management, teamwork skills, report writing and presentation skills.
- Embed skills development and articulation in programmes, in a consistent way such that students are aware of the direct relevance of a given skill to their future employability.
- Develop a structure to embed existing institution-wide skills provision within programmes.
- Promote interaction between HEI's and employers at the programme level.

(Booth et al (2007); Cronin et al. (1999), Faulkner (2006); Nafalski et al. (2002); Royal Academy of Engineering (2007)).

Support the transition from education to employment

There is evidence that all students, female, male and BME want a more practical curriculum, and that women, in particular, benefit from opportunities to get experience of 'hands-on' laboratory work. Industry visits and placements offer significant opportunities for students to experience 'real engineering' and to meet positive real models, however it is vital that this initial contact with industry is well planned to ensure positive experiences that challenge rather than reinforce stereotypes.

Actions to promote inclusion:

- Provide timely links between lecture materials and laboratory activities and make links explicit.
- Demonstrate the links between curriculum content and range of potential career opportunities.

-
- Maximise use of visiting lecturers (including via video-conferencing) and exchange programmes to enable learning from a diversity of female, male, and BME lecturers within academia and industry. Video-conferencing⁴ can be used to maximise international links, including those from developing countries.
 - Organise industry visits to enhance students' awareness and to enable contact with a diversity of female, male and BME engineers.
 - Enable students to undertake industrial placements, whether for a full year or shorter periods, to facilitate the transition from education to work. Evidence shows that the majority of graduates who found a job immediately after graduation had done a placement
 - Provide BME SET role models through interaction between HEI's and BME Networks and business forums at the programme level.

(Baglihole, B. (2006); Booth et al. (2007); DfES Research Report 448 (2003); Faulkner (2006); WEWIN (2006)).

Develop delivery strategies to include all students

It is reported that all students would like more opportunities for interactive learning, and there is evidence to show that lecturer-centred teaching and whole-class instruction are detrimental to learning for women. A wide range of studies show that on STEM courses, in particular, male students exert control over discussions, are given more attention by lecturers and are asked more challenging questions. A similar picture emerges for BME students, with reports of them being marginalised and becoming 'invisible' in traditional STEM learning situations. A learning environment and teaching strategy that take account of a range of learning styles will engage the broadest range of students.

Actions to promote inclusion:

- Use a range of teaching methods to accommodate students' varied interests, values, prior experiences, ambitions and learning styles.
 - Include interactive teaching techniques and questioning methods that enable interaction and reflection e.g. use of white boards; discussion of questions in
-

pairs / small groups; building in individual thinking-time before asking for responses.

- Incorporate group work and plan groups to enable all students to participate equally and to increase their ability/confidence in a range of skills e.g. where groups are not self-selected, rotate group roles; provide opportunities for women/BME students to choose to work together.
- Define and clarify technical terminology and jargon when it is introduced.
- Be aware of student-student interactions and vary teaching strategies to promote inclusion of all students.
- Have high expectations of all students with clear feedback mechanisms to praise achievement and enable improvement as required.
- Regularly review teaching practice and/or use peer observation to ensure active engagement of all students e.g. monitor who tends to ask questions, answer questions, and lead groupwork.
- Enable 'Fast Track' provisions for mathematics, ICT skills and English to be made at an earlier, pre-entry, stage including collaborative provision within FE and sixth forms.

(Cronin et al. (1999); Driver, G. (1982); Roger, A. & Duffield, J (2000); Murphy, P. & Whitelegg, E. (2006)).

Develop a positive learning environment and culture that is inclusive to all students

The culture of an Engineering department the 'how we do things round here' develops, largely unconsciously, around the needs, interests and experiences of the people who teach and learn within it. Alongside technical knowledge, taught through the formal curriculum, students learn the informal rules, beliefs and attitudes, 'the hidden curriculum', from the experience of attending and learning within a specific department.

Engineering in academia (and as a profession), is white and male-dominated and, unsurprisingly, reflects and reinforces Western male norms. Curriculum influences culture, as does teaching style and course content, but a range of other taken-for-granted, less-tangible, issues have a significant effect on the extent to which an environment challenges stereotypes of who should or could be engineers, or

reinforces them. These include the physical environment, the nature of day-to-day conversations and banter, the pictures on the walls, the style and content of notice boards, departmental publications and ease of contact with other women and/or minority ethnic students.

Actions to promote inclusion:

- Participate in staff training/workshops to increase awareness of gender and culture related differences in learning styles, educational experiences and self-confidence of students and to identify strategies to promote inclusion.
- Use language and course materials that are inclusive in terms of gender, culture and ethnicity e.g. make reference to a diversity of female, male and BME engineers; ensure that images reflect a diversity of engineers; use examples and analogies that are likely to interest a diversity of students.
- Use inclusive language e.g. avoid '*Morning Lads*'; continually referring to engineers as 'he'.
- Challenge comments and 'jokes' about female engineers – whilst offence may not be intended, they contribute to a feeling of being unwelcome and not taken seriously as an engineer.
- Display current work and achievements of a diversity of students.
- Use positive images of a diversity of engineers; promoting the contribution of female, male and BME staff.
- Ensure that any materials used by, or on display within the department are inclusive and do not reinforce stereotypes.
- Display opportunities for networking, attending conferences and linking with employers that are inclusive to female, male and BME students.
- Create a clean, well-organised physical environment.
- Provide sufficient women's toilets and facilities.

Chambers, D.W (1983); Cronin et al. (1999); Mills, J. & Ayre, M. (2003); Roger, A. & Duffield, J. (2000); Seaton (2002); Westcott, E. (1996); WEWIN (2006)).

Offer support and networking opportunities

Membership of social and professional networks contribute to a sense of belonging within the engineering community and impact on academic progress, career choice

and progression. Whilst all students need support to thrive, being in the minority can be a particularly isolating experience, and seemingly small inequities may have cumulatively large negative effects upon students' confidence and career aspirations. Appropriate support structures and ready networking opportunities help prevent this, and will particularly benefit women and BME students, who tend to have limited/less access to informal networking opportunities or role models.

Actions to promote inclusion:

- Conduct induction processes that extend over the first term. Pay attention to students from minority groups in order to be sensitive to their needs and to assist them to build a support network. Involve current students and lecturers from minority groups.
- Offer a range of support mechanisms to students e.g. mentoring, support groups, flexible allocation of tutors, access to professional networks.
- Ensure that support is structured into industrial placements – this will enable students in the minority to develop effective strategies for their transition to employment.
- Offer a range of ways for students to mix socially that appeal to a range of interests and backgrounds.
- Encourage students to become members of their associated professional body (or bodies).
- Promote and encouraging participation in SET activities outside the degree programme.
- Make students aware that undertaking a placement provides opportunities to network.

(Baglihole, B. (2006); Booth et al (2007); Faulkner (2006); WEWIN (2006)).

Emphasise links between students and lecturers

Clearly, lecturers are a key influence on students' motivation and achievement, hence an environment where contact with lecturers is regular and commonplace is likely to benefit all students.

Actions to promote inclusion:

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- Enable clear, accessible routes for all students to approach lecturers.
 - Encourage students to contact lecturers and ask questions.
 - Offer ongoing student support, pastoral as well as academic, and an effective tutorial system with tutors briefed on, and appropriate to, their role.
 - Develop openness in departmental management and communication.

(Cronin et al. (1999); Murphy, P. & Whitelegg, E. (2006)).

Promote co-operative working amongst students

There is substantial evidence of women's preference for a co-operative rather than competitive approach to learning and work, and team-working skills are regarded as essential by employers. A curriculum that integrates the social applications of engineering into the learning process and enables discussion of the values implicit in these requires, and also promotes, a more-co-operative style of learning, is generally more attractive to women and does not disadvantage male students.

Actions to promote inclusion:

- Encourage co-operation among students e.g. build small-group discussion /problem-solving into lectures
- Support the formation of peer study groups.
- Provide study areas for students that promote interaction and co-operative⁵ working.
- Conduct careful timetabling to ensure (part-time) student carers can engage fully.
- Combat isolationism through group projects and teamwork.

(Cronin et al. (1999); Murphy, P. & Whitelegg, E. (2006); Powell et al (2004)).

Use a range of assessment methods

In recognition of students' different learning styles, use of a range of assessment methods will avoid disadvantaging certain groups.

Actions to promote inclusion:

- Use a range of assessment methods to reflect different learning styles in both technical and non-technical aspects.
- Make explicit the grading scheme of any assessment method.
- Include student self-assessment and review.
- Implement anonymous marking, where possible, in individual assessments / examinations.

(Cronin et al. (1999); Murphy, P. & Whitelegg, E. (2006); WEWIN (2006)).

Develop mechanisms to make use of student feedback

Mechanisms that allow feedback from students (and industry) to shape the curriculum and the learning environment are key to developing courses which enable a diversity of female, male and BME students to thrive, fulfil their potential and aspire.

Actions to promote inclusion:

- Devise a comprehensive, timely and inclusive student feedback procedure.
- Evaluate and review curriculum, teaching style and culture based on feedback from a diversity of students.
- Take account of student feedback on the informal learning environment as well as the formal parts of the course.
- Incorporate opportunities for rapid feedback e.g. '*instant whinge*' systems allow students to give instant feedback electronically to a moderator who will direct comments to the lecturer without revealing the identity of the student. The presence of the moderator provides a degree of anonymity for the student whilst ensuring some accountability for comments made.
- Consult widely on course design and research areas including feedback from a diversity of students and from industry.

(Cronin et al. (1999); Nafalski et al. (2002)).

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**Delivering Inclusive Engineering: A practical tool to promote best practice when
developing and enhancing engineering courses**

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Abstract

Engineering courses are under pressure to change due to a range of factors including the demands of industry, student feedback and the government's Widening Participation (WP) agenda. Courses must adapt in order to attract and retain a broader range of students. The purpose of the research was to develop a checklist for inclusive course design that would help academics to review and develop curriculum content, teaching methods and learning environment.

Introduction

Engineers are vital to the health of the economy and essential in enabling us to meet key global challenges, and yet the UK is failing to keep pace with the increased demand for engineering professionals (Wilson, 2000). The current shortage of graduate recruits is having a direct effect on productivity, creativity and hence profitability (Spinks et al., 2006) and if attracting the engineers of the future is proving a problem, so too is retaining them, with less than half of UK graduates subsequently choosing to enter the profession (SEMTA, 2004). The UK's rapidly changing demographics add further urgency to the need to broaden participation in Science Engineering and Technology (SET). It has been predicted that by 2011 only 20% of the

workforce will be white, able-bodied men under the age of 45 (UKRC, 2005). Since this has been the traditional source of engineers, it is clear that if the UK is to maintain a skilled engineering workforce, it will need to look increasingly toward women, adult learners and people from Black and Minority Ethnic (BME) backgrounds (Spinks et al., 2006). In response, Higher Education Institutions (HEIs) will need to adapt in order to make themselves attractive to this broader constituency.

Background

Previous work on widening participation in SET

Since the early 1980s there have been numerous initiatives aimed at understanding and addressing women's under-representation in SET, which persists in spite of girls' high performance in science at school (DFES, 2005). Much of this work has concentrated on improving access and equipping women to fit into existing SET culture, however the high drop-out rate of women who have entered SET has prompted an examination of the culture itself (Cronin et al., 1999). There is considerable variation in women's participation across SET subjects, with previous research finding that many women in SET departments where they are in a very small minority, such as mechanical engineering, do not feel encouraged to reach their full potential (Cronin et al., 1999). This has led to an increased focus on engineering education, with particular emphasis on what is taught, how it is taught and the wider learning environment within engineering departments. And whilst there is significant variation between the participation of different BME groups within SET, evidence of their relative lower degree attainment and slower progression (even after controlling for other factors) further prompts this increased focus (Connor et al, 2004; Booth et al, 2007). However, while the desirability of increasing access to SET may be accepted, the need for culture change within higher education has proved more contentious (Cronin et al., 1999), with the accountability for women's under-representation placed on pre-schools, schools, careers advisers and parents, and higher education defended as 'altruistically sex-neutral and gender-unbiased' (Byrne, 1993).

In universities, engineering curricula remain largely focused on a technical knowledge transmission model, in which decontextualised theoretical content remains predominant. Critical analyses call for an expansion beyond this 'hard' engineering knowledge to include the practical and societal implications of technology, as well as other social concerns associated with feminine values in western culture (Xiang-Yun Du, 2006). Previous studies have found that both female and male SET students regard engineering subjects, particularly, as dull, unappealing, uncreative and uninspiring (Cronin et al., 1999). Teaching in SET also tends to follow a traditional model based on lectures supported by laboratory sessions and problem classes or tutorials. Research suggests that most SET students would like more interactive

teaching/learning, clearer links between subjects and more practical problems, as well as a range of assessment options (Cronin et al., 1999). Research undertaken with female engineering students across Europe (Sagebiel & Dahmen, 2006) has also identified a preference for more discussion and project work, and a particularly strong desire for more industrial placements and practical work. BME SET students were also found to be more likely to call for increased opportunities for work placements (Booth et al, 2007).

Alongside technical knowledge, taught through the formal curriculum, students also learn the informal rules, beliefs and attitudes associated with becoming an engineer. Whilst there is significant commonality in feedback from male and female students on how to improve engineering teaching, women alone report the 'chilly climate' that exists for them in what writers highlight as SET's masculine culture (Cronin et al., 1999). The daily experience of jokes, language, behaviour and images may appear minor in isolation, but evidence suggests that their day-to-day accumulation within an overwhelmingly male environment can adversely affect confidence and career aspirations (Seymour & Hewitt, 1997).

Curriculum content, teaching methods and the wider learning environment each play an integral role in shaping the extent to which departmental culture welcomes the broadest range of potential engineers. Inclusive courses enable this by attempting to include the interests, values and experiences of all students, whatever their backgrounds, in shaping engineering identities. It has been argued that an inclusive course will not only be attractive to all groups and give all students an equal chance of success, but by drawing on a range of perspectives and values is likely to challenge and extend the thinking of all students (Nafalski et al., 2002).

The London Engineering Project – a current initiative to widen participation in Engineering

The London Engineering Project (LEP), led by The Royal Academy of Engineering and funded principally by the Higher Education Funding Council (HEFCE), aims to broaden participation in engineering higher education by increasing Science, Technology, Engineering & Mathematics (STEM) attainment and progression amongst women, BME students, adult learners and those from families with no previous history in higher education. Through a partnership of schools, universities, STEM organisations and industry, students from thirty schools across South London are engaging in STEM enrichment activities. The UK Resource Centre for Women in SET (UKRC) acts as a gender mentor to the LEP, delivering advice, training and hands-on support.

Central to the LEP is the role of higher education partners - London South Bank University (LSBU), University College London (UCL) and the University of Sussex - in developing and enhancing degree courses aimed at attracting and retaining a broader range of engineering

students. This work is supported by an HEI working group which brings together engineering academics from the partner universities, representatives from the Royal Academy of Engineering, the Engineering Professors' Council, Widening Participation advisors and experts in gender, race and science teaching. Each of the universities has a specific remit within the LEP to develop or enhance Foundation, BEng or MEng courses with a common theme of widening participation. This presentation focuses on the development of a checklist by this HEI working group to enable the delivery of inclusive engineering courses.

Methodology

The process of developing the checklist was part of a broader process of the HEI working group to identify the principles of, and practical ways to achieve, the delivery of more inclusive engineering education. This began with specific workshops facilitated by group members highlighting current research and best practice, and identifying critical success factors in promoting inclusion in engineering degree courses. These were participative, challenging and aimed at promoting broad discussion and engagement with the issues. The idea of developing a checklist emerged from follow-up group discussions as a means of capturing and distilling the findings into a practical tool for shaping curriculum content and teaching methods. From analysis of the output from these workshops and discussions, and with regard to previous checklists (Cronin et al., 1999; Nafalski et al., 2002), the UKRC representative drafted an initial checklist comprising action points relating to teaching content, delivery and wider culture.

Feedback was gained, both from individuals and in meetings, of the working group and partner universities, and the checklist was amended and enhanced, with the addition of detailed guidance from UKRC and a full set of references. A further process of review, discussion and amendment gave rise to the checklist in its final form.

Concurrent to the workshops, the LEP engaged an external evaluator to gain the views of students through focus groups on the style and content of engineering courses within the partner universities. Findings, available after the final draft of the checklist had been agreed, supported its themes and proposed actions. For example, several students criticised the need for memorising, book-work and the lack of creativity and innovation within their courses. This reflects previous research that disciplines such as engineering, that represent 'hard' fields tend to involve less discussion about values and more memorising, learning facts and principles, more multiple choice, less general knowledge and less emphasis in effective thinking skills such as critical thinking (Neumann, 2001). Feedback from several of the students in focus groups

about the apparent irrelevance of much of their studies to 'real life' and contemporary society reinforced research findings above, that had informed the checklist.

Outcomes and Discussion

Given the diversity of the HEI working group, particularly that of universities with varied student populations, attainment and approaches to widening participation, discussion about what was meant by increasing inclusion and how best to achieve this was wide-ranging and challenging. This diversity of perspective was welcomed as a necessary and valuable part of the process. Analysis of the output from the initial workshops showed the key areas to be curriculum, teaching practice and culture. The first draft of the checklist, produced in February 2007 and based on these three areas, was reviewed by members and the partner universities.

Feedback was diverse. Some felt they were already implementing the good practice embodied in the checklist, others that its emphasis on a more discursive approach and a broader range of skills would serve to dilute 'real' engineering content and adversely affect course quality. In one case it was asserted that students had expressed satisfaction at current course content, with its abstract technical focus and analytical rigour, and so there was no case for change. It was also questioned whether academics had, or would even want, the necessary skill sets and knowledge to deliver this broader curriculum. One university had already used the checklist to audit current practice and highlighted potential resource implications of further implementation.

The contrast between student feedback and that of some academics was apparent, with students being more likely to support the recommended actions of the checklist, particularly regarding a lack of creativity in teaching content and styles, requests for more discussion, project work and practical experience, and greater application of technical content to real life and contemporary society. Feedback from academics demonstrated that whilst some individual academics and institutions were aware of the principles underlying inclusive practice that had informed the initial checklist, this was not true of all. As a means of addressing this, the guidance document provided the rationale behind the main checklist themes. It was acknowledged that any process of departmental change is challenging, and it was intended that the guidance would help engage academics and prompt discussion and co-operation to promote change.

It was also recognised that a checklist may imply to some that academics need to be told what to do and that it may fail to acknowledge fully the good practice already in place, either of which might provoke resistance. However, the working group believed that the checklist would help promote best practice by underpinning what some academics were already doing, reminding

others of good practice that had not necessarily been implemented and informing those new to the concepts.

There was agreement that implementation of the checklist should be specific to each university, and that the process would need to be owned by departments themselves, rather than led by an external project such as the LEP. Previous work to implement inclusive teaching in engineering has identified the necessity for any change to be department-led and to be enabled by a process of dialogue and co-operation (Cronin et al., 1999; Nafalski et al., 2002).

The checklist in its final form, produced in October 2007, is a detailed 10-page document of action points and guidance organised into twelve sections, the full version of which is available at www.setwomenresource.org.uk. Section headings are given in appendix 1. An example of one of the sections is given in appendix 2.

The checklist is in the early stages of use by the LEP partner universities to review and develop engineering degree courses. Its practical impact in enabling a more diverse student group to become engineers will be closely followed by the LEP.

LEP Activities and the School Curriculum

'The ideal engineer is a composite ... He is not a scientist, he is not a mathematician, he is not a sociologist or a writer; but he may use the knowledge and techniques of any or all of these disciplines in solving engineering problems.'
N W Dougherty (1985)

Overview

The Government's initiative on science, technology, engineering and mathematics (STEM) was created to maintain and improve the science base in the United Kingdom. STEM activities are needed to support teachers in engaging and motivating pupils. Such activities show how learning need not be compartmentalised, but instead provide a vehicle for cross-curricular learning that is both engaging and relevant.

Background

The number of young people opting to take degrees is increasing year on year. However the number of young people opting to take an engineering degree has not changed in the last ten years.

According to the Confederation of British Industry (CBI), the number of UK students graduating in science, engineering and technology (SET) subjects needs to increase by 97,000 by 2014 in order to keep up with demand.

To increase the number of home-grown engineers and scientists there is a need to encourage potential students to consider, and their teachers to actively promote, engineering as a career choice.

The London Engineering Project (LEP) is a partnership led and managed by the Royal Academy of Engineering. This partnership of industry, higher education institutions and national science outreach organisations, together with funding from Government, aims to increase the numbers of young people choosing engineering as a career choice. Their work has focused particularly on enlightening female students, students from black and minority ethnic backgrounds and students from families with no history of higher education to believe that engineering as a degree choice and career is within their reach.

Methodology

The approach adopted by the LEP to engage students was through delivery of STEM activities during and outside of the school day, through taking engineering activities into schools and through taking students out of school to experience engineering in universities and the workplace.

The activities were developed by a diverse group of fieldworkers, many with an engineering background, and delivered by the fieldworkers with support from student ambassadors and STEM Ambassadors. To reach their target audience, the activities needed to be both gender and culturally inclusive. The process devised to ensure LEP activities were inclusive became known as DRIVE (see appendix).

DRIVE is a working document designed to ensure that LEP activities would deliver positive engineering messages and raise awareness of the issues around involving both gender and culture. Initially, DRIVE provided a system to capture an outline of the activity, resources required, costs and more importantly, a mode of delivery that highlights the best practice in equality and inclusion. Working through a set of guidelines fieldworkers outlined how they would ensure the activity provided a learning environment that encouraged girls and cultural diversity. Latterly, the DRIVE process was extended to include links to the school curriculum.

This case study explores in depth, a Key Stage 2 activity, *TRAM*. It is concerned with:

- The learning outcomes for students
- How a creative teacher can use an LEP activity to enhance the curriculum and its delivery
- How teachers can build upon *TRAM* and extend to other LEP activities in the secondary curriculum

TRAM: An LEP activity for primary school students

TRAM is a group activity designed to enhance learning for primary school pupils. It is a one day workshop in which groups of five to six pupils are given the task of building a working model of a modern electric tram system for urban transportation using raw materials supplied (see appendix). A tram as a method of travel was chosen as it is powered by electricity, clean and non-polluting. They have the advantage of being reliable, quick and, once built, cheap to run. The day is divided into three phases, thus allowing *TRAM* activity to be delivered by teachers in three separate sessions.

During the first session, pupils investigate circuits, carrying out electrical investigations that support skills and processes in the Year 6 science curriculum on electricity (SC4 Physical Processes). Most Year 6 pupils will have made circuits to light a bulb, but few will have explored circuits with buzzers and motors. Bulbs work whichever way the current flows, motors work in different directions according to the flow of current while buzzers will only work with current in one direction. Once pupils have explored the effect of current, they continue to explore circuits looking at the effect of more than one element, first in circuits in series and then in parallel. The tasks for pupils during this session are to:

- Make a propeller move
- Find out how to make a propeller spin in both directions
- Make two motors and propellers move

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- Make two propellers and motors move in different directions using the same batteries
- Make a bulb light and two propellers move using the same batteries
- Make two propellers move at different speeds

The knowledge and skills acquired from the investigations in the first session are applied in the second session, building a working model tram. In their groups, pupils engineer a tram system of tracks and rails with overhead electrification and a remote controlled, battery operated vehicle. Their target is to build a working tram that will run for one metre up and down a track. The tasks for pupils during this session are to:

- Build a track
- Build a vehicle with an electric motor that turns a wooden pulley using a rubber band
- Build a system to support two overhead cables that will be electrified at 3 volts

This session supports the knowledge, skills and understanding across all aspects of the Year 6 design and technology curriculum. Groups of pupils that complete this session early can extend the work by designing and making stations, platforms and signals for their tram system, taking into account of the needs of potential users. A more challenging extension is to control the speed of the tram, as well as the direction it travels, using a variable resistor. Teachers can have a previously made circuit with variable resistors to demonstrate how it works to the whole class at the end of this session or at the start of the final session.

In the final session of the *TRAM* activity, pupils test and evaluate their systems. Each group demonstrates in turn how their system works. A joint report on their findings can be through a poster to display or booklet. A presentation in whole school assemblies allows parents to appreciate the importance of engineering skills.

***TRAM* and the Primary Curriculum**

Pupils learn, use, develop and refine a wide range of skills in their work across the National Curriculum. Some skills are subject specific (for example painting in art and design), while others are common to several subjects (for example enquiry skills in science, history and geography). Some skills are universal; for example the skills of communication, improving own learning and performance, and creative thinking and these skills are essential to effective learning.

The *TRAM* activity was delivered to pupils at Walnut Tree Primary School, Lambeth in the spring term 2008. Andrew Chaplain, a teacher at the school, said,

‘What has been fantastic about this workshop is that it has taught the children dedication, enthusiasm, imagination and most of all teamwork, and it has given them the tools to enhance their presentation skills.’

Mick Waters, Director of Curriculum at QCA, said,

‘The cross-curriculum dimensions are essential tools to help young people make sense of the wider world.’

The *TRAM* activity can be used by a creative teacher as a teaching platform to plan a scheme of work across the primary curriculum. Through linking subjects, pupils have the opportunity to develop the essential skills for learning and life in an engineering context, thus raising the profile of engineering, increasing understanding of its impact on society and introducing engineering as a viable career choice very early in their school career. *TRAM* reinforces the evident links between science and design and technology, but there are also links with the Key Stage 2 National Curriculum in mathematics, English, history and geography.

Opportunities for teaching and learning essential skills across subjects can be identified when planning. Pupils can be encouraged to reflect on what and on how they learn, and how these skills can be applied to different subjects, different problems and real-life situations. With respect to different areas of the curriculum pupils can:

- Develop their geographical enquiry and skills through studying the wider impact of tram system on the local environment, roads, housing and its social impact. They can use maps and aerial photographs to explore and discuss whether the landscape was suitable to build a new tram system and what impact it would have on the future of the area with respect to local industry and sustainable employment. In their study of localities in the UK and elsewhere, the impact of a tram system compared with the existing transport system in a less economically developed country may be explored.
- In history lessons, link the building of a new tram system with either Victorian Britain or Britain since the 1930s. The *TRAM* activity can be related to both the changes transport brought to workplace practices and the impact of technological changes on society. Furthermore, the *TRAM* activity can also form part of a local history study investigating how transport in the local area has changed over a period of time.
- Explore and apply scientific and technological skills in a range of environmental contexts. Whilst all aspects of the design and technology curriculum are covered in the *TRAM* activity, other forms of transportation can be explored, further developing knowledge and understanding. For example, making and using a hot-air balloon (explore air-power), studying bicycles (explore gears) and studying cars (linking with Greenpower challenge, a national extra-curricula competition).
- Develop skills across all aspects of the English curriculum throughout their work in the other subject areas.
- Apply their mathematics skills in number, geometry and statistics in a variety of contexts in the *TRAM* activity itself and through associated project work in other subjects. Mathematics, the M within STEM, is a not only vital discipline in its own

right, but underpins the other STEM subjects providing a common skill set that connects and distinguishes between them.

Through looking at an engineering project in the wider social and environmental contexts and the impact that being an engineer can have on both present and future society, the appeal of becoming an engineer becomes more attractive to girls, while the interest to boys is not lost. Instilling in the younger mind the idea that engineering can be their future, before stereotypical roles are imprinted, may impact on later choices.

To consolidate learning and provide a vehicle for assessing pupil progress (APP), a group activity jigsaw and an individual investigation record sheet (see appendix) was designed by the LEP. The jigsaw can be used to promote further group work, encourage discussion and highlight misconceptions.

Making STEM part of the Secondary Curriculum

Learning from primary to secondary schools is fraught with the insecurity of changing schools, moving into a much larger environment and the lack of continuity in learning. Secondary schools have information about achievement at Key Stage 2 tests and teacher reports. A bridging unit serves to highlight prior achievement and understanding and provides a mechanism for teaching and learning in secondary schools to build on prior knowledge. The *TRAM* investigation record sheet provides a bridging unit from Year 6 to Year 7 across STEM subjects and a springboard for secondary teachers to collaboratively explore different ways the new secondary curriculum can be used to inform planning for STEM.

The new secondary programmes of study (PoS), found at www.curriculum.qca.org.uk are skills based. The key concepts identify the big ideas that underpin the subject while the key processes identify the essential skills. The curriculum opportunities outline the scope for teachers to enhance and enrich the curriculum and make cross-curricula links. On each subject page, the tools for comparing subjects allow teachers to compare the PoS for different subjects side by side. For example, the key concepts of mathematics, science and design and technology all highlight creativity, critical understanding, an understanding of historical and cultural roots of the subjects and their importance in today's society. Examples of STEM activities can be found at www.qca.org.uk/stem. The LEP developed a significant number of activities for secondary school pupils, examples include:

- Tube Lines Improve and Upgrade; an integrated science and engineering activity designed by the LEP fieldworkers within an industry context that can follow on directly from *TRAM*. The activity is based upon what Tube Lines does for the Piccadilly, Northern and Jubilee underground lines in London. It involves designing and building electrically powered model railway trains together with the equipment needed for an inter-change station.

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- Trebuchet Challenge; a half day activity held at the Tower of London in which students build an early machine of war. This can be developed to consider practical applications for mechanical systems, to experiment with the shape and materials of projectiles, to explore the speed and distance of trajectories, to perform computer simulations of projectiles as well as to consider the ethical and moral implications of war.

Summary

STEM activities can be used as an integral part of the delivery of the curricula either through making cross-curricula links or within individual subjects. Activities can be used to introduce an area of the curriculum or as a mode of assessment. Assessing progress is integral to informing planning, teaching and learning.

The National Curriculum aims to enable all young people to become:

- Successful learners who enjoy learning, make progress and achieve
- Confident individuals who are able to lead safe, healthy and fulfilling lives
- Responsible citizens who make a positive contribution to society

The focus for learning is across three areas:

- Attitudes and attributes; namely confidence, determination, adaptability and enterprise
- Skills; particularly literacy, numeracy, ICT and PLTS (personal, learning & thinking skills)
- Knowledge and understanding; the big ideas that shape the world

STEM activities both in and out of lesson time will help schools fulfill these aims through:

- Opportunities for pupils to engage in collaborative problem-solving activities
- Discussion amongst pupils to generate creative, practical, cost-effective solutions that are relevant and fit for purpose
- Designing products that contribute positively to the community and/or the environment in which pupils are given the opportunity to analyse, evaluate and communicate their findings
- Pupil learning and understanding about the relationship between science, society and the future of the world
- Consideration by pupils of ethical and moral issues and global sustainability

Questions to think about when introducing an activity in school include:

- What areas of the curriculum does the activity address?
- Does the activity enhance, enrich and support the curriculum?
- Can the activity address cross-curricula issues?
- Where does the activity fit into the scheme of work?
- Does the activity allow for reflection and further follow up work in school?

<p>Activity Title: Tram</p> <p>Activity Correspondent : Doris Ntow & Israt Jahan (the person who submits activity for Drive and receives feedback)</p> <p>Date submitted: January 2007 Date for return of completed drive:</p>	
<p>Overview of activity</p>	<p>Tram is a fully participative, interactive learning experience for a class of Y5 or Y6 pupils. The teaching aim of the project is to give all 30 pupils in the class a taste of engineering activity, and, at the same time, to enhance their learning of science and D&T. The overall aim of the project is for children to build a tram system to demonstrate the working and advantages of a modern electric tram system for urban transportation.</p>
<p>Description materials & resources used i.e. handouts/leaflets/PowerPoint</p>	<p>Raw materials per group</p> <ul style="list-style-type: none"> 2 sheets of A4 Correx 1 Tram base 4 big wooden wheels 1 small wooden wheel 5 elastic bands 1 motor 1 motor bracket 1 black pulley 2 pieces of dowels (15cm) 1 straw 2 red wires 2 black wires Marker pen Ruler 2 lengths 60cm dowel 2 lengths 60cm metal rod 2 lengths 30cm dowel Correx scissors 2 AA batteries and a double battery pack

Delivery technique	The predominant teaching technique is interactivity. Pupils are set an open-ended challenge and take ownership over their response. Workshop leaders are on hand to act as advisers, and are trained to take a constructivist approach to science and maths learning. All science and maths activities are firmly rooted in the national curriculum, so that the school knows that relevant work is being undertaken. The activity takes one day of Y5 or Y6 time. Teachers are briefed beforehand so that they can see where the activities fit with their curriculum.		
Max No. of students per activity	30 pupils		
Age group(s) – please delete as appropriate	Primary Yr6	Total hours required to run activity	5

Activity Plan		
Time i.e. 9-9.30	Breakdown of activity i.e. ice-breaker	Resources required
1 hour	Investigation of electrical circuits, including construction and comparison of series and parallel circuits	Steel rod, Wires, motors, crocodile clips, batteries, propellers, bulbs and bulb-holders
2 hours	Building of battery powered rear-wheel drive vehicle, using pulley wheels and dowel for track/guidance system	As above plus correx, dowel, wooden pulley wheels, straws, glue-guns
1.5 hours	Modification of vehicle to overhead catenary electrification	As above
0.5 hours	Plenary: presentation of research	

Curriculum Relevance	
Please outline aspects of the curriculum your activity addresses;	<ul style="list-style-type: none"> • Science Sc4Physical processes - Electricity QCA Scheme of Work Circuits • Technology Aspects of PoS 1 – 4 relating to : QCA Scheme of Work Controllable vehicles • Maths Aspects of number, geometry statistics • Other

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	1 Speaking; 2 Listening and responding
Have you discussed with curriculum adviser further activities/resources for schools/learners?	Give date of meeting and brief summary of outcomes; October 2008 Further activity to consolidate learning – Electricity jigsaw, can be found in resources area of LEP website. Ideally jigsaw would be worked on in small groups, pairs or threes, with teacher/pupil discussion

Teacher support/Staff support	
How do you get the teachers & the staff involved? How are they been briefed?	

Ambassador /SEA	
Are you using an Ambassador or SEA? In what way are they being a role-model? How are they been briefed?	

Activity Costs – please list the costs for the following;	Cost per Activity	Cost per Student
Fieldworker time (approx. £120 a day, per person) Ambassadors (£14.00 an hour, per ambassador)	£240	£8.00
Printed Materials Other Materials Re-useable resources Logistics (e.g. travel & courier costs)	£60	£2
Budget Cost	£ 300	£10.00
Actual Cost	£	£

Your check list	
How have you included the all important engineering messages in your activity and materials? Please state where and how you think this will positively change attitudes. Our aim is that students want to be an engineer, to make sure they know what engineering is after completing your activity and	<ul style="list-style-type: none"> • LEP Presentations • Scenarios in your activities • Introduction • Wrapping up • Follow up activities

<p>where to get more information about careers in engineering.</p>	<ul style="list-style-type: none"> • Careers information <p>The engineering messages are an ever-present feature of the activity, raising awareness of science and engineering throughout. An introduction is normally made, relating the activities to real life contexts and the work of engineers. In addition, a jigsaw of the messages is given to the pupils to reassemble as part of their plenary session.</p>
<p>Have you worked through the LEP- Gender Inclusion/ Cultural Diversity Guidelines?</p> <p>Please outline how you've done this and give an example(s) under each heading.</p>	<ul style="list-style-type: none"> • Activity: Children are divided into five groups with a mixture of different abilities and genders. The groups are given the task of making a working electrified Tram system using raw materials supplied to them. • Context: At the moment there is no scenario with the Tram project but this is something that is being looked into. Children are given written instructions to follow as well as verbal in order to create the Tram system. Each member of a group are numbered 1-5 (or 6 depending on number of children in class) and then given a job to carry out in order to make the Tram system. The reason for this is so that every child has a job to do and also understands that within engineering there are different fields. E.g.: "if everyone made the track who would make the tram, overheads, stations act..." • Images: There are no images at present of people or cartoon characters but a clip of a real Tram system is shown to the children at the start of the session. The clip depicts how trams are used by everyday people to carry out there daily tasks such as work, shopping, school etc.... The clip also shows how trams run on electricity which means hardly any pollution is let out into the environment via this transport. • Names: As there is no scenario at the moment for the Tram project, names are not needed. Never the less due the nature of schools we work with there is a huge number of names from our children whom are all from different backgrounds and cultures. The children's names are used as examples when setting a verbal scenario.

	<ul style="list-style-type: none"> Language: The children are always referred to as engineers throughout the duration of the workshop. When referring to an engineer the 'she' is used more often now. Use of examples/reference points: At the start of the lesson children are asked about engineering and they think it covers. "Which parts of the world have you seen the tram system in" "Why should we use trams" How much does a tram cost to make? "Who does the planning for making the tram system"? Teaching methods: During session, children are put into groups of 5 ensuring equal numbers of boys and girls, each allocated an active role working to a deadline and finally coming together to present their project. There is an ongoing assessment and evaluation of group performance and support throughout the session. Session ends with detail evaluation of the whole session by the children whereby they are asked to prepare a presentation of the day. Children need to present three or more things that they have learnt about Trams and engineering.
<p><u>For secondary activities only</u></p> <p>Have you contacted Jodie Cole at the BA to discuss suitability for CREST accreditation?</p> <p>N/A</p>	<p>Please state the date you made contact below:</p> <p>What has been agreed with the BA?</p> <ul style="list-style-type: none">

Curriculum Relevance - to be completed by RAENG representative	Action Points
<p>Tram is a practical way to introduce, teach and learn aspects of the key stage 2 science, mathematics and design technology curriculum.</p>	<ul style="list-style-type: none"> Ensure that key objectives from KS2 science and mathematics are addressed in order that pupils make the connection between the activity and their school work Ensure that teachers are aware of follow-up activity to consolidate learning.

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Date completed: 8 th Jan 2009	Completed by: JK	
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Gender Inclusion comment - to be completed by UKRC representative		Action Points
<p>All the feedback from Drive 1 train is relevant and needs to be applied. On the response to this I would like to see how the feedback has been applied. Tram is an ideal opportunity to bring in the environmental and social impact of engineering, rather than repeating the train exercise with Trams. Having observed the children I appreciate how they enjoy and participate in the activity but still this does not provide the context for engineering nor does it explore all the many different areas of engineering. Also , this is an example of engineering which is happening now and will effect local surroundings, we could foster a sense of ownership and participation which could have a lasting impact on their career choice.</p>		<p>All the actions from Drive form 1 are relevant and need to be worked through. Seize this opportunity! We could look at different models of transport: cars , bicycles, hot air balloons , trams etc, examine the social implications, environmental costs, materials used etc., carry out an analysis and come up with what would be best for Southwark. Look at why tram has been chosen for Southwark, what may be suitable in other areas. Opportunity to look at other forms of transport in other cultures/countries, historical forms of transport. Use a map of an area of where tram is actually going through Southwark, get students to consider/plan route then go on site visit to see what planners have decided, and why. Get female engineer, ideally BME to work with students around planning and then show them around site.(idea from Yasmin re biscuit factory)</p>
Date completed: 21/12/06 Revisited: 7/7/08	Completed by: RE/YP	
To be reviewed by:		

Cultural Diversity comment - to be completed by ACNST representative		Action Points
		•
Date completed:	Completed by:	

Engineering Messages, Logistics & Costs Audit comment - to be completed by LEP coordinator	Action Points

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<p>Include points on Social and environment impact of a tram compare to a new train line.</p> <p>Discussion/quiz on environmental impact of a new tram system.</p>	<ul style="list-style-type: none"> Prepare a quiz on either the social and environmental impact of tram.
Date completed:01/02/07	Completed by: HH

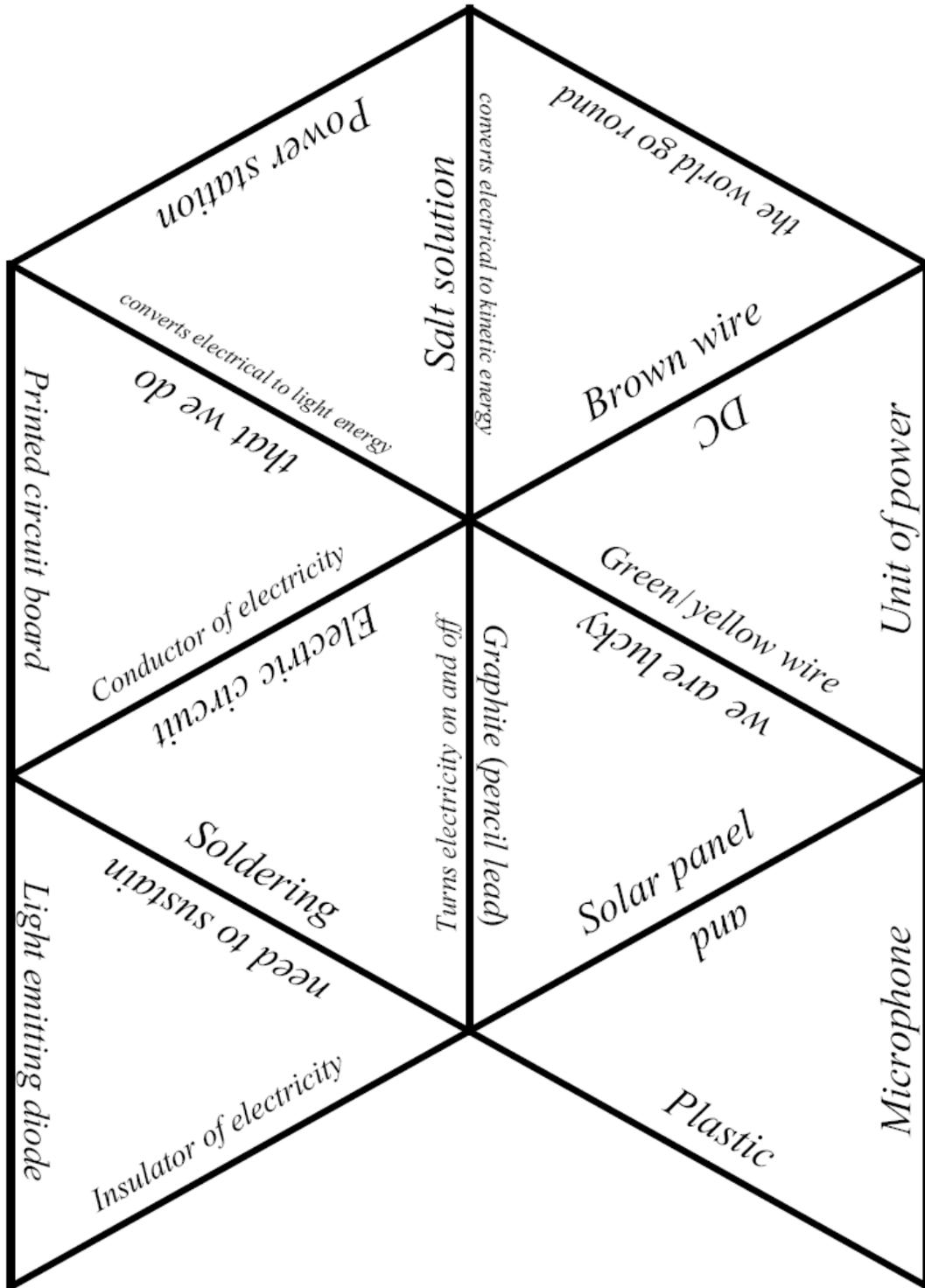
<p>Suitability for CREST accreditation comment - to be completed by BA representative</p>	<p>Action Points</p>
<p>Date completed:</p>	<p>Completed by:</p>

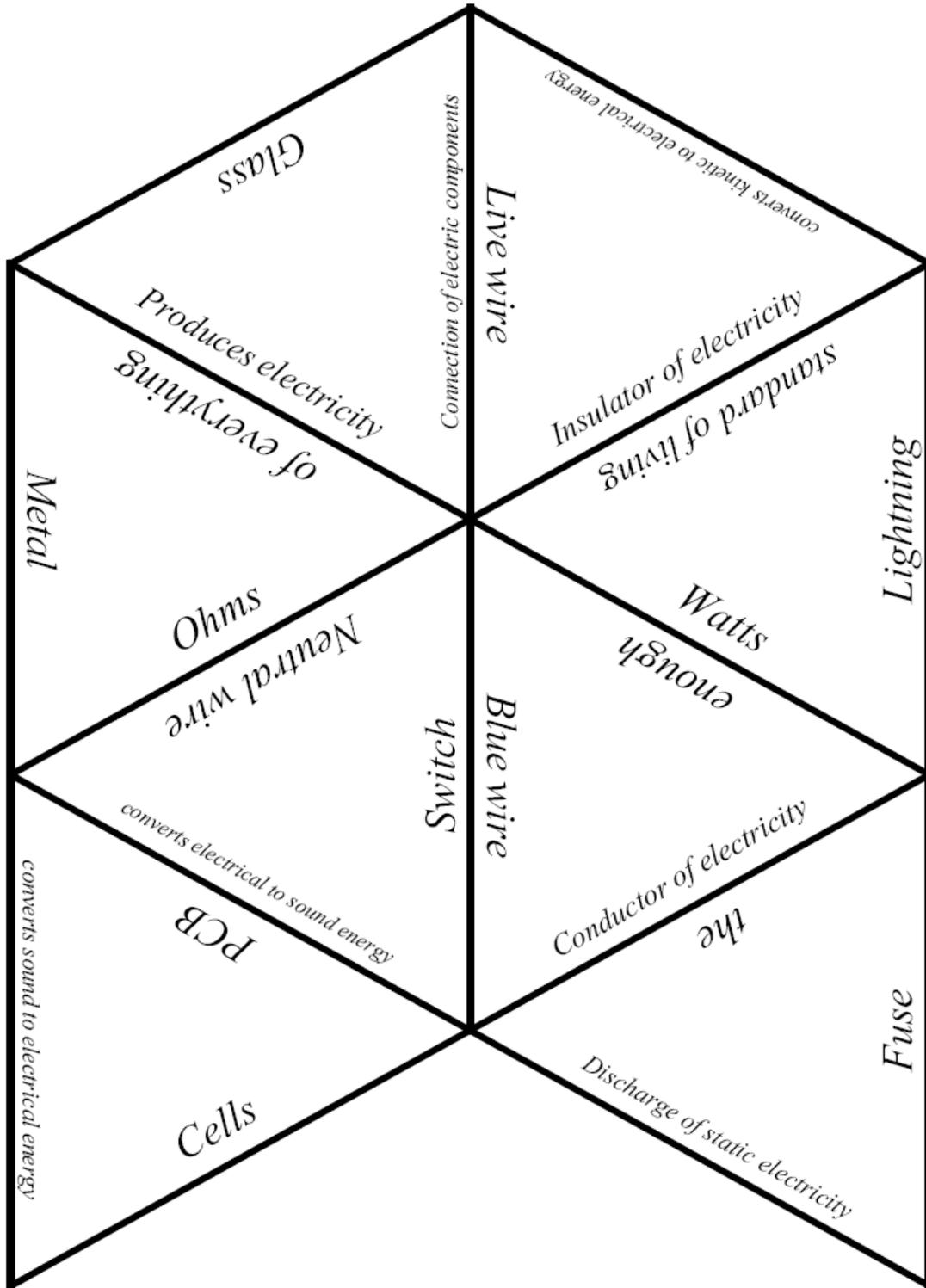
<p>Sign Off - to be signed off by LEP coordinator</p>	
<p>Tram in Sheffield – video – can we see the video?</p> <p>Social and environmental impacts – discussion on why they use tram. What do they use in different countries?</p> <p>Effects on immediate environment. Wider impacts. The route of the tram.</p> <p>Needs expanding, how can you construct an activity around this, plenary, icebreaker or quiz!</p> <p>Cross river team come in and do presentation and they are all women.</p> <p>Once these things have been completed we can look again at signing of the activity.</p>	<p>Date: 01/02/07 Signed: HH</p>

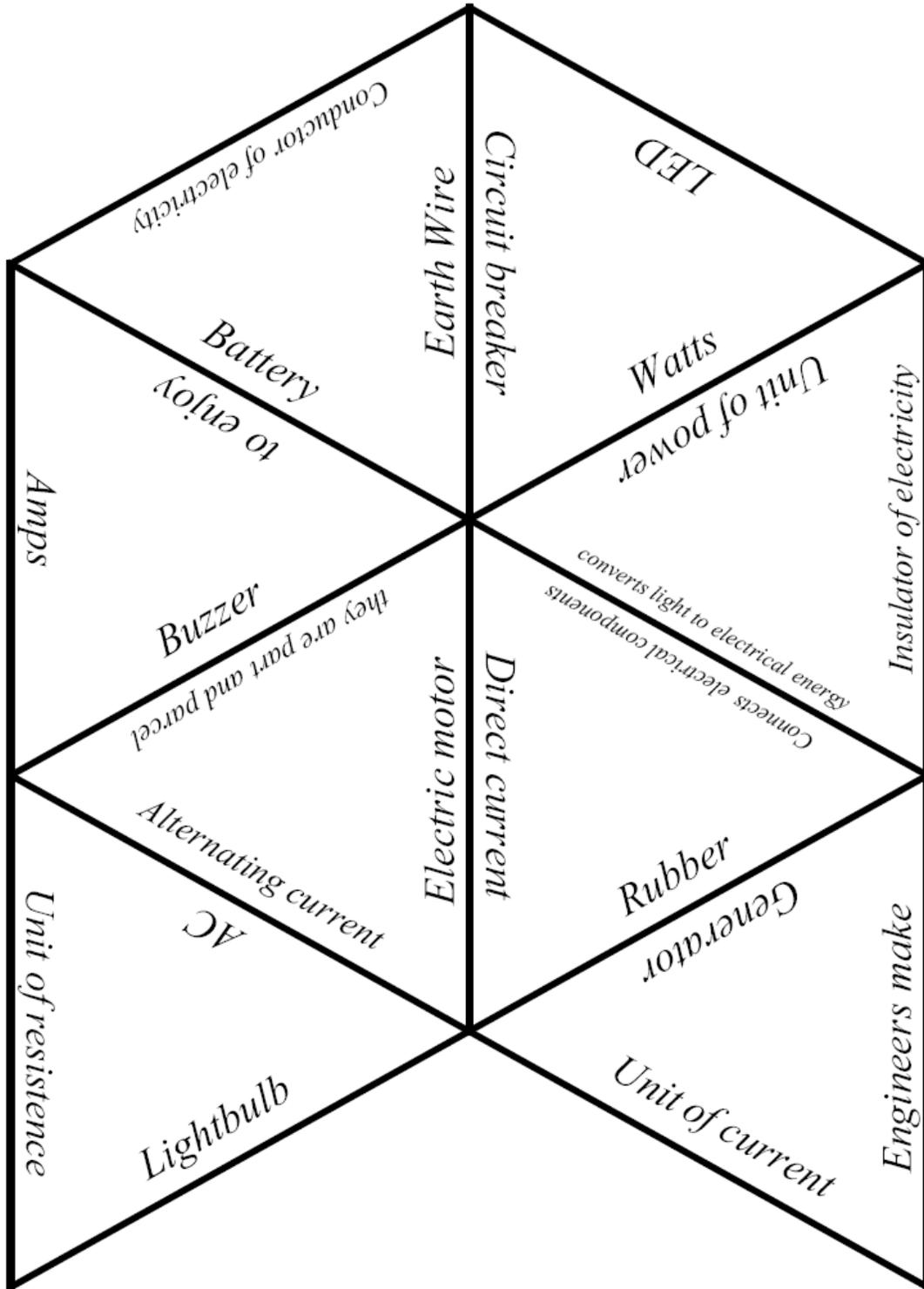
<p>Post Delivery Evaluation</p>	
<p>Quantitive/ Qualitative Breakdown</p>	<p>Please complete as fully as possible, giving examples.</p>
No of girls: boys ?	
Breakdown of BME students?	
Did all the students participate equally?	<p>If yes, in what way?</p> <p>If no, what would you do differently next time?</p>
Did the engineering messages work?	<p>If yes, how do you know?</p> <p>If no, what would you do differently next time?</p>
What else would you do differently	

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next time?	
Did the CREST pilot run smoothly?	If yes, in what way? If no, what would you do differently next time?







Investigation Record Sheet for TRAM Project

Using the record sheets, in your group record what you have found out from each of the investigations.

How did you get the propeller to move?

What did you have to do to get the propeller to move?

How did your group make two propellers move at the same time?

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How did you investigate two propellers moving at the same time but at different directions?

How did your group get the two propellers and the bulb to work altogether?

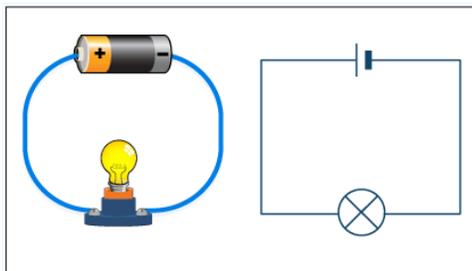
What did your group do to get the two propellers moving at different speeds?



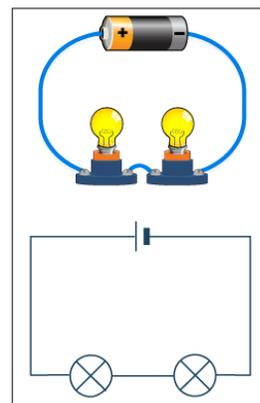
Has your group noticed a pattern emerging each time you moved onto the next investigation? If yes what has your group noticed?

Symbols used in electricity

What type of circuit is shown in the diagram below?
Is it a series circuit or a parallel circuit?

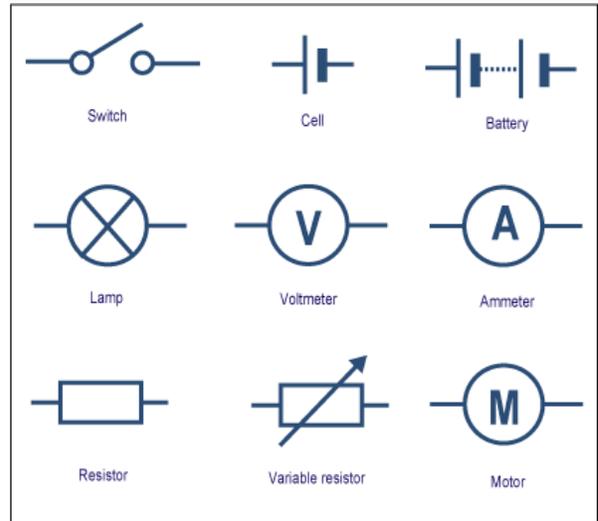
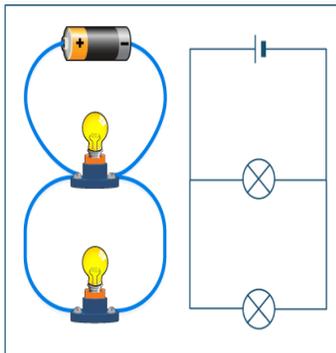


A series circuit with one cell and two lamps



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A parallel circuit with one cell and two lamps.



Baseline Evaluation Notes: **Engineering at LSBU at the start of the LEP**

Sources of Information

Senior Manager
Curriculum Development Officer
Lead Academic
Student Marketing Officer
Dept. of Engineering Systems

Context – before LEP

Overview

It is important to note that the interviews conducted for this report were undertaken early in 2006, soon after the LEP had began its work. Looking back in late 2009, staff at LSBU find it hard to recognise some of the points raised. It is therefore likely that the report is strongly influenced by the opinions of one or two individuals.

Engineering at LSBU is comparatively successful. FESBE is the second largest faculty in the university – ***‘LSBU was established as a Technological, Science and Engineering institution and these subject areas are what it is most well known for’***. The numbers of students applying for courses have increased over the last two years and are actually up by 35% this year. However, there are issues for Engineering at LSBU: students particularly struggle with the maths content of the courses¹ and the need for the accreditation of professional bodies is an important consideration. LSBU also struggles with its image. As with all universities, the pressure on academics to produce research in order to attract funding is also increasing

Constraints

The senior manager explained that 1992 came as ***‘a blow’*** to LSBU: It ***‘had been a good polytechnic but became a third rate university and it has taken 15 years for it to get its self respect back’***². Pre 1992 CNAAB used to accredit the degrees but post 1992 the university accredited its own: this meant that ***‘the value of the award was tied to the status of the university’***. Because of this, the importance of the accreditation of professional bodies has really increased. This is problematic for LSBU and also other institutions. Engineering is ***‘caught between a traditional outlook and a desire to modernize’***: ***‘engineers’ perception is that it would be dangerous (literally) to make engineering more interesting’***.

- The university is very heavily reliant on local students. Some 70% of students are drawn from three or four local boroughs (a high proportion are from Tower Hamlets). These ***‘students are predominantly from lower socio-economic groups and struggle to afford the fees that are currently charged’***; many students work long hours at full or part time jobs outside their studies. The university currently pays back five hundred pounds to students in bursaries – this figure goes up to seven hundred and fifty in the third year (this is given to all ‘home’ fee paying students). The senior manager explained that ***‘LSBU was first***

¹ It is fair to note that this is a common problem in all universities

² This is not a view shared by LSBU staff when questioned in 2009

built with a mission to 'educate the poor of London' and that position has never really changed. There is also a high proportion of mature students who are considered by staff to have a **'better work ethic'** and to be **'the most focused students and the best employees'**. However, the outside commitments of students at LSBU can make it difficult for them to study; currently the rate of drop out on some courses at LSBU is 27%³.

Staff and students attitudes and morale

- The desire for more and new students is balanced in engineering departments by the **'comparatively small numbers and insular and engaged teaching that engineering has been able to enjoy'** because of the weighting given to engineering students by HEFCE (1.7 given directly to the faculty at LSBU). This **'has meant that engineering has been quite protected and engineering departments (generally) are reluctant to change'** *. Departments are also worried that they will lose their academic credibility if they innovate and **'hang on to the need for maths and professional body accreditation'**.
- Staff see maths as the weak link in the chain of progression to degree level and they see the problem as originating in the schools. There are large numbers of students on engineering programmes at LSBU without A level standard maths on entry (most have vocational qualifications) – some initially struggle with GCSE level.
- The curriculum development officer's perception is that the more high achieving students feel that they are being held back by the rest. Tutorials are often spent bringing people 'up to speed' (he hopes the online maths resources being developed will free up some tutorial time).
- Staff are encouraged to be active in their profession and this can impact positively on curriculum content e.g. work on energy sustainability has been cascaded into the teaching of the MSc and then down into undergraduate programmes.

Recruitment

- Approx. 50% of students are non- white British. There is a very high proportion of black students: **'many students are first generation and have a very fluid relationship with other countries e.g. Nigeria and the UK'**. There is a high proportion of mature students (approx 50%+); these students are particularly high in numbers on masters courses and the MSc in Building Services. Relatively few of the students have A levels; most have vocational qualifications such as BTEC and NVQ. Building and Services and Chemical Engineering courses have the highest proportion of women. The MSc courses in Engineering all recruit large numbers of international students. This is not the case for Building Services though the MSc course draws from all over the country.

³ This figure does not relate to engineering courses

- Building Services and electrical engineering are popular. However, students applying to Building Services rarely come through UCAS: most apply directly to the university and are already in employment planning to study part time. Chemical Engineering has recently seen a strong increase in numbers. Mechanical Engineering is not recruiting well – this is probably due to the fact that **‘the course does not have accreditation from the institute⁴’**.
- The increase in A level grades required by HEIs generally has impacted negatively on students who come via different routes (i.e. most of the students at LSBU). Students with vocational qualifications have to match A level students in terms of UCAS points and LSBU is caught in a difficult position regarding its image – it is not perceived as desirable in terms of the university’s image to set the point score requirements too low when other universities are raising their requirements (because of the improving A level grades) but if LSBU follow this example, they will disenfranchise potential students who come from local institutions and via different routes.
- The prospectus:
 - This had remained in a very similar format for 10 years. However, this year significant changes have been made. The student marketing officer (in position for 10 months) has spent several months gathering opinion and market research has been carried out independently to investigate students’ response to the prospectus and website. It was found that **‘people use the prospectus as a directory’**. However, images were also found to be important to **‘spark their interest’**. Particular to LSBU is that the student body is varied and so is **‘a difficult market to target’**; Student marketing staff have attempted to make the information **‘clear and accessible for everyone...the majority of students are non standard entry and mature students with life experience’**. A problem identified with the previous prospectuses was that a lot of the text, written by the academics themselves, was inaccessible to potential applicants: **‘talking in a language people are not going to understand’**. Also identified was a problem with the way that the entry requirements were set out **‘they were trying to be inclusive but it was actually very confusing’**; this was identified as being a particular problem for people with qualifications other than A levels. As a result of these findings, the details of qualifications that are accepted have been replaced by information relating to the UCAS tariff system. The points needed to qualify for some courses have actually been raised slightly to fend off the **‘perception if it’s too easy, it must be rubbish’**. The new prospectus also has a sharper focus on progression; student marketing explained how foreign students consulted, particularly wanted this focus. A problem which was identified for LSBU is that they **‘haven’t really got a brand’**.
 - The prospectus is now organised according to the structure of the faculties: an individual image has been selected in an attempt to give each faculty **‘a personality’**. Initially the plan was to use an image for each division page that summed up the faculty but that was difficult as

⁴ Accreditation was obtained in December 2007, backdated to the September 2006 entry.

there was a problem that subject areas would be upset, so the decision was taken to use local images of London (the image selected for the FESBE was the London Eye). Marketing staff also made sure that pictures of staff e.g. of the Vice Chancellor and student profiles were presented in the same format to suggest that the institution is **'friendly and that they are on the same level – it's not elitist, not hierarchical'**. Organising photo shoots within each faculty for the other images was also difficult as academics were needed to help set these up and **'they don't view it as important – you've got no budget to pay anyone but you need students and staff'**. Academics are also **'quite territorial about the images they want'** but were said to send in dated and poor quality pictures.

- The text in the new prospectus was organised more systematically for each subject area than had been done previously. Each area had a single page and a template was sent out with subject headings to encourage some consistency across subject areas. Instructions were also sent out to academics requesting they **'write in clear English (and) for someone who doesn't know anything about the course'**. Each faculty has a co-ordinator who volunteered to co-ordinate the information. This information was then gathered and edited centrally.

Progress and Issues for the LEP

- Curriculum development:
 - The role played by the curriculum development officer in FESBE has enabled LEP approaches to be taken directly to members of the relevant departments. At monthly FADC meetings he has circulated the curriculum checklist created by the LEP and has successfully engaged members of the committee with it (they are currently rating recommendations according to what they consider to be most important). He has also gained agreement that the checklist will be applied to at least one course in each department: this includes the three foundation degrees but also two other programmes. In his role he has been attending course boards which have given him insight into student complaints and issues which he can feed into the LEP report **'Transition issues and their impact on curriculum development for engineering'**. He also plans to run focus groups about students' perception of engineering at the university. The role has provided him with the opportunity to work with the 14-19 sector in local schools and colleges and to increase awareness of what is happening in this sector among his colleagues at LSBU.
 - The curriculum development officer sees increasing awareness among teachers and lecturers of what happens in other sectors as important. He hopes to organise a workshop/ awareness day to encourage more understanding and collaboration between sectors. Many lecturers and some teachers **'are from grammar schools and their own experiences colour their expectations of students - they see A levels as the only way into HE'**.
 - Fast track courses in maths/ computer science and english are offered to incoming students and students already at LSBU who want to boost their

knowledge. LSBU is currently looking at ways to engage more FE students and colleges but there are funding issues.

- LSBU is currently developing an online maths trainer. A lecturer is using a model for teaching maths used in soviet Russia (maths is taught in a linear fashion). The hope is that this will be developed in time for 2009 – for the first group of incoming diploma students. However funding for this initiative has run out and there is a need to match the 30k spent already to develop the facility further.
- Foundation degrees:
 - LSBU is providing curriculum material to FE colleges to help them deliver HNC/HND level courses. This will create a link to the foundation degrees at LSBU: the hope is that students should be able to progress smoothly onto the foundation degrees at a stage in the programme appropriate to their existing skills and knowledge and that this will avoid past students' frustration that they are repeating material covered at FE in the more expensive context of HE.. LSBU also currently has the funding to organise progression accords with FE but this needs to be done quickly as the funding is time limited; there is a need to build momentum on the projects – the curriculum development officer is visiting each FE institution to check on progress.
 - EDF Energy has indicated that as part of the work based learning component of the degree course they would be prepared to let students use their 'in house' training facilities. However, the relationships with Thames Water and Transport for London are not certain. The lead academic would like to bring in more partners – there is currently no engagement with sector skills councils. He feels that giving training to local people to work with service providers so that they can offer technical maintenance would be beneficial and would help to address the perception that HE education is not delivering relevant skills.
 - A course leader (FD Building Services) from the Department of Engineering Systems outlined his work on the foundation degree in building services. He sees the foundation degree as way to **'overcome the problem of students with vocational and occupational qualifications having to go backwards to move onto academic routes'**. He hopes that the foundation degree will make this process less daunting for vocational students who he sees as the key to filling the skills gap identified by Semta (Sector Skills Council for Science, Engineering and Manufacturing Technologies) : **'it should offer a much smoother route'**. (The lecturer said that graduates of the HND course are moving straight into technician jobs paying K45 because there is such a shortfall). He plans to ensure that students can transfer onto the successful HND course if the foundation degree **'goes belly up'**. However, he is confident that this will not happen: **'Industry see LSBU as a benchmark and will accept a foundation degree if it is from LSBU'**. The course Leader said initially intends to focus on part time students at four FE colleges as he sees this as manageable: **'I can go into four colleges now and make sure the foundation degree works'**; once this base is established and accepted by industry he thinks it can be extended to include other colleges and more full time students.

- Marketing initiatives: an outreach initiative is being developed which involves inviting 6th formers to the university to experience work in robotics and mechatronics. (LSBU are in the process of applying for funding for this work).
- Diplomas: the curriculum development officer identified a potential problem for the diplomas as a perception among FE colleges and parents that engineering diplomas are for **'lads with ASBOs'** (source Camberwell Science Centre)⁵. He feels that there is a real need for information in colleges regarding the demands of engineering and the range of skills that engineers need. FE colleges do not generally have the technical facilities to offer the diploma. Lambeth and Southwark have agreed to offer the diploma and LSBU could support them by offering workshop facilities.
- The lead academic described the need for better communication: **'there is a feeling that we're half way into the project but in reality very few of the academics at LSBU are engaged with the project...this wasn't part of the project plan...there was a feeling that staff would be engaged with the schools but that isn't really happening – student ambassadors are in schools but not staff'**. He hopes to engage the pro Dean with the project to **'make sure that things done in the project are carried through into our curriculum'** and described the need **'to engage with what is happening in the schools'**.

What the university hopes to gain by the partnership

- **'A strong network from LSBU to supply lines...good relationships with schools and colleges'**
 - **'good relationships with employers so that we can play a strong part in bringing suitable people through to what employers need'**
 - **'An enhanced awareness of the WP agenda'**
 - It was also agreed that the partnership was valuable to the university as it brought with it the prestige of being associated with the Royal Academy of Engineering (RAE). The curriculum development officer also discussed the hope that the RAE could impact positively on the awarding bodies to encourage a more flexible approach to course design.
 - The curriculum development officer was keen to gain funding to allow the work of the online maths trainer to continue –currently a further £30K is needed.
- * The senior manager was able to provide insights into engineering departments across the country through his work with the Quality Assurance Agency (QAA).

⁵ This comment was made at a time when there was very little information on the new Diplomas. The Diploma in Engineering has become a success locally.

Baseline Evaluation Notes: **Engineering at UCL at the start of the LEP**

Sources of Information:

Lead Academic/ HoD

Senior Lecturer/ admissions

University publications unit

Overview

Engineering at UCL recruits effectively though is not in a position to be highly selective and cannot ask for the grades some other courses at the university can demand. There are concerns over students' satisfaction with the course. Teaching is heavily mathematical and theoretical; the lecturers view this approach as vital if students are to be appropriately prepared to become practicing engineers.

Constraints

- The course recruits successfully though not so well that the staff can be too selective: ***'what we are asking for balances what we get'***. The average A level grades of students coming into engineering are ABB/BBB while Law ***'can be very discerning – engineering students are well qualified but not at that level.'*** The senior lecturer/ admissions tutor attributed this difference in recruitment to the salaries students can expect on graduating: ***'if engineers were paid the same as lawyers then we could recruit'***.
- An issue that academics seemed concerned about was the destinations of students. The senior lecturer/ admissions tutor put newly graduated engineers' choice of finance as a career rather than engineering down to starting salaries: ***'near 40k in finance rather than 25k in engineering'***.
- The senior lecturer/ admissions tutor emphasised findings from discussion groups with students at the end of their final year that indicted students ***'are very happy with what the education contains'***. This did not relate to what was said during a mid course focus group with myself. It may be that students who have finished the course are more positive about their experiences or that students may not wish to express criticism directly to someone who is seen as responsible for the course. Students' responses were taken seriously by the lead academic.
- The lead academic talked about how he had introduced ***'the engine gear box exercise'*** a ***'very practical'*** exercise that ***'relates to their everyday experiences - it's the system approach – I'm not talking about taking the analysis out'***. He said that the course was ***'not a dry course – not as dry as some courses that teach theory'***. The lead academic was instigating these changes to the course while the

senior lecturer/ admissions tutor seemed more reluctant to acknowledge a need for such changes.

- Both academics were aware that students struggle with the heavily theoretical course content. The senior lecturer/ admissions tutor mentioned how well Pakistani students score in tests compared to their English counterparts. He attributed this difference to the fact that Pakistani students follow the old A level maths course rather than the modular AS/A level course taught here: ***'they can gradually improve when they are taught A level by module'***.

Staff attitudes

- The lead academic identified women as an important target in order to increase recruitment and participation in engineering. He explained that funding for WP initiatives targeted ***'those who haven't had a chance first time round'*** and felt that this was inappropriate*: ***'it's a long haul – it's very difficult to cover the ground if students have not been academically trained from 12/13 years old'***.*
- The senior lecturer/admissions tutor's perception of problems for engineering were external to the course at UCL. He discussed the need to create an ***'appropriate image of engineering...need a TV series'***. Students' moving into finance rather than engineering on graduation was attributed to the greater monetary rewards offered by careers in finance.
- The senior lecturer/admissions tutor was very clear about the role of different courses/ HEIs in providing graduates for industry. He explained how the UCL course ensures graduates are ***'capable of doing a job with mathematical analysis...'***. He went on to say that ***'you can't design an aeroplane without fluid dynamics'***. He described the need for ***'engineers who can evaluate things, modify things, sell things'*** he explained that ***'LSBU students are fine to do that but they won't have the full range of mathematical skills to do the jobs that UCL students can do'***
- The lead academic acknowledged that the emphasis on maths was unpopular with students but explained that this was necessary: ***'you need a certain amount of off the job instruction – there's a lot of boredom – neither parents or kids realise, if they are going to become truly proficient there's a lot of drudgery'***
- The lead academic explained how the lecturers at UCL were academic engineers so did not have a perspective on working in industry informed by personal experience.
- The lead academic described how there ***'was some reluctance'*** in the school when Engineering with Business Finance option was set up: ***'people were defending science'***. However, he suggested that staff

were happy with the changes being made currently because **'we haven't removed the science'**. He went on to say: **'if you are going to change the philosophy, you need to change the staff'**.

Approaches to recruiting students

- There are high numbers of overseas students (approx 35%). There are also increasing numbers of local students; local students are prepared to commute from the outskirts of London. Amongst the local students there are high numbers of BME students. Approximately 50% of the student body from the UK is Asian, Indian, Pakistani, Chinese, Nigerian and Cameroon in origin.
- Chemical and Biochemical engineering attract more women and Engineering Business and Finance (20%). Biochemical engineering and chemical engineering are both recruiting very well generally (there are now 50 and 60 students respectively on each course).
- The lead academic said it was important to **'take the best student who is suited to the course (whoever that might be) – you shouldn't take anybody not likely to cope with the content of the course'**.
- A lot of the students applying are interested in automotive engineering.
- Students are still interviewed and a rigid criterion of 3 B grades as a minimum is applied. The interviews provide students with the opportunity to see the department and meet people and are important to when they make their final choice. However, the A level grades determine whether students are offered a place.
- The prospectus:
 - The prospectus has been redesigned this year; previous to this year it had been the same format for many years. It has been designed by an outside agency. Market research was undertaken by an independent company and by the university itself. The findings of this research included that students wanted easily accessible entry requirements, to know about future job prospects, to read other students' views – as these are trusted. It was also found that students rely heavily on the prospectus – many students using the web do so only to order the prospectus. The target audience is **'wide ranging so the aim is to address as many people as possible'** – the publications unit mentioned WP students and international students as part of the target group.

- The prospectus has been written by the publications unit: **'to ensure the right messages are being given across'**. The key message is **'high quality institution, but open, friendly and honest'**. The information used came from a detailed questionnaire sent to all departments. Each course is described using the same format, the first paragraph outlines the key selling point of the subject. There are then a number of headings including:
 - What do we offer
 - Your degree
 - Your learning
 - Your application
 - Your career (there was little information in this section about engineering careers)

The entrance requirements and other details including the RAE (Research Assessment Exercise) score are aligned down the left hand side of the page. The subject leaflets are still written within departments: admissions tutors are the point of contact and the copy is audited by the faculty tutor.

- Photographs in the past have focused on London to emphasise the university's central position and new photographs are to be included each year. The departments are contacted and asked if they want any particular images. Some images are provided by the departments.
- Regarding engineering in particular the publications unit said that there was an attempt in the new prospectus to **'get away from its dry image by relating it to what is going on now - like the Olympics'**
- The publications unit also talked about the positive impact of outreach work carried out by lecturers in schools and colleges: **'this works...it means more if you have academics involvement'**

What the university hopes to gain by the LEP partnership

- The lead academic identified the need to link what UCL are doing in the department with what colleagues are doing in schools; **'it's no good saying how exciting the course is if they then look at the prospectus and see it's boring'**
- Increasing the number of applicants (particularly girls) is **'a long term goal'**.
- In the short term the aim is increasing students **'satisfaction'** and providing students with **'a better educational experience'** that will

allow them to **'go out more confident'**. The lead academic hopes that students will find **'producing something that works under guidance'** will boost their confidence and make them feel more positively orientated to engineering careers.

- The lead academic explained how the Royal Academy of Engineering's links with industry could facilitate opportunities for students to visit companies. He explained that it was currently very difficult to arrange visits for 100 students so trips of this kind rarely take place. If the LEP could facilitate this by approaching companies (he suggested a package of six companies set up by the RAE that students could visit), this would benefit students as it would offer a **'different perspective'** to that offered by the predominantly academic engineers at UCL.

* This understanding of WP seems to relate to the model of targeting adults rather than the current emphasis in policy on school age students.

Executive Summary

This report is based on qualitative interviews with the head of the Mechanical Engineering Department, a senior lecturer and marketing personnel at UCL (University College London). The report outlines the position of mechanical engineering within the university and the progress of LEP initiatives in 2007.

The Engineering Department at UCL recruits effectively though is not in a position to be highly selective and cannot ask for the grades some other courses at the university can demand. There are concerns over students' satisfaction with the course. Teaching is heavily mathematical and theoretical; lecturers regard this approach as vital if students are to be appropriately prepared for become practicing engineers. The lead academic suggested that there was a need to link what UCL are doing in the department with what colleagues are doing at school in order to facilitate a smooth transition and to avoid disappointment amongst students on starting the course. The lecturers at UCL are academic engineers and lack personal experience of working in industry to share with students. The lead academic suggested that the work with the LEP could help to boost students' confidence and provide them with a better educational experience during their time at the university. He also identified increasing numbers of applicants particularly among female students as a long term goal.

Baseline Evaluation Notes: Engineering at Sussex University at the start of the LEP

Sources of Information:

pro-Vice Chancellor
Dean
Lead Academic
Head of Department
Admissions Tutor
Product Design Tutor
Prospectus Editor
Head of Communications
LEP Fieldworker

Context – before LEP

Overview

Engineering at Sussex is not comfortably positioned: the head of department (HoD) reported a deficit that he saw as only being likely to increase over the coming years; while the department is successful in research terms, its recruitment of undergraduates is floundering, with the department relying for numbers on students in Product Design and the MSc course. However, the pro-Vice Chancellor provided assurances that there was no danger of closure although he said that engineering was 'not below the radar' and support was important. He suggested that growth through development with outside agencies would be an important way forward for the department.

Constraints

- The Dean explained that a problem had been created for engineering four years ago when a restructuring took place. All of the computer scientists were moved out of engineering: **'at a stroke, all the young and female staff were removed'**. Engineering had also been a school in its own right and this restructuring also removed that status – it became one of four departments within the Department of Science and Technology. The pro-vice Chancellor identified a problem for the department as being that it is small and so students with the qualifications to get into Sussex would probably choose a larger department elsewhere.
- At the same time as the restructuring the university decided that the grade entry should be increased. While engineering had been recruiting students with CCC or BCC the MEng now only recruits students with ABB/BBB and the BEng BBC is the lowest offer. The rationale for this increase was that lower grades brought the university's status down. This level of entry

means that Sussex has to compete with Southampton, UCL and Bristol: **'we find it hard to get that many students at that level of entry'** (HoD).

- The HoD was clearly worried by the financial position of the faculty. He explained that the income for the faculty is 4.4 million; 2.2 million is used to run the department; 2.5 million is

spent on central administration costs: **'This leaves a deficit of 250 which will increase to 500 next year'**. There is a tension caused by funding problems. There is evidently an impetus to stay with traditional and cheap teaching methods – chalk and talk/ theoretical and analytical (high maths content) engineering rather than buy expensive, space hungry equipment and facilitate more project orientated and practical work – despite the fact that this is more popular with students: **'students want to see nice new labs with lots of equipment not blackboards and maths'**. The HoD is clearly worried by the financial implications of practical work: **'it's expensive – the university charge for space per square metre... there is also a need to pay PhD students for supervision of 3 hour laboratory sessions'**. The lead academic when in position as HoD had invested in equipment and promoted project based learning. However, the HoD identified problems with funding this approach and with providing supervision at both technician and faculty level; he seems to feel that the better option is to retreat from this approach.

- The HoD said that there were not enough students in the faculty at the moment. The faculty is operating on a student staff ration of 27-25:1 **'which is high for a grade 5 research department'** (Arts subjects at Sussex had 30:1). The pro-Vice Chancellor described how the physics department, because of its successful research profile and theoretical approach to teaching, could run cost effectively without any/ with very small numbers of students: **'don't need undergraduates, it's completely sustainable with small numbers'**. He explained how engineering though successful in research terms is **'much more cost intensive'**.
- The head of communications identified a perspective within the university was that engineering should **'look outward...their engagement with business is not as strong as you'd expect of a department of that caliber'**. He suggested a collaborative arrangement with Brighton University would be beneficial. The pro-Vice Chancellor described the way forward, in his view, for engineering at Sussex as being through **'success at winning blue chip research money'** and through **'stronger partnerships with external organisations'** – this could provide a **'financial underpinning for the department'**.
- The MSc programmes are successful. There are now 50 students studying for Electronic Engineering and 20 Mechanical Engineering MScs.

Except for one or two home students all of these students are foreign: India, Pakistan, China, Nigeria and Greece. ***'Without Product Design and the MScs we would have closed'*** HoD.

- Financial constraints have also led to a reluctance by the HoD to appoint any staff who are not researchers with a successful record of publications: the grade 5 status of the department currently provides vital funds. This reluctance led to the appointment of another theoretical engineer rather than a designer to teach on the product design course as the HoD and other members of the department felt it would be very difficult for a designer to contribute to research in the same way as a traditional engineer. The product design course is now responsible for 40% of the undergraduate intake in the department and is financially enabling the department to continue. The only designer teaching on the course expressed her concerns about how disappointed many of the students on the course are when they encounter the heavily theoretical engineering course content and the lack of focus on design: ***'most students are disappointed with the course – they feedback that what they heard on open day is not what happens when they get here'***. The product design tutor also commented that the female students from across the department all come to her despite the fact that they are assigned a tutor from the department. The HoD identified a problem for members of the faculty teaching product design as being that they ***'are academic engineers – they've been in universities throughout their careers doing research engineering – they don't have design experience'***. The staffing of the product design course was also commented on by the Dean who identified that the ***'lack of teaching resource'*** put into the course had resulted in problems. Another problem for product design is the lack of space and facilities.

Staff attitudes and morale

- The lead academic explained that ***'people are more connected by concern and worry than by a sense of common purpose'***
- The HoD position was described by the current post holder as a ***'a poisoned chalice'***. The post holder is clearly a reluctant HoD and the decisions he has to make regarding appointments and organisation within the department seem to weigh heavily on him. The previous HoD, also described how relentless the demands of the the position were. The HoD pointed to the way that funding currently works; identifying the focus on research contributions of the department as being particularly constrictive and not allowing people to move into different roles that suit them.

- The design tutor responsible for the delivery of the design components of the product design course described how isolated she felt: she is one of the only women in the faculty and is the only designer. She is also younger than most other members of staff.
- The LEP Fieldworker described how her face was being systematically ripped from posters around the building; she has assumed that a member of staff is responsible. She explained how her only **'interaction'** with people at the university **'tends to be when there is a problem'**.
- The admissions tutor described how Sussex was **'one of the few high quality universities offering ...(product design)'**. This is how he accounted for its popularity. While he described product design generally as a **'nobby degree'** but he explained that it was not the case at Sussex due to the **'high engineering content and the high academic content'**. He talked about Engineering for Society as a new initiative that... **'like lots of initiatives – you have to take 10 before one succeeds'**.
- The Dean described a reluctance by staff within the department to teach on the product design course because of the traditional approach of the teaching staff and their reluctance to change. One issue he identified as problematic for the product design course was the **'tension for product design students who come in with less maths'** and that the staff teaching the course deliver the same modules as they do for students on straight engineering courses, without making **'allowances for them...students feel that staff are expecting them to just cope'**

Approaches to recruiting students

- The admissions tutor said that the courses in the school of engineering had a gender mix of approx. 7% girls; this went up to 25-30% in product design. 15-20% are foreign students (admissions are handled centrally - the department now only deal with problem cases). The MSc courses are 98% foreign students. Foreign students are catered for by a foundation year. UK students are predominantly A level students. He said that there are a number of UK BME students (particularly of Indian and African origins) usually from London. There is also an increasing number of local students at Sussex who come from the surrounding area and live at home¹.
- The prospectus is organised around subject areas to ensure accessibility. Every school has a school administrator for the curriculum. Each year the previous year's prospectus pages are sent to them and they are

¹ A pathways scheme 'the Sussex Coastal Highway' supports students from local schools and colleges to gain places at local universities.

responsible for updating the information. They are also asked for subject related images. The copy is written by the HoD/ lecturers but they are dictated by guidelines sent by communications staff who then edit the text. **'Sussex has a strong brand and visual identity...direct, engaging and pioneering'**

- Focus groups with A level students have revealed that sessions on career perspectives where alumni talk about what they have done are particularly effective in marketing courses.
- Images within the prospectus include a balance of male and female/ white and non- white and students from different age groups. (In the engineering section of the prospectus there are 22 students depicted – 19 are male; 3 female and 3 identifiably from ethnic minority groups). Sussex has a high proportion of WP students - currently 22.5% against the HEFCE benchmark of 20%. Catering for international students is also viewed as **'important'**.
- A new brochure had been put together for new degrees within Science and Technology that cut across curriculum areas (Product Design; Engineering for Society; Music Informatics; Human Computer Interaction Design; Physics for Society)

Progress and Issues for the LEP

- A key problem for the LEP appears to be lack of communication within the department; this has led to a real lack of awareness in the department about the LEP. Lecturers view the new degree programme as **'another initiative'** and have no sense of ownership of it. The LEP fieldworker described how she is **'isolated in my own room'**. This isolation is partly caused by her not being involved in teaching and consequently having no immediate connection with students or staff but is also contributed to by poor communication within the department about the project. She complained that the HoD was not informed of her appointment before she arrived; she also mentioned that the head of the administration office had taken her aside and said **'we don't really know what you're here for'**. The Dean expressed the need to win **'the hearts and minds of people not directly involved (in setting up the degree) but indirectly involved in that they are going to teach the students'**. He said how important it was to learn lessons from product design and ensure that students **'aren't made to feel that they are failing'**.
- The pro-Vice Chancellor seemed to be sceptical about the new course though he made no direct criticism. He did make the observation: **'I'm not sure they are getting to the root of the problem'**.
 - The pro-Vice Chancellor used to chair the board of the North Eastern Science Learning Centre and commented that there is

- 'clear evidence that by 11 years old the psyches of children are tuned in or not (to Science)'** and that primary age children should be targeted to **'increase the talent pool'**. He is keen to contribute to preventing **'holes in the country (in terms of provision) where certain subjects aren't offered'**; his concern is that this will particularly impact on the increasing numbers of local students as they will not travel to other parts of the country in order to study a particular subject if it isn't offered at their local university. He is also concerned that if capped fees are lifted, increasing numbers of highly qualified graduates will choose to study at top universities in other countries. This **'brain drain'** could result in real problems for universities like Sussex as their cohort of students will move up to fill the places at Oxford and Cambridge etc.
- The pro-Vice Chancellor also discussed his experience of geography graduates/ PhD students moving into engineering roles and how students from other disciplines are a **'resource that could be tapped far more effectively...youngsters do not understand what engineering means – how broad it is'**.
 - The pro-Vice Chancellor's view of the way forward for the department did not encompass increasing student numbers as a priority though he did mention that **'it would be nice if it was a bit more like Psychology in terms of recruiting'**. He described the choice universities have between **'cut or grow'** and while he supports growth he provided the example of Lancaster as an example of a university that had **'grown in the wrong way...they projected growth on student numbers...the unit of resource for teaching always goes down'**
 - The admissions tutor suggested that the popularity of product design might be due to the fact that there is **'no engineering in the title'**. The pro-Vice Chancellor's view was that the name of the Engineering for Society Degree may be problematic: **'if it generates interest that's a good thing – but it will be seen as something that isn't necessarily what it is by potential applicants'**.
 - The pro-Vice Chancellor identified himself as responsible for the appointment of the LEP funded post. He said the other candidate for the post **'would not have been considered in our terms as research active ... in my view it was a no brainer...the 2nd and 3rd year of a degree should be taught by people who are active researchers in their area'**. He described how last year students had led a campaign demanding to be taught by leading academics **'3rd years know who the research active leading figures are in the department'**. He also described how important it was to make appointments that **'set the standard'** in that they are suitable for the position of the university within the sector: **'if the degree was being set up at Coventry it would be a different kettle of fish...I**

- work at a certain point in the sector***. The pro-Vice Chancellor said that his decision was not about research funding while the Dean said that the funding issue had driven his backing of the HoD's decision.
- The Dean expressed his concern that his role in the appointment had given the impression he was not fully supportive of the new degree. He explained that this was not the case – he is very keen to see it succeed: he described the new appointment as ***'very energetic'***. The Dean is developing a number of similarly cross curricular degrees within science and technology (Human Computer Interaction Design; Physics for Society; Music Informatics). He explained how ***'currently people in various senior roles e.g. Civil Servants; MPs; COs of companies have backgrounds in humanities/ social science but that these people are making complicated decisions about science'*** and that these new degrees will provide appropriately qualified people to move into these positions. The Dean's view of these new routes (including Engineering for Society) is that they ***'don't pretend that graduates are going to be scientists...they will understand the concepts but not necessarily practice them'***.
 - The Dean sees the lead academic's replacement as a key figure in the success of Engineering for Society. He sees a senior member of staff as vital in rallying support for the degree amongst existing members of the faculty.
 - The lead academic has made progress with accreditation for the degree: the IET have been ***'very positive'***.
 - The LEP fieldworker needs direction to develop her role. She is currently reluctant to work within schools with potential students for the new course as she feels that more needs to be done at the university to make it a more inviting and welcoming environment; especially for women: ***'I've been ignoring requests for info'***.
 - The LEP fieldworker has invested a lot of energy in improving the communal facilities in the Eng 11 Building where she is based. She has painted and revamped the café; painted the toilets and managed (after a series of 'negotiations') to acquire a machine providing sanitary protection. Eng 111 was identified by the HoD as a ***'nice teaching space...including a lab for 1st year/ foundation for electronics/ mechanical workshop'***. The Fab Lab, set up by the lead academic, is also in this building. The Creativity Zone is a new space which is open to all subject areas – this is a large white space that can be divided into smaller spaces; there are plasma TVs and 2 learning facilitators. The product design tutor commented on how useful these facilitators were in helping with teaching strategies.

- The LEP fieldworker feels that the course is not being marketed effectively **'it's unimaginative...the key selling point of environmental development is buried'**. This view was reiterated by the lead academic. However, the head of communications seemed open to marketing the course differently but was unaware of the intended target audience. The LEP fieldworker said that changing the UCAS keywords (2 months ago) had made a difference to interest: four people had responded subsequently. However, the head of communications tried to find the course using the UCAS codes and it was very difficult. More work is needed on the way Engineering for Society is presented in the prospectus. Collaboration between the engineering faculty and communications unit did not appear to have developed enough for a successful marketing strategy to be developed. The head of communications described how moving the product design degree out of the engineering section in the prospectus had impacted positively on recruitment. (The admissions tutor also suggested product design's popularity might be due to the fact that there is **'no engineering in the title'**). The head of communications made some suggestions for ways forward:
 - Developing connections with particular schools with high proportions of appropriate students for the course – it may be useful to start by contacting the girls' schools association. (HE provided a successful example of links with Islington and City College)
 - Focus groups with groups of targeted students to explore: the name of the course and their reaction to it; the course description; their experience of finding the course through UCAS

What the university hopes to gain by the partnership

- The pro-Vice Chancellor expressed the hope that the connection with the LEP would facilitate improved links with outside agencies that would enable the department to access new sources of revenue.
- The Dean is keen for Engineering for Society to succeed as it will pave the way for the other new degrees that are being developed. He hopes these degrees will attract undergraduates who would not opt for **'traditional technical, mathematical, scientific degrees'**.
- The Dean's account also suggested an appreciation of the opportunity to appoint young dynamic members of staff within the engineering departments. It was evident from the pro-Vice Chancellor's account that the role staff could play in research and consultancy was vital in his view to the way forward for engineering at Sussex.

Students' account of their experience of studying **Mechanical Engineering at Sussex, LSBU and UCL**

Introduction

It is important to note that the students' views provided here reflect quite strikingly many of the points raised in the LEP HEI checklist of good practice (2007). Students talk specifically about 'the importance of placing engineering theory within its practical context', 'the need for opportunities for problem based learning' and 'co-operative working'. Students' discussions of their experiences also suggest the need for 'inclusive' approaches and 'links between students and lecturers'. Students also all talked about their futures and it was evident from their accounts that they want to learn 'skills to become professional engineers' and that they felt they needed 'support' to make the 'transition from education to employment'.

Contributors

Focus groups were held with Year 2 and Year 3 students at each university. Numbers in focus groups were between 5-8. Some of the students interviewed were on combined or part time courses. These focus groups were held between January and November in 2007.

Theory and practice

Lectures were discussed by all students and, unsurprisingly not all lectures were viewed as interesting. However, there appeared to be two issues that were raised within these discussions that were important to students and were impacting on their motivation. One issue was that the sheer quantity of lectures that some students had to attend demotivated them:

it's twenty hours a week of just lectures'; 'just going through stuff on the board'.

One student said that you had to '*learn it, memorize it and understand it – if you can do that you pass*'. Students discussed finding lectures 'boring' and one student said that he 'can't concentrate in lectures'.

Students also discussed how some lectures were read from a slide. As these slides were also available on-line, they described how they struggled to motivate themselves to attend:

Student 1: *It's just that sometimes in the lectures - they are not very interactive like –they have a power point and read from the power point. That's not really giving people the incentive to go to the lectures. If you're going to put it up on the internet anyway and then read from the power point – well, I can read myself.*

Interviewer: *So people actually don't go because they can think – oh I can look at it at home.*

Student 1: *That's what they do – they put the power point up and will read the slides off. We can do exactly the same thing.*

Student 2: *The thing is they talk about slide notes and when it comes down to the exams, the information you needed for the exams aren't in the slide notes.*

For a large number of students interviewed, the reality of the course did not match their expectations when they had applied:

Student 1: *I still don't think it's as hands on as I thought it would be.*

Student 2: *Same here – I'd like to get to use all the machines.*

Student: *And I saw this – I remember I saw in the brochure – the prospectus – it had a picture of this racing car and it conned me into taking the course. I thought I'd be making that.*

I thought I'd be designing Ferraris (laughs)

Student 1: *I thought it would be more product design and maths mixed together – which it slightly is but ... it's not so much product designing – you don't get all those projects*

Student 2: *I thought it would just be creating a lot of stuff – making*

Student 3: *I thought it would be more hands on -doing more doing projects and things.*

Student 1: *We get to design the stuff – we never get to make it*

For some students the lack of practical and creative work was a source of disillusionment with the course. Students talked about how thought that they would be 'making something amazing' and they found that in reality 'it's not really a creative subject' and that it's 'just doing bookwork'.

...the problem you've got fundamentally is that engineering is maths – you've got to learn the required maths and that's it...you've got to do three years of maths solid. I think the problem is that when people choose it at A level ...I don't think anyone really realizes how theoretical it is

...but quite frankly the course isn't that entertaining

While the desire for more creativity was echoed widely by many students interviewed, *all* the girls mentioned 'creativity' as being important to them in their choice of engineering as a degree:

Student 1: *Don't you find that really sad – you come into this degree – they want to use their physics and their maths but they want to be creative about it and there is no creativity in this department. It is very mundane – it's very much just churn out work after work after work*

Student 2: *Yeah, it doesn't matter if we spoon feed you ...there's no innovation, there's no creativity...*

Student 1: *If they'd told us what we are getting into – I am sure they wouldn't have that many applicants*

A large number of students talked about the lack of practical work on their course and discussed wanting more focus on application:

it would be nice to break it (the theory) up – everything comes back to integration and maths – same biscuit different icing

there's very little discussion of engineering in the applied world. There's a lot of maths questions – for instance, last year for fluid dynamics...I would have preferred to have an aspect where you discuss its application in a more descriptive fashion'

Student 1: *I have a friend at whose labs are always practical – not just taking the beam and stressing it and getting results. It's actually like get in car part chassis and*

seeing how it works you know and you apply all your knowledge and whereas what we do is all abstract and we can't see results as you go along so it just becomes intuitive.

Student 2: *It's like applied maths*

Student 3: *It's all theory.*

Our course isn't integrated together as well together as it should be. I think the first year was more integrated in some aspects in maths and we applied that to electricity and we applied that to quite a few courses whereas once you take second year maths you don't apply it anywhere.

Students were appreciative of the opportunity to immediately put into practice theories learnt during lectures:

Student: Yeah, ... today this is a lecture where we have got the lab after this and the practical – like everything we learn in here ...

Interviewer: So you put it into practice straight away.

Students: Yeah

Students appeared to be demotivated when they could not relate what they were learning to any practical application:

... I can't see what I'm supposed to have learned from the lab session or the lectures – I am not sure what I am supposed to have taken away from it. ...we just go through the worksheet that they give us and we do it all in one go but I don't actually know why I am doing it – it's just – why – what's the relevance of it?

Group and project work

During interviews, students talked most enthusiastically about project work that they had completed. One reason for this enthusiasm appeared to be the opportunity that such projects allowed for creativity:

Student 1: The blender project – I did like that
... we had to design a blender
...I thought that was a good one –it was really good. I was in my element.

Interviewer: Because it was product design?

Student 1: Yeah

Student 2: You actually got to be creative

Student 1: For the first time - and the sketching and the design

Students also appeared to find being given the opportunity to be involved in every part of the process rewarding:

I actually think that this design project was really good because it's the first project where we thought up the design based on some theory. We then actually designed it using ideas

– which was quite tricky but then we did have quite a lot of time to do it and then it was made and then it was tested and then we got to look at how it worked... We have come from designing to making, testing. We did everything and we had never done that before.

Another reason for students' enthusiasm for project work is the opportunity to link theory to application:

last year we had a project on a clutch and that was probably the best project I've ever done (general agreement) it was something that's getting used. Ok it's a simpler type of clutch than the ones being used today but you could actually see something happening – we all worked as a group as well which was a lot more fun

Our system design project is a – we've got a few projects as a group – which is a good thing – we got a system design project – mechatronics- and we need to build a wind turbine which is an interesting thing.

It is also evident from students' comments that they enjoy the opportunity to work in a group. While students describe this as being 'fun', they also discussed how working as a group provided them with useful skills for the workplace:

Student 1: *Sometimes the lecturer just put us in a group so we just need to sort out*

Student 2: *I think the idea was pretty much like – when we go into industry we won't be able to choose who we work with so it's to locate us – we work like this and we sort ourselves out.*

Yes we were our own bosses. We had to organise meetings and get our group together and when it's not compulsory it's quite difficult to get everybody coincided and so it is a learning curve there. It teaches you how to manage your own time, manage groups – things like that.

I think it was a really good idea because that way we get – 'cause in the future you can't necessarily choose who you work with so that shows you that you need to work with other people and you do it whether you know them or you don't and I think it was quite useful.

Indeed some students complained about the lack of opportunity on their course for group work when team work is such an essential skill in industry:

There's very little group work...when you consider in real life, engineers have to work in a group all the time

While students clearly valued the opportunity to work in a group, this was not seen as unproblematic. Students discussed their experiences of working with people who did not contribute enough and people who were too dominating:

What I have actually found when teams consist of more than four or five people things become difficult because some of them are not really responsible and you know you just

have to do everything on your own. It happened to me once. We had four people in the team and one of the members was saying he never had the time so we had to manage between ourselves.

...it's all about the managing so each one of them needs to know they can do something and the other thing is ... lets say there's a couple or three people who would like to do most of the work and you just tell them your opinion ...the trouble is they don't listen to you but after a couple of weeks they find out what you said was correct.

One student explained quite specifically, and reflecting almost precisely a suggestion made in the action points to promote inclusion of all students¹ suggested in the LEP HEI guidelines, how beneficial the rotation of roles within the group was to ensure that all students could contribute and are rewarded fairly for their work:

When we had our first project last year like it was four people right ... it is a better idea, we have been told, if one week one person can be project manager and someone else will be a secretary so the following week we just swap over so we put that in our logbooks who did that and each report we put on who was the author – who it was written by. I think that is a great idea because basically you can tell if everyone has done their job properly.

¹ 'Incorporate group work and plan groups to enable all students to participate equally...e.g. where groups are not self selected, rotate group roles' HEI checklist (draft 3 June 07)

Support

A number of students identified lack of academic support as being an issue. Some students described finding tutorials ‘*very tough to follow*’ and said that ‘*there’s a lot of people who are struggling*’. The students discussed the fact that there was little time in tutorial sessions (where there can be ‘*80 students to one lecturer*’) to go through questions. One student said that you have to ‘*take it home and teach yourself...nobody really helps you*’.

Notably two female students talked specifically about the lack of interaction with lecturers as being a problem:

Student 1: *We have lectures and that’s it and in the first year we had help with the maths and we had a tutorial but in our subjects now there is no kind of student/teacher interaction. It’s literally just stand at the front lecturing – if you have any problems come and find me but they don’t always reply to you.*

Student 2: *But twenty hours a week that we have lectures, especially in the second year when you have that many. If you’re stuck you need to be able to get in touch with a tutor then and there so can progress with it. I think that is one of the major problems here that we don’t have seminars – maybe they don’t have the resources but I think it matters so much – just to keep up with it.*

This view was echoed by another female student interviewed who commented a number of times on the importance to her that tutors are ‘*approachable*’:

Student 1: *One lecturer – he’s really good – he will go out of his way to help you.*

...

Student 2: *He is approachable isn’t he?*

Student 1: *Firstly he is very approachable.*

...

Student 1: *I think they (the lecturers whose courses were enjoyed) were just able to relate to the students more – they were more approachable.*

Interviewer: *Approachable – you’ve said that a few times. Is that ...*

Student 1: *I think that helps.*

All students interviewed appreciated the input and support of lecturers. One group described how this support was built into their course and that this was important in ensuring that they were able to follow lectures where large numbers of students were present:

Student 1: *We work in the lab. And we are given certain hours to catch up on what we were doing – the tutors always stay with us – like if we need anything we can go up to them and ask.*

Student 2: *Sometimes in the lecture there are about two hundred pupils and the lecturer does not know if we don’t understand - that’s why we just go back to our tutor and ask questions*

Interviewer: *So that works – in the afternoon if you haven't understood what happened.*

Student 1: *Yes 'cause it's a lecturer with only fifteen pupils ... If we have any queries we just ask the teacher ... If we have any query we just ask.*

Students were critical of lecturers who they perceived to have no interest in them and not to 'care'. It appeared to be important to students that lecturers seem interested in them and whether they understand:

Student 1: *Some of the lectures that we have – you get the impression – I mean I might be completely wrong on this – you don't want anything to do with this – you just want to go there, show a slide or do a presentation, just say their part or say their piece and just leave and that's it – you just get that feeling.*

Student 2: *You always know if the lecturer happy – like half way through they will stop ask if everything is alright – having difficulty in any way – having problems. Most of it we won't admit to it anyway (laughter) but it's just nice to know – to get the feeling that they care where the other ones – they don't ask, they just read whatever piece of paper they've got – it's like a speech right – they do their thing, they hand out the work and leave and you never get hold of them again.*

As well as the desire for more contact with their lecturers, students talked about the importance that instructions are clear to them at the onset of tasks so that they are able to progress independently:

Student 1: *Sometimes you don't know what's – sometimes on the work sheets it's not got the full instructions so when you come to do it – it's just like – then they come over and say yeah but you're supposed to do this*

Student 2: *They give you a problem but they don't give you a similar problem to tell you how to do it so you're stuck there – like okay – how do I do this?*

Student 1: *If you've never seen it before you wouldn't know where to begin*

Several students also commented on the need for more differentiation in some of their courses. They discussed how their different backgrounds provide them with different skills and how this is not always appreciated or catered for by those planning courses:

And all the way through uni they assume we know a lot of stuff from our previous backgrounds that they assume we were taught but everyone comes from different places.

Certain courses like mathematics – people who tend to come with A-level and they find it very easy but when you go in like professional studies – like writing reports and stuff like that – people coming from industry do well

And the way the exam is set as well. That's the problem...they want to make life difficult for the A-level people ...they are forgetting that some people are struggling – some people are ... so I think they have to consider everybody and just try to carry everybody along.

Of course you know there a some people who understand everything straight away – it's just like, sometimes they are speaking just to them and it 's just like they skim over everything else because they just assume that everybody else just know it – and you don't

What was evident from all students' interviews was that, apart from during group and project work, there was little opportunity on any of their courses for discussion with peers or 'cooperative working amongst students'². One student, on a joint honours degree, talked about how useful she had found discussion with her peers in her other subject:

Like the only thing I can compare it to is we were doing part of our course at ... and every week we had an hour session between 5.00 and 7.15 in your class and it was very much class discussion – ideas bouncing off and I thought that benefited the programme for us and something like that in the engineering would be useful.

For some students, discussion was viewed as a luxury that could not be afforded due to time constraints:

Well it's pretty much the same with us because even to talk like – 'cause we have two long days at uni – it's like we start at 9 o'clock in the morning and it's until seven today and the other days it' nine till five

Student 1: ...as well where you think basically - but you do not have that time we try to look for jobs as well, try to cover our work and everyone is busy through the week as well.

Interviewer: So discussion is not so much built into the course.

Students: No - no time

This lack of opportunity for discussion could leave students feeling very isolated and vulnerable:

Student 1: We've been here for two years now together and this is the first time I've spoken to anyone here...

Student 2: We don't get on (laughter)

Interviewer: So would that – I can't work out whether that would be good to have that more built into the programme

Student 1: It would – it's always better to talk – like - we sit all together in the same room...

² The HEI checklist suggests that institutions should 'promote co-operative working among students'

The only discussion is along the lines of I don't understand can you explain that please

Assessment

What was very evident from students' comments was their desire for more formative feedback:

Some coursework we hand it in but when they give it back to us they never write down what we did wrong or need to change and at the end of the day we learn by making mistakes.

A presentation we had last year I never had any feedback on what I did wrong. So I don't like my mark and that's it.

Student 1: They tend to give out work sheets then you just follow the work sheets.

Student 2: Yeah, the worst thing is when they give out the work sheets and you don't know the mark.

Student 1: We did in the first year. We got a lot of feedback and that's what we kind of expected but this term...

Student 2: ... This term was pretty bad – we didn't get anything marked...

Student 1: ... we don't get any like – they don't go through it – they don't check it so we don't know what mistakes we've made or...

One group of students identified that this lack of monitoring, combined with a lack of clear understanding of the tasks set, was demotivating; the resulting temptation was not to complete tasks:

Student 2: Yeah, just do it and even if we did do it we don't get any like – they don't go through it – they don't check it so we don't know what mistakes we've made or...

Student 1: They say do a work sheet but we're not marking it and it's just like – well if you're not marking it ... I know you've got to do it 'cause you've got to learn it for the exam but you've got to be shown how to do it in the first place – it's not really something that makes me want to do it so...

Student 3: And because you don't get a mark for it – it's just – why would you do it?

Student 1:... The thing is – we've found you could actually get away with it – not do any work and then just learn from the very beginning from those sheets.

However, this was clearly not the case on every course; students valued the support provided by some tutors in organising notes and checking work:

Student 1: ... will number each handout that he gives us and then tell us when to put it in our file.

Student 2: Yeah and like half way through he will check your notes to make sure that they are in good enough order that you can revise from them.

Also appreciated when lecturers set work was that they have an understanding of the course as a whole and students' work loads:

The thing I most like is that he knows the situation that we are in – he knows the work we have been given from other people and he always takes that into consideration before giving us anything to do whereas the other lecturers kind of think they are the only ones that exist and give us whatever work load they want to and that's it.

During discussions about group and project work, students talked positively about the role of the log book which they viewed as an opportunity to explain the contribution that they had made and to ensure that they are appropriately rewarded:

That is a good thing about the logbook...because everyone is supposed keep the log book and write down everything that he does ... if they didn't do anything - it shows actually the work that you've done or you haven't done.

Student 1: So if someone has not worked you can just say they did not try.

Student 2: At the end of the project we might say about someone that we are not satisfied with their conduct.

Supporting transition

An issue raised by one group of students was that they were grouped together with students on different engineering courses and that some of the areas covered were not directly relevant to their own subject area:

Student 1: We do have lessons that have nothing to do with what we are doing here because at the moment everyone is together – all the engineers are together, all the electrical engineers all the design engineers, automotive – all together...

Student 2: ...in some cases, don't get me wrong, I am not saying all cases, - I am not saying that all the things are useless but there are some –one or two things that we don't need to learn. The time taken teaching and learning that subject could have been put into something more relevant to what we were doing – what we are here to do.

A source of frustration for many of the students was their understanding that what they were learning at university was not going to be of direct use in industry and their perception that they were merely jumping through hoops:

Student 1: that's what everybody says – when you do practical stuff it doesn't relate to anything at university ... when you actually need to

start working it is really different. They have to start teaching you from scratch - that's in the field.

Interviewer: Yeah, so how does that make you feel about doing the course?

Student 1: Makes me feel – why do I have to prove it.

...Instead of more theories and lectures I think we need more practical stuff, on a daily basis – real world engineering.

As suggested in the LEP HEI guidelines³ this desire for a more practical focus that relates more closely to industry was pervasive amongst students interviewed and was expressed by students in all focus groups:

I think it is a bit of a waste that you learn just the theory here and then you have to go into industry and then by the time you get into industry you don't know how it works really and then most of the learning curve is in industry so I think that is a waste of three years – it's better just like to pair them up – like pair theory and practice

Students repeatedly expressed concerns about their understanding of the 'real world' of engineering and what role they would have within that world:

Student 1: ... when I look outside ... I don't know really what is going on – who is a mechanical engineer here – what does he do – where do you find out which subject it is you have to do to – if you understand me ...

Student 2: You do a subject so you can go for it ...but even though you know what you are doing when you come here - in the real world – I know it is something different but I don't know what it is.

Student 1: ... in which field are you interested in - building services – I don't know – I'm just confused ... we know we are mechanical engineers – that's it.

Student 2: it's a very important thing because as a mechanical engineer you need to be a specialist in something – you're not only a mechanical engineer ... any industry needs mechanical engineers – but what kind of mechanical engineers?

Student 1: Is it aero-dynamics? It's very important to know also – the various sectors – we don't know which sector – in mechanical engineering I think we have touched every part of it but we do not know which sector to go for.

Student 1:... it's just I don't know what I would actually do in the real world. If I had a real job I can't really see what I would be doing.

Student 2: All I have been given is background knowledge on what I could be doing but we haven't actually been given any experience of anything practical what you'd think a mechanical engineer would do.

...

³ 'There is evidence that female and male students want a more practical curriculum' ...an action point suggested is to 'demonstrate the links between curriculum content and range of potential career opportunities'

Interviewer: So you don't know how what you are doing now actually relates to

Student 2: Actually doing a job, yeah.

Interviewer: And do you have any idea of what jobs there are out there?

All Students: No

One student did comment that there were opportunities to listen to visiting speakers from industry. However, these talks were not prioritized by the students interviewed as they were not part of their course:

Student 1: They have other ones where they have people from engineering businesses actually come in and give lectures or give talks or whatever.... People from different businesses and different fields and stuff – engineering – come and talk.

...

Student 2: But that's not actually to do with the course.

Though very limited, the perceptions one group had gathered from their course of engineering roles appeared to be actively discouraging them from becoming engineers themselves:

I wanted to be a roller coaster designer – I thought you do engineering, you do the maths behind it and then you can design a roller coaster but actually that doesn't happen - someone else gets to come up with the ideas

Student 1: We were told about someone who went to a graduate job designing boats and his first job was to design a screw to hold one of the windows in...

Student 2: it's just a lot more specific than we ever thought it would be

Employment – students' expectations

Concern was expressed by a number of students about their career prospects in engineering on completion of their degree. One student explained how his decision to complete an engineering degree had been motivated by his belief it would be a lucrative career. He now questioned whether he would be well paid and how easy it would be to get a job in the first instance. As a result of this he questioned whether the 'hard' work of the course was worth it:

And the full equation as well – when I started to do this degree, I mean, it wasn't only because I love – I sort of liked mechanical machines and stuff but it was also because of the outcome which is the money at the end but the thing is now... the thing is that it is not an easy course – it is quite hard to do that and when you see what you do to get a degree – what study you do and the outcome is not that good – the salary and also getting a job – that is becoming more and more difficult. I mean that is what I believe.

For some students the combination of a negative perception of engineering as a career that they had developed during their course and their perception that engineers *'don't even get paid that well'* had led to their decision to move into a more lucrative career on completion of their degrees such as investment banking⁴:

what is the start for an engineer in London?...cause you can't live in London on twenty five...when you compare that to an investment banker

Indeed, for some of these students the prospect of their earning potential in banking on completion of their degree was their sole incentive for continuing; for them the motivation for continuing appeared to be this deferred gratification.

What appeared to be true of all students was that their knowledge of engineering jobs and their availability was limited and some students were heavily reliant on grapevine sources of information:

... a friend of mine – he's just finished doing his degree as an engineer and he's been now – he's been two months sending application forms ...

... I've got a friend – he finished his degree last year – he has a first class degree – engineering and he is still unemployed now.

.... My cousin didn't say he wanted to stay in UK – even though he was born here – he lived all his life here - he wasn't that keen to go to the States – but he went and he's now earning one fifty thousand a year

It was interesting to note that all the female students interviewed expressed an intention to move into engineering careers. One student described how she felt being female would be beneficial to her career prospects:

I think there are benefits for girls in this industry though - like the situation with jobs 'cause they want the numbers up a bit... especially abroad. I am not sure about this country but I've heard like Dubai and stuff – just to get their ratios up - it's definitely beneficial

One student talked about her desire to help people as having motivated her choice, after completing her degree, to work in Africa:

You can help people through engineering – Like the thing I want to do in Africa, to have more efficient roads

Gender Issues

⁴ Some of these students were on joint honours degrees so, in their cases, this interest in the financial sector is unsurprising

It is important to note that the female students were all positive about engineering and appeared to be very motivated. They were also more positive about their courses than some of their male counterparts and two students said that they enjoyed being female on a predominantly male course. However, some issues were identified that they felt affected them specifically because of their gender. Two students described how they felt that the older lecturers and technicians in particular, found dealing with girls challenging; this appeared, at times, to lead to behaviour that they found patronizing and inappropriate:

Student 1: *I think especially this year my project had a lot of manufacturing to do so I spent a lot of time in the workshop and in the beginning – just the communication down there like – you know, he took me aside, took my hand and it's like – do you know what a bearing is? He showed me what a bearing is and he took me by the hand and took me to the carpenter's tray and said this is a big bearing and this is a small one and I thought wow – would you do this to the guys?(laughs)
...But by the end of it he kind of gained some respect for me and you know, realised that I wasn't just a silly little girl but yeah – he's retiring now so he is in that generation where, you know, it's a little bit*

Student 2: *Sometimes in the first year - I mentioned an idea and then they brushed it off and then somebody else would bring it up and I would be like – I said that ten minutes ago and there was that slight- because I am a girl but I play on it in a way... We are not just dumb.*

Student 1: *And we talk to lecturers and they're like – why my dear. Don't call me my dear – I have a name and it's just a bit... a lot of the lecturers are very old fashioned. Some of the younger lecturers are better but they are not used to talking to girls.*

One female student described feeling pressurized when she and another girl were grouped together during a bridge building project '*...I felt everyone was expecting us to make a crap bridge...*'

Summary

A number of clear issues emerge from this data in terms of students' responses to their current courses. Students' discussion of their courses suggests they desire a range of teaching strategies and more practical, creative, project and group work. From students accounts it appeared that there was a lack of differentiated approaches to teaching and learning on their courses despite the fact that on all courses, students came from diverse backgrounds and had diverse needs. Students particularly identified a desire for more interaction with their lecturers and were appreciative of lecturers who they perceived to care whether they were engaged. Linked to this was a desire for more formative feedback so students understood how to make

progress. Overwhelmingly, students identified their lack of knowledge of the current 'real world' of engineering and what jobs were available as being problematic.

UCL: Female perspectives and students' responses to the centrifugal pump exercise

Contributors: 3 3rd year Engineering, business and Finance & 4 2nd yr Mechanical Engineering students (the group included 3 women)

The course generally and the female students' views

Students reiterated the views of the first focus group about the course generally. However, it is interesting to note particular concerns of female students.

- As with the first group there was some discussion of whether it is worth going into engineering at all as other careers, such as working in the financial sector, provide higher rewards: '*what is the start for an engineer in London?...cause you can't live in London on twenty five...when you compare that to an investment banker*'. However, the three female students did all intend to remain in engineering, viewing being female as an advantage to their job prospects, though all discussed working abroad:

I think there are benefits for girls in this industry though - like the situation with jobs 'cause they want the numbers up a bit... Especially abroad. I am not sure about this country but I've heard like Dubai and stuff – just to get their ratios up - it's definitely beneficial

One student talked about her desire to help people as having motivated her choice, after completing her degree, to work in Africa - '*You can help people through engineering – Like the thing I want to do in Africa, to have more efficient roads*'.

- Students talked about their frustration with the course itself.
 - All the students talked about the mismatch between their expectations of the course and the reality. Two female students in the group particularly discussed their expectations that the course would allow for some creativity, and their subsequent disappointment:

Student 1:*Don't you find that really sad – you come into this degree – they want to use their physics and their maths but they want to be creative about it and there is no creativity in this department. It is very mundane – it's very much just churn out work after work after work*

Student 2:*Yeah, it doesn't matter if we spoon feed you ...there's no innovation, there's no creativity...*

Student 1: *If they'd told us what we are getting into – I am sure they wouldn't have that many applicants*

Student 2: *They need to change their course!*

- The number of lectures was again, a concern for all the students in the focus group. Two of the female students discussed this and their desire for more contact with lecturers and more opportunity for discussion:

Student 1: *We have lectures and that's it and in the first year we had help with the maths and we had a tutorial but in our subjects now there is no kind of student/teacher interaction. It's literally just stand at the front lecturing – if you have any problems come and find me but they don't always reply to you.*

Student 2: *But twenty hours a week that we have lectures, especially in the second year when you have that many. If you're stuck you need to be able to get in touch with a tutor then and there so can progress with it. I think that is one of the major problems here that we don't have seminars – maybe they don't have the resources but I think it matters so much – just to keep up with it.*

Student 1: *Like the only thing I can compare it to is we were doing part of our course at the LSE and every week we had an hour session between 5.00 and 7.15 in your class and it was very much class discussion – ideas bouncing off and I thought that benefited the programme for us and something like that in the engineering would be useful.*

- There was also a discussion amongst the group about the need for more application and of the need to link theory to the real world:

Student 1: *I have a friend at Queen Mary's whose labs are always practical – not just taking the beam and stressing it and getting results. It's actually like get in car part chassis and seeing how it works you know and you apply all your knowledge and whereas what we do is all abstract and we can't see results as you go along so it just becomes intuitive.*

Student 2: *It's like applied maths*

Student 3: *It's all theory.*

Our course isn't integrated together as well together as it should be. I think the first year was more integrated in some aspects in maths and we applied that to electricity and we applied that to quite a few courses whereas once you take second year maths you don't apply it anywhere.

I think it is a bit of a waste that you learn just the theory here and then you have to go into industry and then by the time you get into industry you don't know how it works really and then most of the learning curve is in industry so I think that is a waste of three years – it's better just like to pair them up – like pair theory and practice

- The female students discussed some issues that they felt affected them specifically because of their gender. The girls all discussed feeling that the older lecturers and technicians in particular, found dealing with girls challenging; this appeared to lead to behaviour that the girls found patronizing and inappropriate:

Student 1: *I think especially this year my project had a lot of manufacturing to do so I spent a lot of time in the workshop and in the beginning – just the communication down there like – you know, he took me aside, took my hand and it's like – do you know what a bearing is? He showed me what a bearing is and he took me by the hand and took me to the carpenter's tray and said this is a big bearing and this is a small one and I thought wow – would you do this to the guys?*

...But by the end of it he kind of gained some respect for me and you know, realised that I wasn't just a silly little girl but yeah – he's retiring now so he is in that generation where, you know, it's a little bit

Student 2: *Sometimes in the first year - I mentioned an idea and then they brushed it off and then somebody else would bring it up and I would be like – I said that ten minutes ago and there was that slight- because I am a girl but I play on it in a way... We are not just dumb.*

Student 1: *And we talk to lecturers and they're like – why my dear. Don't call me my dear – I have a name and it's just a bit... ... is very straight talking but a lot of the lecturers are very old fashioned. Some of the younger lecturers are better but they are not used to talking to girls.*

The centrifugal pump exercise

- Learning CAD was identified by all the students as being worthwhile:

It's such a useful (CAD) programme to use in industry it's definitely a useful skill to have

Several students talked about how they would have liked more guidance in CAD and how it would be beneficial to them if this were to be more central to the course as a whole:

Student 1: *it's such a useful programme in industry that I think it should be a core in the classroom*

...

Student 2: *We do engineering drawing but I mean when is that actually useful in industry because everything is done on computer nowadays so I think if that were changed to I-deas then you would have to use CAD systems and I think that would be a lot more useful*

The students generally felt that they needed more guidance with I-deas to equip them to tackle the centrifugal pump exercise and, specifically, more guidance nearer the time that they would need to use the programme.

- The group work required for the exercise was commented on positively by all students who felt that this experience was beneficial as it related to working in industry:

I think it was a really good idea because that way we get – 'cause in the future you can't necessarily choose who you work with so that shows you that you need to work with other people and you do it whether you know them or you don't and I think it was quite useful.

I think it was quite nice to deal with some new people maybe you wouldn't have worked with. I think those are skills that shouldn't be undervalued 'cause sometimes you get some difficult person and you have to deal with it

Yes we were our own bosses. We had to organise meetings and get our group together and when it's not compulsory it's quite difficult to get everybody coincided and so it is a learning curve there. It teaches you how to manage your own time, manage groups – things like that. Yeah, I think more of that would be a good thing.

Students also commented on how working in a group enabled them to perform better in the exercise as they were able to share ideas:

No I think it is a really good thing to do because some things some people might not have thought of you know someone else comes up with them in the end that would be better.

There was some discussion over the way that the group work was arranged. Opinion was divided over whether it would have been more

beneficial for the groups to have been given one shared goal and for each member of the group to have been given an individual responsibility. This model of group work had been experienced by the students in the popular clutch exercise:

That (clutch project) was group work but as an individual everyone had to do their own project kind of thing and then you just worked with the group to kind of put the presentation together – that was the main element of group work. I think what group work should be is that one project should have one ultimate goal – and there should be five sections to that and everyone should do different things so they - not do the same thing.

However, other students felt that there were advantages to students in each group being asked to do the same thing:

We all have our own designs and I think if you say we will just have one together you will obviously get stronger members and weaker members and they won't all want the same and whereas by doing it everybody has to do each one and okay you get five different things but it's kind of good to get the students to do their work and then between them they sit down and assess which one is the best one and you'll choose that and then you talk about it as a group and then you'll decide why so like, I think you've got your individual and your team work there and I think it is a good thing.

- Students talked quite enthusiastically about the way that this exercise enabled their involvement in a whole process - design, manufacture and testing:

I actually think that this design project was really good because it's the first project where we thought up the design based on some theory. We then actually designed it using I-deas – which was quite tricky but then we did have quite a lot of time to do it and then it was made and then it was tested and then we got to look at how it worked. I think there is improvements to be made everywhere but that is with everything but I think the thinking behind this whole project is really good. We have come from designing to making, testing. We did everything and we had never done that before.

When you actually see your work in action – you see what you have actually done – the pumps... that's the first time we've done that

I think it's a good idea. I think it's really refreshing

Student 1: *I liked this actual design project because it was different*

Student 2: *It was different*

- Students also commented on the appropriateness of the subject focus of the exercise:

It wasn't sort of – it was fluid mechanics which was a bit – we had never done this before and I think it is important that we do something like that in this course

I don't think every project should be made because that's a bit of a waste but it's good to have this one and the fact that it's fluid mechanics as well I think it – because of our knowledge about mechanics and everyone has to do that course so

- Another aspect of the exercise that students talked very positively about was that their findings were going to be shared and were part of a wider project:

Student 1: *And am I right in thinking that it's not just for us though, that it's actually – that the results will be accessible on the Internet.*

Student 2: *That's what Phil said – yeah- it's not only used for our project, it's used – it's a small part of a big project.*

Student 3: *And then next year they'll have more research to prove that*

Student 2: *It makes you think that your work is actually useful.*

Student 4: *Yeah it's not just to get a grade and ... you are actually helping someone*

- As discussed, students had commented on the mismatch between their expectations before starting the degree course and the heavily theoretical reality. When asked if this exercise related more to their expectations of the course before they started, students were very positive:

Interviewer: Would this approach – if there was more work like this – would that change that perception?

Student 1: *That's definitely more engineering as we perceived it (before starting the course) I think so*

Student 2: *Yeah it would and even just little things like applying our maths course – like applying it to something*

Student 3: *I am more of a designer – design based – creativity – and I think this was – yeah – definitely motivational*

However, students also commented on how the exercise did limit their creativity as they were 'spoon fed' a particular approach.

How much freedom did we really have in terms of the approach that we could take? If you think about it, we weren't told directly what to do but everyone did the same thing which would suggest that in fact we didn't have that freedom to do different approaches. We all came to the same conclusion – we all had to use parametrics to analyse one thing against another thing and then everyone just did that and the designs of the impellers weren't wildly different from each other.

*We were just saying it was a boring process because we had to use a spread sheet and just change one parameter each time and that's how far the maths went.
...And that's it. There was no knowledge of fluid mechanics no – I mean we knew the basics of slip factor and knew the basics of disalignment.*

While students commented on the necessity for constraints due to time and the limits of their own knowledge, they did all talk about wanting more opportunity for creativity and discussed ways of making a more creative approach possible. One suggestion, that several students supported, was the opportunity to discuss ideas during the design stage with the tutor who set the task:

*One improvement might be that a meeting with Doctor B. should be built into the timetable because we've never done anything like this.
...I think it would help if you had a meeting with him just once or twice so he can ask you what you are doing 'cause the whole point is to do maybe something slightly different but you need to have a bit of guidance 'cause if you are doing something too different – is it wrong?*

- The discussion of assessment methods largely focused on the unfortunate timing of the presentation, which had not given them sufficient opportunity after their exams to prepare. However, this timing had not been planned and was due to problems with the manufacturing process. There was also discussion of the log book; one student commented on how he felt this to be a useful way of differentiating between students:

To be honest, I like the log book because the advantage is that that is where you show your innovation. You do something slightly different to someone else and you put it in the log book – you go a bit further than anyone else. That option is always open to you whereas if you are told exactly what to do then I think it would be harder to do that

APPENDIX N

Students appeared to have been confused over how the assessment was going to work and one student commented on the unfairness of the weighting on the performance of their design:

Student 1: *Fifteen per cent for the performance is ridiculous because we guessed all the values so if someone designed the perfect impeller from the reasoning* **Student 2:** *We didn't guess it.*
Student 1: *Well okay – there is an element of guessing*

Two students discussed the need for more formative feedback so that they could improve their work over the course of the exercise:

If this is in industry it'd be different but we don't get our final grade until right at the end – it should be learning in between and improvement and you know modifying – there's none of that.

FdEng in Power Distribution

Introduction

Foundation Degrees became a key tenet of government policy following the recommendations of the Leitch Review that by 2020 40% of adults should be qualified to at least level 4. The focus on employer engagement within the Foundation Degrees has now been extended by HEFCE across HE and 'employer-led, work based programmes have become of key importance within the higher education sector'¹. In 2007/08 there were nearly 72,000 students on over 2,500 programmes. The need for Foundations Degrees identified by the Leitch Review was both an economic one, to increase UK competitiveness by increasing the skills of the adult workforce, and to address issues of inequality and social justice.

The development of the FdEng was driven by the extra imperative that there is a shortage of people qualified to this level in engineering. The FdEng at LSBU, set up with the LEP and EDF energy, has been running for a year and a half. This report focuses on the views and experiences of the 2008 cohort of students and the staff at EDF and LSBU who have been involved in the development of the programme.

Method

This report is based on information obtained through interviews with LSBU staff, students and EDF staff who have been involved with the course. A conversational and open approach was taken to interviewing; the aim was to work collaboratively with participants to explore their experiences of being involved with the FdEng (Kvale 1996).

While conversations with LSBU staff and staff at EDF were quite full, focus groups with students were necessarily brief due to the time constraints imposed by their course at LSBU. As 28 out of the 29 students registered on the course are part time, the students spoken to during focus groups are all part time. Three focus groups were held with students: one consisted of students who were already employees at EDF who are on the Engineering Development Programme (EDP)²; another focus group was held with the three students who have been recruited to the EDP through LSBU and the third focus group was held with students registered part time on the course who are not part of the EDP – though most of these students do work for EDF. Two focus groups were held with the course director present for some, though not all of the discussion. The other focus group was held without any staff presence.

Conversations with all participants were transcribed in full; codes and categories were subsequently developed. This report is an attempt to outline participants' views and experiences as they were described during interviews and focus groups.

¹ The impact of Foundation degrees on the workplace and students: A summary of research projects commissioned by the fdf (5)

² The EDP is described in detail in 'Perspectives from EDF Networks Branch Staff

Key findings

The numbers of students enrolled on the FdEng have risen dramatically from the previous year: in 07/08 only 5 students were recruited to the course whereas in 08/09 this number rose to 29. From modest beginnings the course has now recruited an enthusiastic cohort of students and fulfills many, though not all, of the aims envisaged for it.

This rise in student numbers has been an important development for LSBU staff, who were enthusiastic about the course and explained how, as a result of this improved recruitment, it has now become established and is being taken seriously within the university at faculty level:

...this is a real thing and it's gone up to the faculty level and they're quite pleased and so we have to sustain it. ... There's a framework group now – these students, when they graduate, will get a foundation degree. (Deputy Head of Department)

Staff at EDF appeared equally pleased with the course. The Head of Training and Development explained how she felt foundation degrees are ideally suited to sectors where there is a shortage of appropriately qualified people:

I think it is ideally suited to these kind of industries where there's any kind of shortage ... those are the kind of places a Foundation degree should be developed. (Head of Training and Development)

EDF staff viewed the course as mutually beneficial for the company and the university. The company has a shortage of qualified people and the FdEng has been integrated into the EDP which was developed to both train existing staff and recruit externally. The course has, to a limited extent, recruited externally independently of EDF, which is also beneficial to the company:

... it's a case of a win win and we know that there is something in it for them and there is something in it for us. In my simple little mind that's what employer/university links should do really – working together. (Strategic Resourcing Manager)

The students are also pleased with the course, viewing it as relevant to their work and as likely to enhance their career prospects:

I mean it's by far the most relevant course for me – by far... (Part time FdEng student)

The actual cohort of students on the programme has shifted from the initial intended target group of local students, with some progressing through schools directly onto the programme, to predominantly mature students, already working in a related sector. This actual cohort does reflect the ambitions for the foundation degree in many respects. The FdEng will enable adult students to access HE who have not previously had the opportunity to do so. It will also help with the skills shortage in engineering at EDF with a number of those who succeed on the programme likely to progress to the BEng or possibly a new work based programme at I Eng level.

However, EDF were hoping that the FdEng would provide them with more external and local recruits who are representative of the communities that they serve. One of the ambitions of foundation degrees, identified in the Leitch review, is 'to help address serious social issues, such as deprivation and inequality, endemic in many communities'³. Clearly recruiting locally would benefit the local community as well as making EDF's workforce more representative. Strategies that could help to achieve this, including targeting local colleges more coherently with visits from staff and offering bursaries to students, were discussed. The hope was also expressed that students will start to apply to the course who have been part of LEP projects in schools. The Engineering Development Programme (EDP) and FdEng now offers a clear route into HE for employees at EDF who enter the company at apprenticeship level, which provides another entry point for local people.

LSBU Staff perspectives

Recruitment

- Recruitment to the course has risen exponentially from 07/08. In 07/08 the course recruited 5 students; this rose to 29 in 08/09. 28 of these students are part time. 15 students are on the EDP and a further 12 students work for EDF.
- LSBU staff expressed some concern that the university had only recruited a small number of students independently of EDF. The appeal of the course to mature students with experience of working in a related field was discussed. However, people with this experience were identified as difficult to find. A source of potential recruits suggested were recent graduates from craft level courses.
- The programme has not recruited from the local community and the full time course only recruited one student. A bursary system was suggested to encourage recruitment from the local area.
- The success of EDF in recruiting students to the programme was discussed. The EDP was identified as having significantly boosted numbers on the programme. However, a problem this year has been that the EDP students are predominantly internal and so the shortage of trained staff is not solved but transferred to a different level within the company. LSBU recruiting externally through the FdEng for the EDP was identified as beneficial for EDF, the students and the university.
- The marketing carried out by LSBU staff has been limited due to other commitments in staff time. A leaflet has been produced and sent to libraries and colleges. However, it was suggested that direct interaction with potential students would make these strategies more effective. It

³ The impact of Foundation degrees on the workplace and students: A summary of research projects commissioned by the fdf (5)

was also suggested that more could be made in marketing material of the excellent links the course provides for students with EDF energy.

Retention

- Retention to the course has been good so far with only 2 full time students transferring to other programmes. The motivation for this appeared to be their being isolated in such a small group.
- The students are performing so far in line with other courses and there are some extremely high achieving students on the course. Students were described as being unaware of their own levels of understanding - this may be indicative of the fact that, in many instances, they have been out of education for a long time.
- The timetabling of the course from 9am to 9pm during the second semester was identified as a concern especially as many of the students have to travel relatively long distances to attend.

Students as consumers of HE

- Because of EDF's investment in the programme, LSBU staff are keen to ensure the company is happy with the provision. The students on the EDP were identified by LSBU staff as having a powerful group voice.
- This group voice had been used to successfully acquire a shorter day during the first semester and additional maths tuition. Staff had also offered a pre entry course in maths for some of the students on the EDP. However, this was all described as being positive for the department who had consequently provided the same opportunities to students on other programmes.

Lecturer Time

- The funding of an additional lecturer who has contributed to the FdEng as well as a range of other programmes was discussed as being a benefit to the department.
- However, the success of the course had also had repercussions for staff. The numbers of students in maths lectures has risen dramatically. The Course Director has more demands made on his time than other course leaders because of the additional demands made by employers.

Industrial Contacts

- The relationship between EDF and LSBU developed through the FdEng was discussed as a real benefit to the department. The Technical Adviser at EDF now sits on the Industrial Liaison Panel. Access to sites at EDF and the development of material specifically linked to the four core units of the FdEng were seen as particular benefits of the contact as they make the course relevant for the students – this was also seen as a benefit to the company. The opportunity provided by the connection to discuss resources with EDF staff was also seen as positively impacting on the quality of the course.
- There were some frustrations for the department; particularly the cancellation of visits to sites. Setting up meetings with EDF staff is also time consuming. EDF staff have been too busy to contribute to the delivery of the course.

Potential developments

- The department has drawn on the expertise acquired through setting up the FdEng to set up another FD in electrical engineering.
- Students now on the FdEng are offered a guaranteed route onto the BEng programme. There is also a possibility that a new work based programme could be developed to enable student who have completed the FdEng to progress to I. Eng Level.

EDF Staff Perspectives

EDP & FdEng

- Independent of the FdEng the EDP had been set up for a range of reasons including improving competence and safety and to recruit and train people in shortage areas. The FdEng was integrated into the EDP as it was at an appropriate level and relevant in content.
- EDF staff viewed the integration of the FdEng into the EDP as beneficial for both the university and the company. LSBU delivering this as part of the EDP reduces the amount of time taken up with training by EDF staff. EDF staff expressed high hopes about the positive outcome of the course for the company in terms of staff competence, understanding of the company and ability to work at a higher level.

Recruitment

- It was initially hoped that the FdEng would help to recruit a more London based workforce for EDF and was initially seen to be a route for younger students who had engaged with LEP projects in schools. However the development of the EDP has changed this focus: the aim is to target three specific groups. Internal to the company are those already in positions that need to upskill; another group is those with potential who have come through the apprenticeship route. The most important target group is people from outside the company who it is hoped will constitute up to 70% of the intake to the EDP in 2009. This external group is viewed as preferably having a background in engineering rather than being school leavers.
- While it was hoped that LSBU would recruit a fresh pool of potential external candidates for EDF, this is not seen as vital. EDF staff discussed various marketing strategies that were to be put in place to recruit appropriate students to the EDP.

FdEng vs other courses

- A number of problems were outlined with available qualifications before the development of the FdEng. One issue is that HNCs in electrical engineering are difficult to find. Distance learning was viewed as unsuccessful. HNC and ONC qualifications were also identified as lacking relevance for students already working at EDF. A key difference hoped for graduates of the FdEng was that the course will have contributed to their competence in the workplace.
- The FdEng was viewed by one member of staff as a useful addition to the range of courses already available. However, another member of

staff viewed the FdEng as so much more relevant to the sector that it should be developed across the UK for all Distributed Network Operators (DNOs).

Views of the course provision

- The course was viewed very positively by staff who commented on the flexibility of the lecturers at LSBU and the efficiency of communication between the university and the company.
- Some issues were identified with the course. A key area of concern is the length of the day for part time students on the course and the lack of breaks within the day. However the resolution of these concerns appeared to rest with EDF as well as with LSBU and various ways forward were discussed: there appears to be potential for the programme to span over two days; for the programme to extend over a longer period of time or for students on the EDP to be enrolled on the 3 day a week full time programme.
- The numbers of students in some lectures were identified to have caused some problems at the start of the year.
- The Industrial Studies course was discussed: it was felt that Accredited Prior Learning (APL) should be more consistently awarded to students.
- Work based placements were identified as a problem though one that was rooted at EDF. The work based learning had not yet been undertaken by students on the FdEng because of the demands for training within the company. However, the Head of Training and Development was confident that these problems could be resolved.

Potential Developments

- It was suggested that the FdEng could acquire national accreditation as part of the Energy and Utility Skills' National Skills Academy. However, there were reservations about this as a way forward with one member of staff suggesting this approach could compromise the content of the course.
- Interest was expressed in students, successful on the FdEng, progressing onto Bachelors degrees.
- EDF are keen to identify another provider north of London to deliver a similar programme to their staff; Bedford was mentioned as a possible HEI.
- A further future possibility for the company is to have lecturers in house to deliver programmes as this would counter the problem of employees having to travel to different HEIs. The possibility of working with LSBU to develop this was discussed.

FdEng Students' Perspective

Motivation for joining the course

- The course appealed to people already working in a related job or with an established interest in working in Power Distribution.
- Some students explained that their line managers had suggested the need for further training. In a couple of instances the FdEng had been suggested by line managers but most students, including those employed by EDF, had located the course themselves.
- All the students had looked at the course on-line initially but talked about how direct contact with the Course Director had been instrumental in their registering on the programme.
- Though students on the EDP had not elected to start the course independently they talked about how the qualification would progress their careers; improve their safety and competence at work and access the BEng. Students on the EDP appeared committed to continue working for EDF.
- While they had applied for the FdEng independently in the first instance, joining the EDP had been a key motivator for three of the external students to take up their places on the programme.

FdEng vs Other Courses

- The students not on the EDP identified the increased relevance of the FdEng to their work over other available courses.
- There was some discussion amongst the students on the EDP about whether as the FdEng is a new course it will be as well recognised by their employers as the HND/C. Some students viewed the FdEng as providing the same benefits in career progression terms as the HND.
- A benefit of the FdEng over alternative courses was identified as being its relevance to application in the workplace and how this should improve competence and safety.
- Several students compared the FdEng favourably to an ONC course they had previously started. The benefits discussed were the contact with lecturers and regular attendance at college.

Student Experience and views of the course provision

- Students on the EDP viewed the EDP programme as being beneficial; providing them with insights into different areas within the company which was enabling them to make informed choices about where they wanted to work. Being on placements in small groups also provided opportunities for peer support with academic work. However, the programme was seen as demanding and students were struggling to balance the demands of the EDP, home commitments, travel and the

demands of the FdEng. Several students explained that, as a result, they were focusing more on the FdEng as that was an official qualification.

- The students not on the EDP also discussed the difficulties of balancing the demands of the course with work and home commitments. Peer support was also identified by this group as important; students described how they found opportunities to meet up so that they could work together.
- Students talked positively about the course overall. Particularly mentioned was the contact that they had with lecturers and the opportunities provided to ask questions and clarify their understanding.
- Blackboard was mentioned as being a valuable resource.
- Students were able to make some connections between the course and their work already. Also commented on was how the lecturer made the maths content relevant and accessible.
- Students were unhappy with the length of the college day. It was felt that this impacted on their concentration and performance on the course. Students on the EDP suggested that it would be preferable if the course were to run over 2 days or for them to do the course full time. It was suggested that this would particularly help those struggling with the maths content.
- The need for worked out solutions for maths problems to be put on blackboard was widely discussed. All groups felt that this would support their learning.
- Students viewed Industrial Studies negatively as they felt the course did not help to prepare people for work in a business environment.
- Students were unanimously critical of the maths tutorials: it was suggested that the group is too large and the fact that the maths tutorials and lectures are given by different people confused students.
- Class sizes were also commented on; the size of the group in maths lectures was identified as problematic as student cannot hear and there have been problems over seating.
- Students in one group commented that the lab sessions did not relate to the work done in class.
- The acute differences in students' levels of educational achievement before starting the course was discussed by students. This led to very different perceptions amongst students about the challenge posed by the course and students commented that these differences contributed to some students losing focus in class and disrupting the learning of others. Having very well qualified people on the course, however, clearly provided additional support for struggling students.

References

The Impact of Foundation degrees on the workplace and students: A summary of research projects commissioned by fdf

Kvale, S. (1996) *InterViews: an introduction to qualitative research interviewing*. Sage

FdEng Power Distribution: LSBU staff perspectives

Contributors:

A focus group was held with the Deputy HoD, Course Director and the course lecturer appointed specifically to teach on the FdEng.

RECRUITMENT

The numbers of students enrolled on the FdEng have risen dramatically from the previous year: in 07/08 only 5 were recruited with 3 now still remaining on the course, whereas in 08/09 29 students are now registered - 28 are part time and 1 full time. There is one female student on the course. (Two other students who initially registered on the full time course have now moved to other programmes within the department.) Out of this group of 29 students, 15 are on the EDF's Engineering Development Programme (EDP). Of these 15 students, 3 had applied for the course directly to LSBU and had been referred by the university to EDF, who had subsequently offered them a place on the EDP. Of the remaining 14 students 12 either work as employees for EDF or are contractors for them. 1 of this group is registered as a foreign student. The remaining 2 students work for other employers (Network Rail and BNP Paribas) and applied to the course through the university.

LSBU recruitment to the course

Concern was expressed by university staff that the recruitment and retention in the first year of the course had been so limited. In terms of the university recruiting independently of EDF, this pattern had persisted in the second year with the university again recruiting 5 students in total. The Deputy HoD expressed some concern that this would be disappointing to EDF who were initially hoping to recruit new employees through a fresh pool of qualified people recruited independently by the university:

I think if you go back far enough EDF – what the original hope was that the LEP/South Bank would deliver numbers of full time students – let's say fifteen and EDF could give those students work based learning and give them some work placements, probably in the summer and then select from those the people that they would like to take on in employment but it just hasn't happened. We just haven't had - the applicants from the full-time routes haven't had it. It didn't happen in the first year and last year it didn't happen either. (Deputy HoD)

A problem facing lecturers aiming to recruit full time students to the course appeared to be the highly specialized nature of the course itself. The people applying to the course through the university and EDF were predominantly people who were already working in the area and wanted to embark on the course part time. Even the few full time students who applied had again already worked in the area:

... this one is so specialist, you see, and getting full timers to come in is proving quite difficult 'cause it's a very specialist area and the full

timers that we've had tend to have already worked in that area don't they? These aren't school leavers coming in (Deputy HoD)

EDF had had only one applicant who was a recent school leaver (this student applied because his father already worked at EDF). However, having identified that the course had appeal and relevance for people with some experience of working in a related field, there appeared to be some difficulty in reaching this group of potential recruits:

But it's how you find them because they're not findable. It's easy to find eighteen year olds because they are either at school or college. Once you get people who have started work or have worked a bit in the business – where are they? Are they studying at college – they maybe, maybe not. How do you get to them? (Deputy HoD)

Also discussed were the difficulties that people who have already started their working lives would face committing to a full time course:

Whether they want to be studying full time – if they're doing part time contract jobs then they would be reluctant to come full time because the money would go (Deputy HoD)

A possibility for widening recruitment suggested by LSBU staff was engaging with different employers:

The other thing as well is, probably trying to sort out the possibility of having maybe some other employers with our courses. That would obviously be in line with EDF. That probably could open up the route for us to get more students from other employers if the university is providing such a programme and then allow other employers to come on board. (Course Director)

However, this was viewed as problematic because of the breadth of EDF's reach across London, the South East and East Anglia. The only other Distributed Network operator (DNO) identified who have employees within the London area have already developed a Foundation Degree Programme with Aston University:

...the next closest supplier ... is Scottish and Southern Energy. They're just about in West London; they tiptoe in from Reading and just about touch the areas of West London. The problem with them is they're already involved in their own foundation degree with Aston University. Aston University started a foundation degree aimed mainly at national grid which is at the higher voltage end from what EDF are but that has broadened out to running with other companies based – the electricity operators closer to Birmingham so EON are involved in it, Scottish and Southern Energy and there's a couple more so where we might have broadened it out perhaps to get people from Scottish and Southern Energy, they're already involved and also that scheme is franchised – it doesn't run at Aston University until the second year so students do the first year at a local college. (Deputy HoD)

Reaching people who had qualified on courses at craft level was also discussed as a way forward. However, LSBU staff were not familiar with many courses that provided these types of qualifications:

...it's such a specialist area. There aren't many, what's the word, craft courses that lead into this material you see because it's high voltage engineering. I mean there are some because how do these people get qualified to that level. (Deputy HoD)

Lack of recruitment from the local community

Linked to this concern is that the people currently on the course do not come from South London; most living outside London altogether. They also do not reflect the profile of the population of South London in terms of their ethnicity. The Deputy HoD discussed EDF's ambition to recruit locally through the programme so that their employees were more representative of the area in which they work:

So none of those are indigenous as such are they? Not even from the ethnic community really. They're not long standing South London from the Afro-Caribbean community which may be the EDF were hoping – because one of the reasons – if you go back to why it was set up they actually wanted a more representative sample of employees from the areas in which they serve, from what they currently have because one of the things they wrote, way back when it was set up with the LEP, that the employees tend to live away from the areas in which they work because they all live outside London and they travel in. They haven't recruited many people from the South London area that work for them. They all live outside so they come in and one of the things they were hoping is that they would get a work force which is more representative of the area in which they serve, and lived in it more locally. (Deputy HoD)

One suggestion made was that a bursary system could be put in place by EDF to encourage students to enroll for full time places on the course. The suggestion was that this could resemble the Power Academy bursary system though an issue for EDF with a bursary system is that students are under no obligation to work for the company when they graduate.

Recruitment within EDF

The reason for the exponential increase in numbers on the FdEng was identified as being due to EDF advertising internally and due to their setting up the EDP. The financial security presented to potential recruits coupled with the opportunity the company has to advertise to a 'captive audience' was viewed as being largely responsible:

Of course the company was very successful because it's got a captive market when it puts a circular around about would you like to be paid to train for two and a half years then you've sort of got a captive market. (Deputy HoD)

The EDP

The development of the EDP programme at EDF had significantly boosted numbers. This programme is also set to continue for at least 5 years so the supply of students from the programme to the Foundation Degree is set to continue:

...without this engineering development programme this course wouldn't have looked that big – you see, so it would have been fifteen fewer so rather than twenty nine it would have been fourteen ...they plan on running it next year this engineering development programme, as far as we know. (Deputy HoD)

EDF had set up the EDP quite separately from the FdEng and it was only in May '08 that the university learnt of the programme. The company had advertised externally but almost all the recruits for the EDP had come from within the company. 25 people had applied and 18 were initially selected. Of the 15 students currently enrolled on the programme half had previously been enrolled on an HND or ONC which they had given up in favour of the EDP and the FdEng.

However, the Deputy HoD outlined a problem for the company being that the recruits were predominantly internal and so the shortage of trained staff was not solved but transferred to a different level:

And the problem for them is you see, many of them, they were hoping to get a wide variety of applicants – they didn't. They got some from outside the company but the vast majority were from within the company – some 70%. Of the twenty five, something like twenty or eighteen were from within the company... these are people from within the company who are stepping up. If they are stepping up that means that there are some empty places down below so their problem of shortage of staff isn't solved is it?...Many of them are qualified to craft level...technician level you see and these aren't youngsters. Some are but they're people in their late twenties and thirties some of them so they are quite experienced staff, you see but EDF have obviously seen they've got potential to come up to the next level which is what we call Incorporated Engineer level then they offer them a place on this course. (Deputy HoD)

The model provided by the students who had applied directly to LSBU and who had subsequently been offered a place on the EDP, was identified by LSBU staff as a very desirable one for EDF:

but what we did ...we had already got some full time applicants here so we said to the EDF, if we got permission, would you accept those CVs to have a look and see if you're interested in putting them on your graduate development programme? They said yes so we contacted the students and said would you let us send your CV or application form off to EDF so that they can assess it and then certain of the students – like those three- they originally applied full time to South Bank but with their permission (Data Protection Act) their details were sent to EDF who then invited them for interview for their graduate development programme and now they're on the foundation degree coming part time

in with this group ... They've identified those three as having potential so – but you know I think they would have preferred it to be ... fifteen and they found three within the company but it hasn't worked like that. (Deputy HoD)

The Course Director also suggested that this is a very attractive proposition for the students who not only get their fees for the course paid but also receive a wage. (The wages of employees enlisted on the EDP is not however uniform and dependent on experience/ previous position within the company).

EDF are recruiting for the programme earlier in the academic year for the 2009 intake for the EDP. LSBU staff were confident that a similar number of students would enroll on the FdEng through the EDP.

LSBU Marketing

The university have produced a leaflet to market the course. One of the course lecturers has also designed a single side flyer which has been sent to libraries and local colleges.

Well we did some adverts and some leaflets to local libraries across London – probably about fifty libraries and to colleges as well and job centres as well. You know people probably may sort of mature and widen participation (course lecturer)

However, it was unknown whether this approach had resulted in any students applying to the course either full or part time. The Deputy HoD explained that they 'relied on the LEP' to market the course more widely. Lecturers' Teaching and other commitments were identified as constraining the amount of marketing the department could do. However, visiting colleges and talking to potential recruits was viewed as a strategy that would probably help if time allowed:

And I think, really, with local colleges it really helps to do follow up visits. Although we don't have the experience, word of mouth from other people from what they do, it helps. Just sending leaflets, they may not ever get into the hands of those you want them to get into. If you go along and give them out to a group that are say on a level three programme and are coming to the end of it and they are full time and they look at the leaflet, then you might pick some up...(Deputy HoD)

Indeed, the power of direct communication with students was suggested by the course leader. He described how he had discussed the course with a number of potential applicants who had subsequently decided to apply:

Yeah, they used to ask me what's the advantage of doing this over this one because I wanted to do this at a local college and like not West Kent College or somewhere but the place they work and live so I had to tell them how it is related to EDF and so on and then they chose to come onto this one. (Course Director)

In terms of marketing the course, there appeared to be some opportunity to make more explicit reference to the excellent links with EDF that the course provides.

...we could do better because what we probably need to emphasize in the leaflet that if you are a full time student you are guaranteed four weeks of work based learning as part of the scheme for the degree and also EDF have said to us that they will find summer placements for those that want them (Deputy HoD)

The attraction of this link for potential students was discussed; not only is the work experience valuable for the development of students' CVs but also this connection could result in employment:

... the good thing is they would be given the opportunity to develop a good relationship with employers and if they succeed then you know when they leave...They have more chance to be employed at the end of their programme (Course Lecturer)

The Deputy HoD suggested also referencing in advertising material the possibility of recruits to the course gaining immediate employment with EDF through recruitment to the EDP:

...you'd have to be very careful how it's worded ... it should say something like – if you apply for this course, if you allow us, we will forward your CV to the employer for – you would have to be very careful how you word it. You'd have to get EDF approval, you'd have to check it out with the college (Deputy HoD)

RETENTION

Retention the course so far has been good. Only 2 students dropped out during the early stages of the course and they joined other programmes within the department. The issues for them appeared to be largely due to the fact that they were on the full time programme and felt isolated due to the lack of student numbers so joined the HND course:

And they have transferred to the HND electronic engineering...It's different by one unit – it actually differs by one unit.

Interviewer: So why did they transfer to that?

Umm, not many full timers on this one so they might have some friends... One said they had more friends on the HND (Course Director)

Student performance

It is too early in the course to determine how likely students are to succeed. There are evidently some very academically high achieving students on the course. Several students achieved 100% in the maths phase tests (February). However 8 out of 29 students failed the phase tests. It is interesting to note that 2 of the students who achieved 100% in the tests had asked for additional

maths tuition and only 2 of the students who failed had identified themselves as in need of additional support. This lack of awareness of their own understanding of maths perhaps reflects the fact that most of the students have been out of education for a long time and are unused to study.

The LSBU staff were not too concerned by the students failing the phase test – the numbers reflect those on other courses in the department. However, the Deputy HoD suggested that it is very possible that a small number of students may not pass elements of the course:

A six in your first exam may mean a variety of things. It may be the warning shot – oh, I do have to work because the others that work, they got fifty- six. I just messed around and I got six or it may be there's a complete hang up on all things mathematical. If there is that person is probably not going to pass the programme and therefore they don't have enough analytical skills to be at this level in engineering, which is Incorporated Engineer level. I mean there are certain basic skills you have to have and if you can't work in the abstract at all and have very few skills, then really you're not really suited to this level of engineering. Not everybody can get a prize. (Deputy HoD)

Timetabling

One concern that may impact on retention of students to the programme; particularly those on the EDP, is the timetabling of the course. The course is timetabled from 9am to 9pm at night with very limited breaks. It was suggested that as the second semester progressed this was likely to become an issue for many of the students. However, the HoD said that university cannot adapt the programme to fit them any further:

...They're going to be here until nine o'clock and they will probably put a lot of pressure on us but there is nothing we can do. I can't see it because the course runs – it's a taught course; it has so many hours contact and that's what it has and there isn't a simple way to cut that down at this stage so we're waiting to see what happens with this group who will no doubt flex their group muscle again, thinking that the same thing would happen but I don't see any way that it can happen. (Deputy HoD)

This long day is compounded for many of these students by the fact that they are not London based so have to also travel long distances to return home after the day at LSBU. All are then expected to be at work the next day:

It will be, yeah. I think they'll be alright. It's just if you finish at nine o'clock and you've got to travel back to Eastbourne, that's a significant journey (Deputy HoD)

STUDENTS AS CONSUMERS OF HE: A LARGE AND POWERFUL GROUP

It was evident that as EDF had invested heavily in the FdEng and the majority of the students on the course were employees of EDF with 15 being a coherent group on the EDP, LSBU staff are keen to ensure that the company are happy with the provision:

Yeah that's why ... we try and support them as much as we can because it is a big investment for the company and okay, they've also invested with us so it's really a question of us doing as much as we can ...

... one of the reasons we're trying to keep our end of the bargain up as much as we can 'cause you think of the cost to the company of this. It's a lot of cost and obviously they're expecting, they don't want too high a wastage and so we really have to deliver. (Deputy HoD)

LSBU staff discussed the power of the group voice of students on the EDP. It was clear that the group of EDP students had been able to use this 'voice' to influence the running of the course. This seemed to position this group differently to most students on other courses within the department – the EDP group appeared to be clearly consumers of HE:

... it gives them more weight – there's no question of that. If they can act with a single voice, you know – we do not like this – then it carries a lot more weight and we've found that in one or two cases but it may make our life a bit more difficult of course or harder but then they are entitled to a decent service, you know, and when they complain – if they complain as a group – we had some issues about the times. (Deputy HoD)

Impact of group voice

One instance where this group voice had been used was in arguing for the college day to be shortened during the first semester. It was suggested that this had had a positive outcome for the students in allowing them to acclimatize to being in an HE environment:

...we had some issues about the times. Basically they don't like staying late in the evening. You see, being a part time course it starts at nine in the morning and we can technically timetable them until nine at night because they have to do three units so they can work until nine at night. Now we had a lot of pressure to cut that down and we were able to in the first semester. We were able to finish at seven, so they all finish at seven but in fact ... many of them finish at five... But it has been beneficial for them because it gives them a gentle run in – to get used to the ways of HE and our ways – so there's that. (Deputy HoD)

Another instance where this group voice had been used was in asking for additional maths tuition and for this to be supplied on different days:

... some of them didn't do that well in the mathematics ... those that wanted to do additional mathematics we said, well, you can do it on that evening at five o'clock so we got an extra tutor on but some of them didn't want that. They wanted to come on a separate day. They

were able to get time off to come in on the Monday morning ... Four or five come in additionally on Monday morning at nine o'clock for two or three hours more mathematics. Partly because of their clout we did that. I think if they had been ordinary students on an HNC – well we've run the HNC for many years – it's the same mathematics unit – they're taught together – we obviously get students fail that and we've never put on any additional maths. ... that is the case of how this group has kind of driven things more than if they had been HNC students from different employers, it wouldn't have driven it because we've never done this before. Although we've – this group are no worse at maths than the broad body of HNC students, you know, it's roughly the same failure rate so they're no different but we've had to put this extra mathematics on because of their requirements and the company has sort of asked for it as well. (Deputy HoD)

However, this had not led to unequal provision between courses as the university attempts to provide consistency. As a result of this policy, additional maths classes were also offered to students on the HNC course:

... because we like to have consistency, we've also put it on for the HNC students so those that have failed the maths, they can come in, not at the same time – we do treat them as two separate groups you see (Deputy HoD)

While EDF money paid for the extra tuition provided for the FdEng students, the extra tuition for the HNC students had been paid for by the department. However, the Deputy Head of Department was very positive about the impact of the extra classes; suggesting that this extra provision across the different courses could help with the ongoing problem of students' difficulties with maths:

... the money for that has come from the EDF money via the LEP - EDFs £4000 a month or something. The sum total came to £80000 and that money pays for that extra tutor that comes in. She does Monday morning nine till twelve and she does Tuesday evening five until seven and then she does a bit more on top of that for the HNC and that's paid for by the department you see. She does a Monday afternoon and she does seven till eight on a Tuesday and that's paid for by the department because that's for the HNC students but the EDF are paid for from their funding. That's also been very successful... it has been a good thing, quite frankly. If we can sustain it, it is a good thing because engineering students always have problems with maths, especially early on and if you can give this extra support – it's not just going to help them, it will help all the cohort, you see. (Deputy HoD)

Similarly, the course lecturer had set up a pre-entry maths course for some of the students on the EDP:

We ought to say, when we looked at the CVs on the engineering development programme before they came with a view to looking whether they needed additional maths and that's another success we had. Najib, I think the idea came from you to run a pre-entry maths

course, you see, so we thought well, that sounds a good idea; we'll float that. We already had some experience of doing that kind of thing with a project last year with the South London Lifelong Learning Network at Kingston College with a chap that set up a kind of a bridging programme to bridge from Kingston College HNC into our second year degree...we kind of based this idea of extra maths on that so we said right, yeah, we could get a pre-entry; what we'll do, we'll have a look at the engineering development programme CVs and the others and see who needs it- see who's a bit...Very few of them needed it we thought. (Deputy HoD)

This had again been offered to all other students doing the same maths unit – so the offer was broadened to the HNC and HND entrants as well. This had been staffed from within the department so had been of limited cost. The course had been viewed as so successful that other departments within the faculty had expressed an interest in running a similar course:

But we also, because of our, what's the word, equivalence things, we had to do it for everybody that was going to do that maths unit so we broadened it to HNC and HND entrants and at the end of the day there were fifteen on this pre-entry course which ran for two days. That was funded from within the department. The funding on that was basically a local deal; the person that did it had to spend the two days delivering the course – it was two Tuesdays and the time to develop it and they didn't have to do their one weeks compulsory recruitment duty that everyone else, the rest of us has to do so that was the deal. That was cost free in some ways. That went very well. So that was another thing that kind of stemmed out of this because if we hadn't had that EDF programme we probably wouldn't have gone down that route and that course will probably run next year and other departments in the faculty have expressed interest (Deputy HoD)

LECTURER TIME

New post

The funding provided by EDF for the FdEng had enabled the department to employ an additional lecturer. This appointment had been of benefit to the department as he was able to contribute to other programmes as well as the FdEng:

Yeah – while I'm involved on the foundation degree I am also contributing to your other programmes like the BEng projects, for example. (Course Lecturer)

However, the Deputy HoD suggested that in the future this contribution would be lessened because of increased commitments to teaching the first and second year students on the FdEng. At present 4 out of his 11 hours of his teaching time are designated to the FdEng but this will increase to 8 in the academic year of 09/10:

...next year ... you'll be doing eight hours ... you see but this year you're only doing four because we haven't run one of the units we were expecting to because there's no full time cohort in the second year but next year, even if there isn't, we will run both units so NH will be doing two units, four hours each unit so if he gets typically about eleven or twelve hours contact so two thirds of his time will be on the foundation degree although (Deputy HoD)

As the foundation degree is so closely linked to other programmes run within the department, various units are taught with students from different programmes grouped together. In this way, the course lecturer has also been able to contribute to the HND and HNC programmes.

...there are other units that are taught to foundation degree students that are also taught to HND so NH at present teaches – he does a two hour lecture in one unit which is not just for foundation degree students. (Deputy HoD)

Combining other programmes as well, like HND, HNC as well so there is a benefit there. (Course Lecturer)

Numbers in classes/ demands on lecturer time

A point briefly raised was that as the maths units are the same for the HND, HNC and FdEng, the FdEng students had been added to this existing group; increasing the numbers in the class dramatically. There was a suggestion that this may have been the cause of some consternation to the lecturer involved:

On this programme ... other people – other people teach on this – mathematics for example, is taught by a chap – he's the course director of HND and HNC so he knows this like the back of his hand. He had a particular way and he's just had to accept that he's got twenty- nine more students in his class. (Deputy HoD)

Another issue raised about the running of the FdEng was that the Course Director had specific demands made on his time by the extra commitment of working with the employers as well as the lecturers and students:

... gets an allowance for being the course director but compared with some courses, the overheads are probably greater because of this extra – course directors normally have mainly contact with students and within the department. ... has both of those plus fairly regular contact with the employer 'cause all of this requires contact. For example, the employer wants the maths results, the phase test results. We can't do that without asking the students so he has to e-mail the students or go and see them and ask them and it all takes time. You think, well it doesn't take long, you can just walk into the class but oh yes, it does. It takes time to remember to go down and to take lists with you, then to ask them, then if you are going to do it by e-mail, to

send the e-mail off and then get all the replies. It all takes time. It doesn't sound much but it is because when you're doing that you're not doing something else so that is additional time where you are liaising with employers and employers can be quite demanding we find because they have different time scales to us. They don't have a termly timetable. (Deputy HoD)

INDUSTRIAL CONTACTS

The relationship that has developed with EDF through the FdEng was also identified by LSBU staff as of real benefit to the department and to the programme. A member of the EDF staff now sits on the Industrial Liaison Panel:

... the other benefits – all we've talked about are student numbers- okay it's a big thing but we have far more industrial contacts via EDF energy than we've had before; one of their technical men sits on our Industrial Liaison Panel; he was at the meeting on Friday afternoon – he came in specially for that and had a good chat – had an argument with somebody about competencies, so I hear...(Deputy HoD)

The department has links with various other employees at EDF who are involved with the programme and these connections are also valued. A benefit identified was the access that these connections should facilitate to sites at EDF:

...that's the other thing we gain; we get access to their sites if we can so we can go on visits (Deputy HoD)

Some hope was expressed that access to sites would not be restricted to FdEng students as such visits could really benefit students on other programmes; particularly the BSc students:

If we could we would send more – for the degree students. I do a class in the final year degree that covers a lot of this stuff at a higher level and it would be fantastic if they could go. (Deputy HoD)

A further benefit from the relationship has been access to material specifically linked to the four core units on the course which LSBU staff have been able to develop into learning material:

...they supply the material ... there are four core units on the course and they supply the materials for them and they are involved in the outlining of the course material – then ... started working with them – like the syllabus and so on. (Course Director)

As significant as access to the material itself appeared to be the contribution that EDF staff had made to providing an understanding of that material:

...there's also access to material that we probably wouldn't have access to if we didn't have this close relationship so it's technical material and also the technical angles that you wouldn't get if you just had the material without any chat, so you see, some of this material

you can find on websites but if you've got access to the people that are involved in it. (Deputy HoD)

The course lecturer suggested that the fact that the course materials were derived directly from EDF, the employer of the majority of students on the course, makes the course relevant to the students and also develops their understanding of the company – so benefits the company too:

...its quite a good activity for the students actually to discover the ongoing activities in the industry to let them know what's going on and also we give them more of the other benefits, we give them the opportunity for other students who are employed to come and discuss their ongoing work...it is very important for them to share their experience with us ...For example, one time, a student brought in his work... some demonstration on practical industrial stuff from a sub-station ... And you know it is an environment which works both ways especially here we help them to be aware of the industry and also with the energy company, to help them understand it further. (Course Lecturer)

While EDF staff had been too busy to develop resources for the course themselves, LSBU staff had been able to discuss approaches with them and so 'enhance the programme':

... we feed back to the technical man what we're proposing. For example, we needed to develop some laboratory exercises so we asked - can you give us an idea? We didn't get a lot from them because they are so busy and ...so we sat down and we said what we would do. We set it up and I think we developed three exercises... we then said to them – this is what we're proposing, these are the exercise sheets; this is what the students will do; what's your feeling about that? They said, oh yes, that's fine so we get feedback on what we're delivering to the students – if it's relevant for what the company see. That's another advantage, you see, to us. (Deputy HoD)

The course lecturer also suggested that the resources could be developed and expanded to work for other programmes:

I mean from us as well, there is another aspect and that is it gives us the chance to develop further resources...we could develop it and expand it ... to other courses. If you take, for example, the unit that we are teaching at the moment, that may need some resources that could be used later on for the B.Eng course... (Course Lecturer)

Issues: commitments of EDF staff

While the relationship with EDF was identified as a very positive one by LSBU staff, it is not unproblematic. For staff at EDF, the FdEng has to compete with more pressing draws on their time. This has led to some frustrations for LSBU staff delivering the course. This has included cancellations of visits to sites:

we had a visit planned for this term and it's been delayed and delayed and it won't happen this term but it should have happened you see but we're hoping we'll get more of these visits (Deputy HoD)

Also discussed was the difficulty of setting up meetings with EDF staff when all can attend; the attendance of all EDF staff involved with the programme was viewed as vital:

you know but it's quite difficult to set meetings up with them... If Sally doesn't come or if Arty doesn't come you've lost a vital component but the other people can't have the input there. We need the people – Paul, the man who runs the development programme, he really needs to be there, you see. Okay, we only have one meeting a term but he really needs to be there. (Deputy HoD)

An example was given where a further meeting had to be set up to ensure that the views of the member of staff at EDF who provides technical support for the programme were taken on board. The Deputy HoD views maintaining these interpersonal connections as being vital to the success of the programme:

We had two meetings because the technical person, he just couldn't make it. We kind of fixed up a date and he was fine but about a week before he got something in his diary, obviously some emergency happened somewhere – of course that had to take precedence so he couldn't come so we set up a separate meeting here with him two weeks later, you see, but that's what you have to do, you see. If you don't do that then you lose contact with them and they think you don't care and the whole programme spirals down. (Deputy HoD)

Also worth noting is that while there were plans for EDF staff to contribute to the delivery of the course, this has not been possible because urgent calls are made on their time that make the commitment necessary impossible:

... don't physically do any delivery... They could and it's written in but they are so busy; they are just so busy ... you can't have a timetable that says – I'm sorry can't do this week now – I've been called away – that's not going to go down at all especially when it's been delivered to some that are full time you see. (Deputy HoD)

However, LSBU staff were still keen to include EDF staff in the delivery of the program if this becomes possible:

If we have someone that comes up with an interest we'll definitely include them in our delivery. (Course Lecturer)

Oh yes, we would jump at the chance. (Deputy HoD)

POTENTIAL DEVELOPMENTS: RECRUITMENT TO OTHER COURSES/ DEVELOPMENT OF NEW COURSES

Expertise in FDs

Setting up the FdEng with EDF has provided LSBU staff with some valuable expertise in foundation degrees which they have been able to utilize in setting up a further foundation degree in electrical engineering. This course, though different in focus, does share some units with the FdEng in Power

Distribution:

The other benefit that I can think of is more widely spread across the department is, we have set this foundation degree up so we're becoming knowledgeable, dare I say experts, about foundation degrees. Now the department has just validated a second foundation degree in, not the same area but an associated area, with a college, Carshalton College. It's a foundation degree in Electro-technical industry. This one is all about supplying power – high voltage and all things and cables down your street whereas the one with Carshalton College is basically about the wiring within buildings. It's all about the sockets in this room and the lights so it's not a completely dissimilar area but it doesn't share any of the technical units in common. It shares some units. (Deputy HoD)

This course has now been validated and it was suggested that the knowledge they developed, particularly about work based learning, had been very useful in this process. The Deputy HoD talked specifically about how to organize this within a number of units as site visits so that the course is accessible to part time students:

... the expertise that we got from knowing about foundation degrees and about work-based learning and how it's all done has been useful ... for example, the issues about, there must be work related content in foundation degrees; one model is to put it all in one unit, just lump it and call it, this is the unit where you have to go off and do some work. Well we – this course doesn't have that model, we kind of put it in a number of units. There's a number of units where they have to have some sort of work experience even if it's – and it is in some of them, it basically means going for site visits, you see. Now we use that model with Carshalton as well because most of the students on that course will also be part time initially so this isn't now stand alone, there's now two. (Deputy HoD)

Progression routes for students on FDs

A further potential benefit to the university is that the students now engaged on the FdEng could progress onto a degree programme. This progression route is guaranteed for the students:

What happens, when these graduate, there's a guaranteed pathway on to our undergraduate programme for them so we end up with students, not just for three years part time, they come another two years on top

of that, you see, if they choose to. If they pass the foundation degree then it's a guaranteed progression. One of the rules for a foundation degree is it has to have a progression route, you see, so that's guaranteed (Deputy HoD)

A possible further development could be the development of a new programme that allows students to progress and gain further qualifications whilst at work. The Engineering Council have identified that fewer people are gaining professional qualifications so there is a need for such programmes:

...the Engineering Council are finding that fewer people are registering to be these professional engineering grades and one of the reasons is they're getting a first degree but they don't, they are not able to study further than that because they're working so this is sort of studying whilst working. We did mention it to EDF very briefly and I think we had things positive back didn't we? (Deputy HoD)

A model on the Engineering Council website currently running at four universities – Kingston being the lead - enables people in work with BSc level qualifications to progress to CEng without leaving work. There is a possibility that this programme could be run on a faculty wide basis at LSBU. However, the Deputy HoD is also interested in developing a similar programme for those students who complete the FdEng but are perhaps not academically inclined to progress onto a degree programme. This work based programme could enable them to achieve an I. Eng Level:

...but those that don't, they've done the engineering development programme, this has brought them towards I. Eng Level and what they might have had to do, they might have had to do some sort of further study for another year to get an unclassified degree but the Engineering Council has now come up with this which is a framework route. They can do a foundation degree and top up to a Bachelor degree by learning Contract, which is all done at the company (Deputy HoD)

There has been some initial discussion about this as a possible route for FdEng students with EDF. LSBU believe that this will be well received by the company as they are keen for employees to have professional qualifications and the students will not have to be given day release to attend a course at college:

... we mentioned this to EDF and they were quite interested in this because what this means – lets say that they identified some of this group that really probably are not going to go through to higher levels of study; they managed to get their foundation degree but they're not getting really good marks and so you think we don't really want to move them onto the next level. In order for them to become chartered to I.Eng., which is what the company would want because actually the companies, although they're interested in the degree, ultimately they're after professional qualifications like I.Eng. and C.Eng. ... Now if they can get to I.Eng. without any further day release to college it's a sort of a benefit to the company because it saves costs. (Deputy HoD)

This course is in the early days of its inception but there was optimism that it could be developed. Preliminary discussions with The Engineering Council and with EDF have been positive. The Deputy HoD suggested that with a single employer, such a programme would be relatively simple:

...it's something that we've had discussions with the Engineering Council that – we haven't gone beyond that but if the company is interested we would be interested in following it, I think. Basically, we have to set up a programme to do it. We have to devise what goes into the programme in terms of a learning contract and what these students do, you see. It's easy if you just have one employer it's quite easy to do. ... It would say, students will have experience on the commercial side of the business and on the technical side of the business or they would spend time with the contracting teams and with the control group teams but we had brief discussions about this and I mean, we are now, this is going to be two years down the line before this can start because the students won't graduate until then ...but it's looking as though it might be another thing. (Deputy HoD)

Summary

Recruitment

- Recruitment to the course has risen exponentially from 07/08. In 07/08 the course recruited 5 students; this rose to 29 in 08/09. 28 of these students are part time. 15 students are on the EDP and a further 12 students work for EDF.
- LSBU staff expressed some concern that the university had only recruited a small number of students independently of EDF. The appeal of the course to mature students with experience of working in a related field was discussed. However, people with this experience were identified as difficult to find. A source of potential recruits suggested were recent graduates from craft level courses.
- The programme has not recruited from the local community and the full time course only recruited one student. A bursary system was suggested to encourage recruitment from the local area.
- The success of EDF in recruiting students to the programme was discussed. The EDP was identified as having significantly boosted numbers on the programme. However, a problem this year has been that the EDP students are predominantly internal and so the shortage of trained staff is not solved but transferred to a different level within the company. LSBU recruiting externally through the FdEng for the EDP was identified as beneficial for EDF, the students and the university.
- The marketing carried out by LSBU staff has been limited due to other commitments in staff time. A leaflet has been produced and sent to libraries and colleges. However, it was suggested that direct interaction with potential students would make these strategies more effective. It was also suggested that more could be made in marketing material of the excellent links the course provides for students with EDF energy.

Retention

- Retention to the course has been good so far with only 2 full time students transferring to other programmes. The motivation for this appeared to be their being isolated in such a small group.
- The students are performing so far in line with other courses and there are some extremely high achieving students on the course. Students were described as being unaware of their own levels of understanding - this may be indicative of the fact that, in many instances, they have been out of education for a long time.
- The timetabling of the course from 9am to 9pm during the second semester was identified as a concern especially as many of the students have to travel relatively long distances to attend.

Students as consumers of HE

- Because of EDF's investment in the programme, LSBU staff are keen to ensure the company are happy with the provision. The students on the EDP were identified by LSBU staff as having a powerful group voice.
- This group voice had been used to successfully acquire a shorter day during the first semester and additional maths tuition. Staff had also offered a pre entry course in maths for some of the students on the EDP. However, this was all described as being positive for the department who had consequently provided the same opportunities to students on other programmes.

Lecturer Time

- The funding of an additional lecturer who has contributed to the FdEng as well as a range of other programmes was discussed as being a benefit to the department.
- However, the success of the course had also had repercussions for staff. The numbers of students in maths lectures has risen dramatically. The Course Director has more demands made on his time than other course leaders because of the additional demands made by employers.

Industrial Contacts

- The relationship between EDF and LSBU developed through the FdEng was discussed as a real benefit to the department. The Technical Adviser at EDF now sits on the Industrial Liaison Panel. Access to sites at EDF and the development of material specifically linked to the four core units of the FdEng were seen as particular benefits of the contact as they make the course relevant for the students – this was also seen as a benefit to the company. The opportunity provided by the connection to discuss resources with EDF staff was also seen as positively impacting on the quality of the course.

- There were some frustrations for the department; particularly the cancellation of visits to sites. Setting up meetings with EDF staff is also time consuming. EDF staff have been too busy to contribute to the delivery of the course.

Potential developments

- The department has drawn on the expertise acquired through setting up the FdEng to set up another FD in electrical engineering.
- Students now on the FdEng are offered a guaranteed route onto the BEng programme. There is also a possibility that a new work based programme could be developed to enable student who have completed the FdEng to progress to I. Eng Level.

Perspectives from EDF Networks Branch staff

Contributors

Separate interviews were held with EDF staff involved with the FdEng. This included an interview with the Technical Adviser, the Head of Training and Development and a paired interview the Strategic Resourcing Manager and a colleague in Strategic Resourcing.

THE EDP & FdEng: A MUTUALLY BENEFICIAL RELATIONSHIP

The development of the EDP within EDF has had a real impact on the FdEng in terms of establishing it as a recognized course. Due to recent fatal accidents at EDF there has been an increase in focus on training and development within the company. The head of training and development explained the importance of ensuring people are qualified and have a level of understanding that has previously often only been assumed:

...I think it is important to get as many people academically qualified as we can with engineering. We have found that great assumptions are made about what people understand and it starts at every level from craftsmen right up to these field engineers and if they really don't fully understand what they're dealing with in terms of electricity and electrical engineering and just what the implications are at every level, they can't really do their jobs to the best of their abilities (Head of Training and Development)

The Strategic Resourcing Manager also explained that while the individual District Network Operators (DNOs) that were brought together to form EDF had their own training programmes, no overarching programme had been developed because there had been no shortage of qualified staff. Developing a programme had now become necessary because of an increasing shortage of qualified people. The training programmes up until the development of the EDP had focused at apprenticeship level and graduate level; while both these programmes draw from outside the company, the EDP, as well as recruiting people from outside, has been devised to facilitate progression for suitable candidates from within the company:

...last year we were asked to set up this Engineering Development Programme which sits between our Apprenticeship Programme and our Graduate Training Programme and whereas both the Apprenticeship Programme and the Graduate Programme take people from outside the company, so they are new recruits to EDF Energy, the concept of the Engineering Development Programme is that yes we will take people from outside the company but it also provides a career progression route for people that are in craft roles at the moment so we are moving them into engineering roles. (Strategic Resourcing Manager)

Indeed, the Head of Training and Development actually referred to the EDP as a 'conversion' programme. A benefit to the company of this appears to be

that they will quite quickly acquire qualified staff that has the flexibility to be employed in different areas across the company:

...the other people that were already employees have come from a range of different roles and are being converted, if I can put it that way, into engineers. They won't all do the same thing at the end of it; they'll be used across networks 'cause we do have a variety of activities where an engineering qualification is necessary; not all of them are outdoors; some of them are draughtsman, designers – those sorts of things and the people that work in Power Link, the people that work at the airports as well as the people that work in the Distribution Networks (Head of Training and Development)

...the plan is at the end of the two and a half years these trainees will be fitting into Networks branch wherever they are required to be (Technical Adviser)

It was evident that the decision to set up this programme had been made independently of the FdEng but that the two had come together in a way that was beneficial to the company and the university:

... it's been a very fortunate thing really I think for us because ... we've now populated that degree course with lots of students of our own ...as it happens we developed this engineer training programme in the company and you know, we've sent them all pretty much on to that degree programme so I think for the university that's probably been really good. I don't think they would have expected to go from – well we gave them two part-time students for the initial year (Head of Training and Development)

The EDP has been developed to fit around the part time FdEng; both last for two and a half years. The students spend four days a week in six week blocks rotating around the Networks Branch learning about different areas. They spend one day a week at the university. The Technical Adviser explained how the FdEng provides the theory behind the practice that they are learning during the rest of the week:

This foundation degree is the academic input into engineering development programme ... the foundation degree will take only a day a week so the trainees will spend that trying to get the theory behind it – why they are doing it and the application into power distribution area (Technical Adviser)

Towards the end of the programme, students on the EDP will move into 'their final destination role' in one of the number of departments within the Networks Branch such as Connections, Asset management, Health and Safety department, Operations, Private network. The hope is that the programme will 'enable them to work at perhaps a higher level' and that they will have an overview of the company and an understanding of 'what departments are doing and why they are doing it.' The Technical Adviser explained that this should ensure more competent and efficient employees:

The benefits are they are employing competent staff because competence is quite crucial and also we are training individuals who will fit EDF Energy specifically therefore individuals' confidence levels will increase and they will be doing the job they want to do and their efficiency will also be better (Technical Adviser)

It seems to have been a fortunate coincidence for the company that the FdEng matched so well the level and academic input they wanted for the EDP:

... the level of academic qualification we were looking for with the Engineering Development Programme was around about the foundation degree level; it was at least HNC but actually foundation degree was better and because we'd actually developed the foundation degree to meet the needs of our business it made sense to put these people on to the foundation degree rather than another HNC somewhere else (Strategic Resourcing Manager)

In fact, because of the limited range of courses on offer in related fields, the alternatives appeared to have been somewhat limited:

There were only two colleges that did an HNC in electrical – like plain electrical engineering in the whole of our patch (Strategic Resourcing)

The Head of Training and Development explained that, from the company's perspective, the increase in qualified manpower that will result from even just the first year of the programme is a gain for the company and the fact that LSBU contributed three to the programme is a benefit in a climate where it is so hard to recruit:

...I think there's eighteen people who are academically qualified in engineering at some level, three of whom didn't belong in the company before so that's a net increase in qualified manpower ...It's a case in this manpower climate really of every little helps (Head of Training and Development)

The benefits to LSBU were also discussed. The commitment of students on the EDP in terms of regular attendance was commented on and contrasted to those who have not received any sponsorship:

... our part-time guys have been religiously going week in, week out and the non- sponsored guys have been a bit casual in their attendance. (Head of Training and Development)

The Strategic Resourcing Manager also commented on the likely impact on recruitment and retention of having a company who is willing to sponsor and employ the right students:

...And hopefully it will help them in ... their ability to find the right people because if you've got – take one person with two scenarios, one in to do the full-time course and they're building up a huge debt, they may well drop out half way through because they can't afford to do it anymore if on the other hand, the university has pushed them

towards EDF Energy and we are paying their fees and they are working at the same time, the likelihood of them finishing the degree course has got to be higher, I would have thought so I think it is a case of a win, win situation. (Strategic Resourcing Manager)

The Technical Adviser suggested a benefit as being the links that have developed between EDF and the university and the fact that the university can deliver the FdEng part of the EDP and so reduce the amount of time taken up by staff at EDF:

I'm sure the lecturers are well qualified and well capable to deliver these modules as well as having strong links between London South Bank University and EDF Energy such as having regular meetings so the both sides will gain the benefit...

...within the company there might be individuals to deliver these programmes but they've got other duties to carry out therefore you could ... pass that duty to London South Bank University at least delivering the academic input for trainees (Technical Adviser)

It is anticipated that the students who have been on the programme should be sort after within the company:

... because the pedigree for them is more that they have been on the Engineering Development Programme more so either than HNC or Foundation degree it's the fact they've been on this programme so you know, people should be very keen to have them out at the other side. (Head of Training and Development)

This 'pedigree' seems likely also to have an impact on the reputation of the FdEng and on it's profile within the company.

All those spoken to at EDF about the connection between the EDP and the FdEng were very positive:

... it's a case of a win win and we know that there is something in it for them and there is something in it for us. In my simple little mind that's what employer/university links should do really – working together. (Strategic Resourcing Manager)

...it's just been very, very interesting to see such a really good degree programme result from that. (Head of Training and Development)

...would we go to South Bank University again if we set up another engineering development programme the answer would be yes (Technical Adviser)

It is worth noting the considerable investment EDF are putting into the students on the EDP as these students are not able to contribute to the departments where they are on placements during the first year:

...This one obviously takes them off the job for two and a half years so it's a big investment in manpower. They are doing placements but

certainly for the first year of it they are not adding any value there; they are just observing or doing fairly minor things. For the final eighteen months they'll be contributing more – they'll be doing more real work but still, you know, I think there were thirteen or fourteen employees enlisted on this programme. Those people effectively not being productive for a year is quite a cost investment but it will be very good to have at the end of that. (Head of Training and Development)

RECRUITMENT

Changing profile of students anticipated on the FdEng

The Head of Training and Development suggested that wanting to engage with the local community, an understanding of the economic needs of the country and hopes for recruitment to the company had initially motivated their engagement with the FdEng and the LEP:

It was always you know, really good stuff that was coming out of the LEP and for the boroughs in London that were picked – absolutely the right thing to do both from the social needs and the economic needs of the country really so we were always completely supportive of the aims ...Originally we thought it would be a great recruitment route as well as supporting it for community kind of aims. We thought it would really help London to produce some home grown engineers that we'll be able to recruit (Head of Training and Development)

A real benefit that was hoped for the company was to help recruit a more London based workforce:

...when you think it's a win/win we need to – we need engineers who live in London. I mean not many of our workforce lives so close to the centre of London and we thought if we can actually recruit some engineers who have grown up through this London Engineering Project eventually, you know, flourished through the Foundation degree and they still want to live in Lambeth and so – they're already here and that's marvelous because the people we deploy in London probably live out in Essex or Surrey or further out – not in central London itself so we thought this is a real opportunity here (Head of Training and Development)

The Head of Training and Development initially saw the FdEng as a route for younger students who had engaged with LEP projects at school:

I suppose originally I imagined they'd come through the LEP route. I still hope some people will ... if there are some of the schools embarking on A Level programmes and things so I presumed a lot of them would be locals from the Lambeth and Southwark area. ... Originally when I was thinking of the project, yeah they'd come straight through the schools and hear about it 'cause that's how it was sold to us ... I thought some of them would then enroll onto the Foundation degree and take that as a route into the Bachelors programme (Head of Training and Development)

However, the development of the EDP at EDF has changed the profile of students on the FdEng to that initially anticipated. There is currently a diverse group of students on the EDP

We've got quite a big mixture in terms of their backgrounds both academic and work wise. I mean we've got one lad who actually comes from outside the company although his father works for the company, he's just done his A Levels so rather than go to university and stack up some horrendous debt he decided to join EDF Energy and do a degree at the same time... At the other end of the spectrum we've got a guy – I'm not sure how old he is – how old is Mark – about ...I think he's not far off fifty – I think he's about forty -nine. And he's been in our contracting side of the business ... he's been around the business for a long time but wanted a change (Strategic Resourcing Manager)

While the population of students on the EDP is diverse, there are specific groups that are being targeted by the EDP that are quite different to this initial expectation of the type of local younger student outlined by the Head of Training and Development.

Target groups for the EDP

The EDP currently has three target groups. The first target group is already in positions within the company but need up skilling. This need relates to safety issues within the company and the need to provide OFGEM with evidence of competence:

... there is a bit of a mop-up that we need to do with a selected number of these people that really have moved into those roles but they haven't perhaps got the academic qualification to back up their ability to do it; not to say that they're not capable of doing it but when we're having to prove things to organisations like OFGEM in order to regain our license to run the network for the next five years or whatever, we need to be able to prove the competencies of our staff and obviously academic qualifications is one of the ways we can prove that competence so we need to bring those people up to the right level to the outside world... (Strategic Resourcing Manager)

However, this route onto the EDP is envisaged to be 'a time limited route' as there are a finite number of people in this position.

The EDP provides a 'middle level' route into engineering that fits between the apprenticeship route and graduate route. The second identified target group are people that are viewed as having potential that have joined the company on apprenticeships:

...it's a career progression for people to come off the tools – like joiners, fitters, linesmen – like what we call the craft grades ... – to move them up from those craft grades to the engineering grades. (Strategic Resourcing)

PW: They would have ordinarily done our Apprenticeship Programme maybe several years ago but they would have done the Apprenticeship Programme and worked on the tools for a number of years but it's a case of doing a bit talent spotting amongst that group. (Strategic Resourcing Manager)

This group can apply to the course independently or are nominated by senior managers. The future intention is to identify people while they are on their apprenticeship programmes and tracking them:

...so we'll start to be spotting the talent while they are doing their apprenticeship programme and then just sort of tracking them into their craft roles and saying : right, okay in a couple of years time you might want to think about..." and just keeping an eye on them (Strategic Resourcing Manager)

The final group that is targeted by the programme is people from outside the company. This is the most important target group and it is hoped will form between 50% and 70% (aiming more towards 60% - 70%) of the intake for the programme in 2009:

...and then there is the people from outside the company and that's the real key really because, Natalie has heard this before but if we just bring people up from the craft group all we are doing is moving the deck chairs round on the ship. (Strategic Resourcing Manager)

Age, commitment and qualifications

During discussions about the type of student it was hoped would be recruited to the EDP, it was clear that this does not relate clearly to the type of student the Head of Training and Development initially outlined as being recruited to the FdEng from the LEP pool of schools. The Strategic Resourcing Manager and her colleague expressed some reservations about recruiting school leavers to the EDP, hoping to recruit, instead, people with more background in engineering:

...we need people with commitment to see this through. (Strategic Resourcing Manager)

As we've mentioned these long days, these placements away from home some of the time and long days on the placements they need to be 100% committed. (Strategic Resourcing)

And generally speaking that commitment comes with age. That's just the way it happens.... there are a number of things that you need to look at. You need to look at their background and that's why picking the eighteen year olds right out of school is a difficult thing to do because they haven't got much of a background... (Strategic Resourcing Manager)

Finding people with the commitment to see the programme through was identified as being essential and also beneficial to LSBU in terms retention on the programme:

PW: That will hopefully help the university as well because it is obviously important for us but it is important for the university to have committed people, particularly if they are going to be doing long days. You don't want people who just turn up for the morning session and then push off – not that many of our people would

However, all those spoken to were keen to be flexible in their approach to recruitment to the EDP and to identify people who were most suitable regardless of their background:

I think you've got to be very flexible with what people bring to you and what they can make of the things that are on offer. If somebody is willing to take on any other forms of study, really, that tells me that is somebody who is willing to learn and adapt and those kind of people are always employable because they are flexible, they'll put themselves out a bit and they are showing a commitment (Head of Training and Development)

It is interesting to note that a number of people on the EDP, including two of the students recruited to the programme through LSBU, already have degrees in related disciplines such as maths and mechanical engineering.

Marketing

LSBU's role in recruitment to the EDP from outside the company was widely discussed. The Head of Training and Development expressed a desire to know how those students had heard about the FdEng in the first instance but had been unable to acquire this information from the university:

... I wonder about how the university market the programme 'cause I was curious to know, the people who have come forward on it – how had they heard about it but they weren't able to answer that question, when I asked South Bank.

Everyone spoken to was happy with LSBU's contribution, indeed it had been hoped that the university would provide larger numbers of external students:

...one of the options actually whether the London South Bank University would bring more talent, young people into sector but the first year mainly was internal staff so it wasn't really our intention. Our intention was to bring a fresh blood into sector, externally so I hope this year will happen... (Technical Adviser)

There was, however, no expectation that LSBU would be the only source of appropriate people external to the company. Various marketing strategies were discussed that were to be used to recruit for the EDP. One was approaching a range of colleges that run the ONC and HNC as it was viewed that students enrolled full time on these courses may well not already be attached to companies:

... And we're also going to be talking to other colleges – FE colleges as well who run ONCs in electrical engineering because people doing ONCs may well not be attached to companies. We're doing the same

sort of thing with the colleges that we are developing links with; the same – would you talk to your students who aren't attached to a company and see whether they are interested ... (Strategic Resourcing Manager)

Another approach taken by EDF was to advertise in local newspapers and in related technical magazines:

Yes – that's the main intention – advertising into probably related technical magazines such as IET, local press vacancies, you know, we are looking for engineering candidates and so on (Technical Adviser)

BENEFITS OF FdEng OVER OTHER COURSES

A clear problem for EDF has been recruiting people who are already appropriately qualified at the HNC level. It was explained that if people had those qualifications they were always already employed because of the shortage of electrical engineers:

... going out to the market place to try and find those people who have got the qualification in their pocket – that's very hard to do. You really don't find many. If they've studied that sort of course they're normally using it in the industry already or they've got a higher level qualification and they're perhaps working in banking or consulting or something like that so it's not the kind of qualification normally that is not readily employable ... you're never out of a job, I mean we just haven't got enough electrical engineers to go round (Head of Training and Development)

A range of qualifications were identified as being useful to the company:

The apprenticeship is a City & Guilds so anything from a level two qualification in engineering upwards is useful to us. If it's an L2 in a different discipline of engineering then we'll try and convert people across. People who have learned some trade elsewhere and are good with their hands, good with tools are valuable... Anything that is an engineering qualification, however, and is linked to power makes it even more valuable so hence the relevant City & Guilds or the ONC/HNC ... are instantly useable. (Head of Training and Development)

However, in terms of appropriate qualifications for employees and potential employees at EDF Networks Branch generally, a number of problems were outlined with existing provision before the development of the FdEng. The Strategic Resourcing Manager identified a problem in actually finding HNCs with a specifically electrical engineering focus, as many have a shared focus with electronics which is of little relevance:

...generally speaking, it's quite difficult to find electrical engineering HNCs; they tend to be electrical and electronic and obviously the electronic bit is not an awful lot of use to us because we are talking megavolts whereas electronics is teeny stuff.

The Head of Training and Development was critical of previous training approaches that had been tried. Her view was that the distance learning approach taken with the HNC programme had been relatively unsuccessful and that students needed more face to face support:

...I'm not convinced that distance learning is really the best way for most people to be studying for a higher level qualification... we didn't really support it being entirely distance learning. Obviously on a part-time programme you've got a lot of homework and things in between but at least every Tuesday they are back together as a group, with the lecturers face to face, have their tutorials ... for the HNC provision we've had an external provider; students working by distance learning and every now and again the provider comes to do some work but I've not been very pleased and neither have the students with the quality (Head of Training and Development)

The Technical Adviser particularly discussed the lack of specificity of the HNC and ONC qualifications. He identified these qualifications as lacking relevance to application for part time students who were already working at EDF:

...going HNC or ONC really doesn't give a specific outcome that we are looking for. ... I mean, what is the point spending a number of years – because don't forget these employees of EDF Energy are going and attending this on a part time basis therefore it is quite a long time to complete ONC or HNC – it took them three, four or five years but what's the point spending four or five years and the money into a qualification which will not be applied in the future within EDF Energy which deals with the power distribution side of it (Technical Adviser)

While it is 'too early to tell', there was considerable optimism about the effectiveness of the FdEng as a training route. The Head of Training and Development pointed to the 'academic rigor' of the qualification and how this will be appreciated in the work place:

...What I do know from the South Bank degree, because I was at the validation panel meeting, the panel did feel it was very high level for a Foundation degree; they almost thought elements of it were closer to Bachelors – very rigorous academically so I suspect that when the business does have the Foundation degree graduates back in the business it will probably see that there is a higher level of understanding (Head of Training and Development)

The Technical Adviser talked about how he, with LSBU, had designed modules for the course that have specific relevance and application for employees. He identified this more specific course content as being of much greater value for employees than and HNC or ONC that merely qualify them to work for the company but do not contribute to their 'competence' within the workplace:

...the specific modules I set up with London South Bank are Distribution systems A, Distribution systems B, Electrical Plant, Network information systems, Network management, Work based

projects for foundation degree and then finally Working in power distribution but they are very relevant modules which would benefit both employees and employers by letting gain the related qualification but also it will give up opportunity to individuals within EDF Energy at that point to understand thoroughly so that they know what they are doing and why they are doing it for. In other words, they will gain the competence solidly so we need to – that's what I said you know, ONC and HNC is fine but if I'm not going to apply into my future role it will just be a stepping stone and I will never use it again. Now, that's not what we want. We want a specific course – that's what I set up with these modules. (Technical Adviser)

There appeared to be less coherence in terms of the vision held by interviewees for the future of qualifications for employees. The Head of Training and Development appeared to view the FdEng as part of a jigsaw of qualifications that the Networks Branch could use within the company. She was less critical of the HNC as a qualification for employees, describing it as a 'tried and tested bench mark for field engineers' that 'has served very well'. However, the Technical Adviser appeared to see the FdEng as being more significant. He mentioned another foundation degree run by Aston with a focus on power generation. His view appeared to be that qualifications with specific sector relevance should be developed and are the most valuable way forward for EDF and other companies in the UK. He talked about the FdEng in Power Distribution as being the first of its kind in the UK:

We've done the first in the UK never mind in London so it was the first programme we created for a specific sector, which is power distribution. Power distribution applies into all other distribution network operators. DNOs are not in London – all over the UK (Technical Adviser)

His view for the future of qualifications for the sector included a nationally recognised qualification that would be valued by all DNOs across the country. He suggested that this is vital for the competence of employees:

Power distribution applies into all other distribution network operators. DNOs are not in London – all over the UK therefore the qualification or recognition of qualification is crucial to apply into required areas with competence level because if you haven't got the competence then how would you do your job? You might have an ONC or HNC but that doesn't necessarily give you the competence. (Technical Adviser)

The Technical Adviser suggested that the FdEng as a qualification, because of it's specific relevance to work in the sector, would be viewed more positively by other DNOs in the country than other more general qualifications:

...any company look at – any DNO for example, they could say oh they done the foundation degree in Power Distribution – it's more relevant than HNC. That's what you need to look at. Yes – the answer is yes to your question. It could be both will be a part of the engineering development programme, which gets the benefit out of it in any case, but also it could be used as some sort of qualificalational accreditation –

why not – because it is more focused on power distribution.... let's assume you are sitting in the HR desk – someone is sending CVs; say you've got two CVs sitting in front of you, one says they've got a HNC in Electrical Engineering, one says they've got a foundation degree in Power Distribution company and you are working for power distribution operators, which one would you prefer? I would prefer the foundation degree – at least it is relevant (Technical Adviser)

VIEWS OF THE COURSE PROVISION

The view amongst all interviewees was that the relationship with LSBU was effective and beneficial. This endorsement has been illustrated by the company's decision to use the FdEng as a central part of the new Engineering Development programme, which is to run for the next 5 years. Though there are very few students in the second year of the programme, the Head of Training and Development explained how feedback she had about the course was 'very positive'. She also described how one employee in the second year had moved jobs within the company as a result of doing the course and was now working in power engineering in a position where there is a real shortage of qualified people:

This particular chap was working in our Power Link division, which is the organisation that powers the London Underground and he 'd done this Foundation degree for a year and he made a move in the middle of the first year He's now in a field-engineering role, which means he's out there in the open with the Distribution Network where we desperately need people. (Head of Training and Development)

There were also positive comments about the lecturers at LSBU and their flexibility in working with the company and students:

...And with some of them it's a long time since they did any studying and I know that some of them certainly struggled with the maths in the first – before Christmas and ...was really good and he and ... have sorted out a sort of extra maths tutorials for those guys who were struggling with the maths (Strategic Resourcing Manager)

The efficiency of communication from the university was also commented on and valued:

... I mean they've always kept us informed of when they're planning to do exams and tests and things so we can let people know. (Strategic Resourcing)

Yeah because that's obviously important having as much notice as we can of things like exam days because we need to make sure that the business is aware of that particularly for the trainees because they are obviously on a programme so if we can let the placement co-coordinators understand when those days are they are going to be out of the business then the earlier we can do that the better (Strategic Resourcing Manager)

Issues raised

However a number of issues were raised about the way the programme has run so far this year.

Length of the day

One key area of concern is the length of the day that the students are expected to attend at the university. All those spoken to aired this concern:

The guys just feel that the day is too long and I think the university need to look at that because you know, students are customers and if they are saying it is too long then perhaps they have not got the structure quite right. (Head of Training and Development)

The fact that many of the students do not live in London and have to commute, in some cases for over 2 hours, to and from the university contributed to this concern. The Head of Training and Development also viewed this as likely to have a negative impact on their performance at work the following day:

...they do a long day; it's nine till nine the day they do and if you've got a long train journey at either end of that, that's a pretty exhausting day. I think the next day they're not very energetic at all because they've done (Head of Training and Development)

It was also suggested that this was particularly difficult for people who have families and commitments outside work; especially when, if they are on the EDP, they are expected to be on placements early the next morning:

Yes they could be really late home on the Tuesday after a brain numbing day and then they're up quite early for work the next day in the field because if they're going out on a field placement they'll probably expect them there no later than eight thirty, probably eight on the job. That's not the easiest thing and if you've got a family, and these guys – the majority of them are twenties and thirties, their families could be quite young and you have to think about the practicalities of these things don't you? (Head of Training and Development)

The Head of Training and Development expressed the view that the EDP should be designed to enable students to be successful; she felt that academic success for the students was likely to be important to them in terms of their personal sense of achievement:

I think you have to set things up with giving people the best chance of success ...you really want them to do well on the academic part of it because that's where they'll take a great deal of - you know, they'll get personal satisfaction and sense of achievement from that so you really do want them to do well (Head of Training and Development)

A further concern expressed was that there was so little time off during that day:

... there's only two very short breaks in that whole day and it's constant which I think I would find tough...I think you get two twenty minute breaks or something stupid during the whole day; now, for anybody to concentrate that long... (Strategic Resourcing Manager)

A number of ways of resolving this issue were discussed. One was that the university should adapt the timetable and organise the course over two days rather than one.

... I mean timetable wise, you know I don't know whether it is possible and obviously it's a discussion we'd have to have with the university to see whether they could do it on a two day a week, you know, if we provided them with enough students each year. (Strategic Resourcing Manager)

It was also suggested that the course could be longer, enabling the length of the days to be cut:

... or you say the days are shorter – it's over three and a half years or three years instead of two and a half and make it longer. (Strategic Resourcing Manager)

Another way forward discussed was to move students on the EDP to the full time FdEng programme timetabled over three days a week. The Strategic Resourcing Manager suggested that this would have the further benefit of enabling them to better embed the knowledge they are acquiring; particularly in maths with which some students are currently struggling:

I think, as I understand it the full-time is three days at the university a week which, you know, may be an option that we might want to look at... And that runs over two years rather than two and a half years... some of them certainly struggled with the maths in the first ...if you can't grasp the maths it makes the engineering side of it difficult as well so it is the sort of fundamental stuff. So giving them more time to assimilate the information that they are getting may be better all round. (Strategic Resourcing Manager)

This view that there is a need to allow students time to embed their knowledge was echoed by the Head of Training and Development:

I didn't design the Engineering Development Programme – if I had I wouldn't have had them working four full days and the long day, I would have given them at least a half day or maybe even one day a week they didn't travel anywhere – they stayed at home and tried to embed their learning or did their studies – I would have only had them at work three days but I am probably a bit soft. (Head of Training and Development)

This would, however, mean altering the EDP itself and the number of placements for students, though this was seen as possible and preferable if the outcome is that students are more successful on the programme:

... Obviously we'd need to completely re-jig it and you know, because it's a pilot it's not set in stone and we want to be flexible and we want to make it so that people can actually achieve it rather than make it so difficult that nobody ever does. (Strategic Resourcing Manager)

... it would shorten the Engineer Development Programme by a little while; they probably wouldn't get as much time on the placements but I think in terms of their work/life balance it would be more manageable for them. (Head of Training and Development)

Numbers in lectures

There was a suggestion that the university had not anticipated the numbers of students on the programme and so there were some problems over room and seating arrangements

...they had more people this year than last year – the university so I think it was... (Strategic Resourcing)

On one of the early sessions there was a punch up about chairs because somebody sat on somebody's chair and it ended up with a bit of a to do so I think there was a few issues like that but that was teething problems at the beginning of the year and I think that's sort of sorted itself out. (Strategic Resourcing Manager)

Industrial Studies

The Industrial Studies course had also caused some consternation to students. Some students were identified as exempt through APL; however, there was some concern that this had not been systematically organised and so some students, who were clearly overqualified, had to complete a module that was of little use to them:

The thing is some of these guys have been supervisors and stuff so they are obviously going to know how to write business e-mails or whatever or any of them would know how to write a business e-mail, pretty much so it seemed a bit of a sort of waste of time. Some of them got exempt from it – what's it called – APL – accredited prior learning – some of them got that then some of them applied for it and then their forms got lost ...(Strategic Resourcing)

It was suggested that there should be a test at the start of the year to ensure that only the students who are identified as needing to complete the module should be asked to undertake it:

I think a way possibly around that might be to give them some sort of test before they start on the course. ...for the university's planning as much as anything it might be beneficial for them to think about some sort of test for these people before hand so that they can actually work out who needs it and who doesn't. That was a bit of an issue (Strategic Resourcing Manager)

Work Based Placements

Another issue that has affected the smooth running of the programme has been the delays in the running of the work based placements. The Head of Training and Development identified this as being a problem rooted at EDF:

The other thing is really on our side that we are a little bit late with some of the work-based elements that the guys need to come and do and that's simply because I've got a huge shortage of resources in house and some of the things they need at the moment I haven't got anybody to teach them so we're trying to find a way round that. (Head of Training and Development)

The recent accidents (four people have been killed in the last two years) at EDF has led to an increased impetus within the company to ensure that all staff are appropriately trained and as the accidents occurred in different areas within the company, this has had wide ranging repercussions:

...because it was totally different parts of the workforce the training charts had to be boosted everywhere which has just made the demand on my resources extremely hard. (Head of Training and Development)

This has meant that the demand made on training centres is much greater than anticipated and so has made it difficult for the company to meet the agreed input for the work related learning components of the course:

... even though I run the training centres and all that it is so hard to get anybody on any courses of any description so a lot of the things that we want to be able to put on for the university, to fit them in, in the time frame – they will come along at some stage but it is probably going to be quite hard to fit them in exactly where they should be (Head of Training and Development)

This problem is compounded by the increased preoccupation with safety as a result of the accidents, with departments being reluctant to allow trainees access:

... the climate, since these people were killed, is so tight on safety; it's not always the easiest thing to bring unqualified people in for experience in the workplace. Some people are very loath to have them because they feel it's risky but it's only a question of finding the right activity. (Head of Training and Development)

Being involved in training is also time consuming for people in the workplace; this coupled with the difficulty of accessing the training centres has been problematic for the work based placements:

I can see there might be some sort of difficulty such as the staff will be spending their valuable time into these guys - valuable training programmes because I mean, we've got a training centre but training centre does not necessarily deliver for foundation degree programme only and will be for the other programmes so fitting in their programme – have they got available time and resources and so on. (Technical Adviser)

The model currently running at Aston was discussed as in this model the work based elements of the course are delivered at the college. However, the Head of Training and Development suggested that the emphasis on 'handicraft elements' that resulted from this approach would be inappropriate for students on the FdEng:

I know at Aston, when it comes to work-based learning what they actually do is they go to college and do more hands on stuff. They have a partnership with Walsall College. We don't do any of that; our Engineering Development Programme and our Foundation degree students – we're not giving them any of the craft sort of stuff. It's almost like the Aston Foundation degree – they're getting some of the handicraft elements as well but we don't think that is appropriate because they're not going to be working in those kind of areas but that's the model that they've gone for so that's how they get round the work-based learning; they don't actually go to the workplace they go to college. (Head of Training and Development)

The Head of Training and Development expressed confidence that the problems could be resolved without changing the course:

...We just need a bit of a look at it and we will find something that is not dangerous or risky to do and doesn't perhaps involve the training centres but when I was scoping it, those were the sorts of things that came to mind. I've now got a wider team who I think can put a bit more thought round that and we'll come up with something perhaps more creative and we'll get round that (Head of Training and Development)

Moving to the full time FdEng programme for those on the EDP was also discussed as a way of cutting back on the immediate need for placements for those students within the company.

POTENTIAL DEVELOPMENTS

Embedding the programme/ progression

There were some differences of opinion in relation to how best to embed the programme. The Technical Adviser was concerned that the FdEng would not become established as a valued programme:

...we don't want to end up with a useless degree which will end up with a QUANGO and investing in them doing nothing so this is a key point... (Technical Adviser)

To ensure that this does not happen, he was keen to see the programme developed nationally. Energy and Utility Skills are currently asking for expressions of interest in creating an employer led National Skills Academy (NSA) and the Technical Adviser viewed this as an opportunity to develop the FdEng nationally. He suggested that the RAE could have a role this development:

That is why I said I personally believe – this is my personal belief that the Royal Academy of Engineering could benefit having a link between

Energy Utility Skills and taking, if necessary or if it applies, to have some sort of joint working group to create whatever they want to create but make sure it won't be a QUANGO.... (Technical Adviser)

It was also suggested that this would beneficially coincide with the LEP's progression to a national programme:

Now the reason I did mention Energy Utility Skills in addition to the RAE – they are talking about a national project rather than just a London project – I personally believe there could be a good idea from RAE to contact the energy utilities, whether there is any work going on or whether there could be some sort of a joint or common group- it being RAE and Energy Utility Skills because that is the main intention isn't it really? Alright you started with the London projects but really RAE is intending to putting it as a national project... (Technical Adviser)

The Technical Adviser went on to suggest that the whole model that appears to be working so successfully for LSBU and EDF could be taken and developed in other engineering sectors so that other sectors are encouraged to develop a programme similar to the EDP:

The next question RAE could ask themselves is could we then apply this to other engineering sectors? Could we set up some sort of scheme – the colleges or universities would deliver the programme but also engineering development programme is a good point – the order of inputs into programme such as delivering their skills into business but I mean EDF is the first one, engineering development programme. The Royal Academy of Engineering might ask other blue chip companies; are they willing to take a brave action or decision which will follow the EDF Energy's lead... (Technical Adviser)

However, the Head of Training and Development was less enthusiastic about acquiring National Accreditation for the FdEng. She suggested that there was no need for national accreditation as the FdEng is already a recognized qualification in it's own right:

I can't see any value in that, to be honest. I mean the foundation degree is a qualification in it's own right. (Head of Training and Development)

She suggested that the sort of homogenization that would take place from the development of the sort of template for foundation degrees outlined by EU Skills may result in a compromise in terms of the content of the course that would be less satisfactory for EDF:

...what Energy and Utility Skills has been trying to do is have a template for Foundation degrees ... I can't say that I am completely in favour of that because I am very happy with what we have got at South Bank. Other companies have already developed one with Aston University a year or so ahead of ours and I'm not always in favour of everything being homogenised because the compromise solution

always means someone is unhappy with it.... (Head of Training and Development)

It was also suggested that universities would not be keen to be constrained in this way in terms of the content of the course:

...with the Foundation degree, I have resisted a little bit this shoe horning into one pattern. I don't think academia would welcome being told exactly how to formulate a degree programme. They wouldn't want that for Bachelors; they wouldn't want it for Masters; why would they accept it for a Foundation degree? I mean universities play to their strengths; they are all unique so I am not sure it would be quite right. You know, I support principles of things being pegged and level but I think you still need a bit of freedom to shape them and make them individual in different places. (Head of Training and Development)

The Head of Training and Development was, however, interested in the possibilities for progression for students on the FdEng. She expressed some enthusiasm for students who have acquired the FdEng to progress to Bachelors degrees:

...we are very keen that people will have the chance to go on from the FD on to the Bachelors- we would really like them to progress from there (Head of Training and Development)

This was identified as a real Widening Participation benefit of the FdEng as it provides students who do not have the qualifications traditionally recognized by universities for their Bachelors courses, the opportunity to acquire this level of qualification:

...which is another real advantage of the Foundation Degree because by no means have these people got A Levels and the traditional route into university would have meant really that they had to have those A Levels so I think it is a superb initiative – the Foundation degree. (Head of Training and Development)

Need to for replication/ further provision

An immediate need for EDF appeared to be to identify another foundation degree or another programme such as the HNC, that would enable their workers who live too far north and south of London to attend the course at LSBU to train to a similar academic level:

...we are certainly now looking for an equivalent foundation degree project in areas further away from London because it's not practical to have everyone travelling to South Bank. You know we've got people in Norwich and down the Sussex coast. (Head of Training and Development)

There appeared to be some problems with locating suitable HEIs to deliver such a programme in that there are not many institutions and those that exist are not known for delivering engineering courses:

... has been to talk to a college in Suffolk – I can't remember the name – it might be West Suffolk ... but we're not blessed with too many universities in the south east of England. There's Kent and then as you get into London there's obviously quite a few there but from north of Canterbury you haven't got too many or on the east coast and the eastern counties - Cambridge being the obvious exception and then you've got Anglia Ruskin and – I think University of East Anglia but there's not that many...our geographical footprint – where our people work; there is a university in Bedford – it's Bedfordshire University; I've not spoken to them but I don't tend to equate them with being strong in engineering; I could be wrong but they've never come onto my radar with engineering (Head of Training and Development)

However, it was explained that one student on the EDP had already started an HNC at Bedford and was completing the course there, as it was better placed geographically for him as he lives in Cambridge. It was suggested that Bedford may be a suitable HEI for the EDF to work with:

We've got eighteen people on the programme, fifteen of which do the foundation degree here at London South Bank. One is finishing off an HNC that he had already started at Bedford College and he lives in Bedford so it made sense for him to continue to finish that but Bedford is a place that we may well look for – you know somebody who lives in Cambridge, it's going to be easier for them to get to Bedford or Peterborough than it is for them to get into this part of London (Strategic Resourcing Manager)

Both the Head of Training and Development and the Strategic Resourcing Manager discussed not wanting to 'go down the correspondence route'. Concern was also expressed over the idea of FE colleges delivering HE level courses; suspecting that the quality of teaching may not be as high:

(re. college in Suffolk) I'm not sure how I feel about that one; they are backed by one of the universities in the east, I can't remember which. There's something that rankles with me; I always think any kind of degree should be from a university not from a college because I think fundamentally there is a difference between the people employed by a college and those that are lecturers employed by a university but that's probably just a snobbish academic kind of a view but I do think there is a difference (Head of Training and Development)

The Strategic Resourcing Manager explained that EDF's input into the course at a new HEI would be dependent on how many people they were expecting to put through the programme.

... if we were just putting one or two people through to expect the college or university to actually change things radically just for us, for one or two people, it would be unrealistic of us

The ambition within the next few years, however, was clearly to find a centre north of London where a course could be tailored to suit the needs of EDF:

With the HNCs I think we would want to have some input. If we are putting a substantial number of people through ... if we were planning on having say thirty-six people on next years intake, in five years time that could be fifty... we've got four hubs – we've got one based in Maidstone, one based in Bidder Street in London, West Ham, one based in Potters Bar and one based in Bury St. Edmunds. So if you take the Bury St. Edmunds lot they cover that part of Suffolk and Norfolk – a big chunk of the country ...we'll be looking for some sort of place up around there to be putting ten or twelve people through; that's when we'll be looking to perhaps talk to a local provider to get them to perhaps tailor what they do already to meet some of our needs – in the same way as we talked to London South Bank a few years ago but I wouldn't want London South Bank to think that we are moving our attention somewhere else because we are not. We just need more of it...Our relationship with London South Bank has worked. It seems to be providing what we want so why not replicate that in other parts.
(Strategic Resourcing Manager)

However, it was also suggested that a possibility for the future would be to have lecturers in house who could deliver courses such as the HNC and City and Guilds. The Head of Training and Development suggested that this would be a more cost effective model:

We use ONC and HNC courses; ONCs tend to be at local colleges – that's probably not too bad but for the HNC provision ...you know a lecturer that has actually got that electrical engineering background to be able to tailor it a little bit and you know, something in the wider geographical footprint plus for their City & Guilds courses I would love to have somebody in house who taught all those sorts of things for us because we will completely support getting all the underpinning knowledge but it's become so expensive; when you pay for literally hundreds of individuals you start to think it probably would be more cost effective to have a ...well, you know the corporate university is very popular – we have one for EDF but it's based in France and it's management development rather than engineering. (Head of Training and Development)

Having lecturers in house would solve the current geographical problem as the lecturer could travel to Bury St Edmunds rather than the students. The Head of Training and Development discussed the possibility of working with LSBU to develop such a way forward:

...The other thing we would obviously support although you wouldn't have the same practicalities with the, sort of, labs and things like that is the universities taking the programmes out to companies so you know, if South Bank was so equipped with a lecturer who could come to us to teach the day so that I could have all the people that work in East Anglia perhaps go to the office in Bury St. Edmunds and do their studies there whatever day of the week it was rather than this huge train journey down to London ... I am actually very strongly toying with

the idea of employing, in house, a teacher of engineering (Head of Training and Development)

Summary

EDP & FdEng

- Independent of the FdEng the EDP had been set up for a range of reasons including improving competence and safety and to recruit and train people in shortage areas. The FdEng was integrated into the EDP as it was at an appropriate level and relevant in content.
- EDF staff viewed the integration of the FdEng into the EDP as beneficial for both the university and the company. LSBU delivering this as part of the EDP reduces the amount of time taken up with training by EDF staff. EDF staff expressed high hopes about the positive outcome of the course for the company in terms of staff competence, understanding of the company and ability to work at a higher level.

Recruitment

- It was initially hoped that the FdEng would help to recruit a more London based workforce for EDF and was initially seen to be a route for younger students who had engaged with LEP projects in schools. However the development of the EDP has changed this focus: the aim is to target three specific groups. Internal to the company are those already in positions that need to up skill; another group is those with potential who have come through the apprenticeship route. The most important target group is people from outside the company who it is hoped will constitute up to 70% of the intake to the EDP in 2009. This external group is viewed as preferably having a background in engineering rather than being school leavers.
- While it was hoped that LSBU would recruit a fresh pool of potential external candidates for EDF, this is not seen as vital. EDF staff discussed various marketing strategies that were to be put in place to recruit appropriate students to the EDP.

FdEng vs other courses

- A number of problems were outlined with available qualifications before the development of the FdEng. One issue is that HNCs in electrical engineering are difficult to find. Distance learning was viewed as unsuccessful. HNC and ONC qualifications were also identified as lacking relevance for students already working at EDF. A key difference hoped for graduates of the FdEng was that the course will have contributed to their competence in the workplace.
- The FdEng was viewed by one member of staff as a useful addition to the range of courses already available. However, another member of staff viewed the FdEng as so much more relevant to the sector that it should be developed across the UK for all DNOs.

Views of the course provision

- The course was viewed very positively by staff who commented on the flexibility of the lecturers at LSBU and the efficiency of communication between the university and the company.
- Some issues were identified with the course. A key area of concern is the length of the day for part time students on the course and the lack breaks within the day. However the resolution of these concerns appeared to rest with EDF as well as with LSBU and various ways forward were discussed: there appears to be potential for the programme to span over two days; for the programme to extend over a longer period of time or for students on the EDP to be enrolled on the 3 day a week full time programme.
- The numbers of students in some lectures were identified to have caused some problems at the start of the year.
- The Industrial Studies course was discussed: it was felt that APL should be more consistently awarded to students.
- Work based placements were identified as a problem though one that was rooted at EDF. The work based learning had not yet been undertaken by students on the FdEng because of the demands for training within the company. However, the Head of Training and Development was confident that these problems could be resolved.

Potential Developments

- It was suggested that the FdEng could acquire national accreditation as part of the Energy and Utility Skills' National Skills Academy. However, there were reservations about this as a way forward with one member of staff suggesting this approach could compromise the content of the course.
- Interest was expressed in students, successful on the FdEng, progressing onto Bachelors degrees.
- EDF are keen to identify another provider north of London to deliver a similar programme to their staff; Bedford was mentioned as a possible HEI.
- A further future possibility for the company is to have lecturers in house to deliver programmes as this would counter the problem of employees having to travel to different HEIs. The possibility of working with LSBU to develop this was discussed.

Students' perspectives

Contributors

3 focus groups were held with different groups of students on the FdEng:

focus group 1: 8 part time students on the EDP who were existing staff with EDF

focus group 2: 3 part time students on the EDP recruited through the university

focus group 3: 7 part time students who were not part of the EDP (most of whom worked for EDF)

MOTIVATIONS FOR JOINING THE COURSE

The three students on the EDP who applied to LSBU directly and the group of part time students who are not part of the EDP all applied for the FdEng independently. A range of reasons was identified for their decisions. Common to several students spoken to, was that they had decided to start a course at the FD/HND level and had identified the FdEng as the most appropriate course available. All these students were being funded through the course by their employers.

The three students recruited to the EDP through the university had all decided, before discovering the course, that they wanted to work in a high voltage electrical context and so were actively looking for courses that would enable them to progress into a career in this area:

I finished my City & Guilds electrical papers and then I wanted to pursue more electrical knowledge theory to a higher level and that's why I have approached South Bank ... I think it was another university or college up in Falkirk in Scotland and I was seriously considering moving there and it was such a relief to find that there was a university in London that was doing Power Distribution....I really wanted to get into the distribution, transmission and generation, higher voltage electrical field as opposed to domestic, commercial or industrial. (EDP new recruit)

Two of the students in this group had already acquired high level qualifications in related subjects but had found that these qualifications were not directly transferable to the UK context:

I got a degree from my country in power engineering...in Romania – but I did not have the opportunity to work in the field. I work for railways and then I came in London ... I found it difficult to find a job as engineer and then I was thinking to attend a master course and I went on LSBU website and I found this course – Power Engineering and I e-mailed ... and asked him, you know, I have a degree, do you think this course is suitable for me to improve my knowledge and get a job (EDP new recruit)

One student had completed a City and Guilds qualification in order to be able to work as an electrician, even though, again, this had been a retrograde step in terms of the level of qualification attained:

...in Italy I did a Bachelor in electro technology. ... When I came over here to find a job they said to me you need to conform with the standard so basically my course was fine to go to university but not to work as an electrician so I had to go back and do the City & Guilds again so it was basically a step back. (EDP new recruit)

He suggested that there are other people in similar positions to himself on City and Guilds courses, who are interested in working with electricity but have found very few relevant courses:

...if you want external you should contact the college they are doing the City & Guilds. You got a lot of people who are sitting here because they are forced to do the City & Guilds. You are forced to do it because there is no other qualification in this country that allows you to work as an electrical person ... Then if you do university the only way there is electronic – a lot of electronic and stuff like that or environment but nothing really specific to electric... someone who has got an engineering mind for electrical is forced to go to a City & Guilds (EDP new recruit)

For some of the students not on the EDP, the decision to embark on the FdEng was motivated initially by a line manager who identified the need for further training. However, it was the students themselves who identified the FdEng as being an appropriate course:

I ended up as a Project Manager for a programme in London but I come from an LV background so to me that was all new so they said do an HNC but HNC is a very electronics bias and it wasn't relevant at all so again, I looked online and found an HNC here 'cause they wanted me to do it anyway, spoke to ... and ... suggested this course also and it was far more relevant to what I am doing so I thought yeah, there's no choice to make, I'll do that. (pt FdEng)

In a couple of instances, line managers had specifically recommended the course to employees:

I think with me it was a slight difference because I was approached by my manager... and because I am working in that direction – I am a trainee at the moment, trainee fault engineer doing switching so he wanted to know from me if really I would be interested in joining into his course because it would give me overall network exposure and it's a very good course and it's been recommended as well by my colleagues at work. I don't know how they found out but they told me, because I was going to go to Dagenham to do the HNC there but I was advised that this would be more appropriate to come and do this course here ...and I am happy the way things are going so far. (pt FdEng)

It was evident from one account that the input from the Technical Adviser at EDF Networks Branch led one student's manager to believe that the course would be useful:

... he turned round and said well he's our head of technical ... he was more than happy for me to come on this rather than an HNC or HND (pt FdEng)

It is worth noting that all the students spoken to talk about having initially identified the course online. However, it appeared to have been personal interaction with the Course Director that actually led them to decide to start the course:

It's being aware of it. I was quite lucky, I actually saw that the Power Distribution Foundation Degree online and that's what I approached him (the course director) about it so ... (pt FdEng)

...He's common to getting everyone on this so... he's also put us in the right direction; he's put us on to the course... this is the most relevant course for me for what I want to do. (pt FdEng)

Indeed, it was clear that the Course Director had gone to considerable lengths to facilitate students in starting the course; including meeting with people at short notice before the start of the course; responding immediately to emails enquiring about the course and even meeting one student every morning for several weeks until an identity card was produced to enable students to access the building.

I sent him an e-mail in the morning at eight o' clock when I got to work because I was talking about this course after I spoke to my manager and he said find out about it and in about three hours time I received a phone call from ... who said I've a letter from you; do you want to see me? I'm available today so I had an urgent appointment with him. The only hold up was me at work ... but ... was there, available for me. (pt FdEng)

My situation is similar. I applied last minute and if ... had not e-mailed me or got back to me it probably would have been here next year. (pt FdEng)

EDP

The students on the EDP, who were already working for EDF, had been recruited to the EDP rather than actively choosing to apply for the FdEng. However, the FdEng was identified as being an attractive part of the EDP and, in some cases, a reason for applying to join the programme:

For me this was the main lure for coming on the engineering development programme. It was the fact that we would get to come here to South Bank and do the foundation degree. The rest of it you would probably have got, you know, the experience, although not in such a structured way and certainly not as fast, you'd have got that

experience throughout your career so really as far as it will affect me personally, it's going to fast track my career. ...(EDP existing staff)

One student explained that having the FdEng qualification would allow him to access new roles within the company:

...there are already on our vacancy boards, jobs that state the requirement of the candidates to have that degree. If you've not got it they're not even going to look at your CV, in some cases. ...(EDP existing staff)

Another student explained how he had worked in the company for twenty years and had felt that he had no opportunity to progress further; gaining the qualification would allow him to move into different areas of the company:

... I'd hit a level where I couldn't really go any further ...and this has come up; you're sort of taking a sideways step and hopefully, sort of up, but it's completely new for me now because it's all about high voltage and power stuff and that...(EDP existing staff)

Another student's account suggested his motivation for gaining the qualification was to ensure his own competence and safety at work rather than secure career progression:

...but I personally want to be operational so I'm hoping that it will be quite relevant when you're out there because it isn't really career progression but keeping safe and people safe and the more knowledge about that really because start making mistakes and – you only make one really. (EDP existing staff)

There was also evident interest in progressing onto the BEng. For the two students on the EDP, who are new recruits to the company, successfully acquiring a place on the EDP had been an important factor in their decision to choose to embark on the FdEng. The EDP provides these students with an income and a position within a large company in a sector where they want to work. Though the income is less than that one of the students was earning independently before starting the course, he identified it as being 'enough to survive'. However the Course Leader explained that the drop in income that would result from joining the EDP had discouraged a few potential recruits to the programme.

FdEng VS OTHER PROGRAMMES

There was some discussion about the FdEng in comparison with other available programmes at a similar level. For the part time students, who had independently identified the course as something they wanted to do, the relevance of the course appeared to have been a key factor in their decision and something that they valued:

Student 1: I didn't really want to do the HNC because it was totally irrelevant really to me.

Student 2: I've done the HNC before and it was completely irrelevant.

Student 1: I mean it's by far the most relevant course for me – by far.

Student 3: Me too (pt FdEng)

One student explained how he had just completed an HNC and was planning to progress onto an HND but had chosen to do the FdEng instead because of its relevance to his work:

I was studying, doing my HNC at Kingston College. I want to do it by doing an HND part-time and ... advised me about this course and I thought it was better and I changed. (pt FdEng)

As discussed, for the students on the EDP who had been recruited internally, the decision to embark on the FdEng had not been theirs – the FdEng had come as part of the EDP. A few students were skeptical about whether the FdEng was a more useful qualification to have than the HNC or HND, particularly in terms of career progression. One student explained how the company appeared to view the two courses as equivalent:

I don't think this course in particular, over say an HNC, will make any difference. If I'd gone down the HNC route it would still help my career in my line the same so I wouldn't say there was additional benefit of this particular course over another and not when I look around our business 'cause I think they see the two as equivalents.

... But EDF Energy aren't really seeing the HNC or the foundation degree as really any difference with regards to skill so when you go back to question of how will it help progress your career – if we'd gone down the HNC route it would be the same as the foundation degree route when it comes to the job interview – I would say - 'cause there's no sort of level distinguishing difference. (EDP existing staff)

The fact that the HND and FdEng were parallel academically and that the FdEng would not lead any faster to a BEng was also commented on:

And if you did an HNC how many more years would you need to get a degree?

Lecturer: It's the same

It's the same – there you go – that says a lot doesn't it? (EDP existing staff)

There was some discussion of the fact that the FdEng was a new qualification and those interviewing for jobs, who themselves had the HNC, might look more favourably on a familiar course:

It's because they're new isn't it. I was a bit concerned about that; for example, going for a job either internally or externally and coming up against someone with an HNC or HND and me saying I've got a foundation degree, whether an employer that had never heard of it will take that up as a high qualification or certainly one that he knows over my qualification. ...(EDP existing staff)

However, students were aware that the first year of the FdEng is very close in content to the HND so it is not until the second year that the specifically relevant modules are covered:

I don't think we can comment too much 'cause as I say we're only doing HNC/HND units at the moment any way so it's the same thing. We haven't moved to the second year where ... it completely changes so that can't be commented on until we're doing it next year. ... (EDP existing staff)

The students studying part time who were not on the EDP also discussed that the second year is when they expect the course to become most interesting:

I think we are all looking forward to next year – I mean I look at everything - next year is the interesting stuff but you've got to get your foundation before you can – you've got to walk before you can run but yeah, next year is going to be so – I mean I have done quite a bit of the stuff that we do next year; it's all interesting because you are taking it that bit further, you're formalising it. ... (pt FdEng)

Career progression was not the only issue discussed; for some students the relevance of the course was about how well it equipped them to do their job effectively and in this context the FdEng was viewed as a more useful qualification than an HNC or HND:

But I'm not talking about that; I'm talking about how well you can do your job from the qualification – that's the difference. (EDP existing staff)

Comparisons were also drawn between the FdEng and other courses that the students had been on in the past; particularly discussed was an ONC that a few students had been studying for with Manchester Open Learning.

... I was doing an ONC with Manchester Open Learning and it wasn't really working. I wasn't learning from it and it wasn't day release and I think Terry was the same. (EDP existing staff)

...It was a couple of days every couple of months and it wasn't really working not as well as day release has been working for this.... I was in the first year and I hated it You did the work then you put it down for two months, come back to it again and it had just gone. (EDP existing staff)

The FdEng was compared very favourably to this course, largely because the regular contact with staff and other students enabled students to focus better on what they were learning:

Student 1: You just end up doing more learning and more structured

Student 2: It's in your mind isn't it?

Student 1: And also you get the chance to ask the lecturers questions

This was contrasted to the ONC where students felt that they were 'left to flounder between sessions'. Another problem identified was that the approach taken was to teach to the assessment rather than ensuring students had an understanding of the course content:

One of the really bad things with Manchester Open Learning is that if you did need anything extra it was generally over the phone or by e-mail – that's when you get hold of them and generally you were just left to flounder between sessions and then because of that when it came to the next two days, sort of two months time you'd just completely lost interest and completely forgotten what you'd learned. You may as well have not gone to the lesson and what happens is they just coached you to pass the exams rather than actually teaching you. It was a case of – this is the sample paper. What you're going to get is going to be pretty much

STUDENTS' EXPERIENCES

The role of the EDP

The recruits to the EDP from outside the company expressed considerable enthusiasm for the programme. One student explained how joining the EDP had allowed him to move quickly into a career in high voltage electricity which otherwise would have taken much longer:

...even if I sacrifice a few hundred pounds a month ... is much more related to the career that I want to do. It's not just – before doing commercial and domestic – that's it. There was no way I could go on high voltage; there was no hope at all....So the only hope was I study and then after the study apply to another company – probably would just same to apply to EDF in the future so I jumped these steps and I make my life just much more easy. It is a good way. (EDP new recruit)

A benefit of being on the EDP identified by both new recruits and those who were already working at EDF is the overview of the company that is provided by the different placements. This was identified as being useful in looking at how effectively departments worked and also in identifying areas to work in the future:

Student 1: you get a chance on this development programme to go into a lot of teams – be a part of a lot of teams for our EDF – working in different departments, you get a big understanding of how different teams work together and how maybe effectively they are working or maybe not. So yeah, the choice of having a look at different departments and the selecting where to go in the future is quite a useful thing on the programme.

Student 2: It's not an opportunity you can get any other way is it really? (EDP existing staff)

However, the students on the EDP described finding the programme quite difficult to manage as there are so many different demands on their time. They described how they had been told at the interview that they would be

required to do 10-12 hours study a week but said that this was very hard to achieve:

Student 1: The development programme that we're on as well – we get a lot of work that we have to do as part of that and we go to a lot of meetings...

Student 2:...A lot of projects to do

Student 1: ...Typing up notes; we've got projects to do; we've got presentations to do; it's very, very difficult juggling it all.

Student 3: ...We've got a big folder in which we have a lot of assignments, which we are meant to be working through.

Two students both on a placement in Ipswich independently explained how difficult they found the travelling coupled with the late finish at the university and the early start the following morning:

At the moment I am working in Ipswich so if I am here on a Tuesday, officially I am meant to be in Ipswich Monday so that is a two and a half hour drive to work, two and a half hour drive back, a twelve hour day on a Tuesday and then Wednesday I'm back there again by eight o' clock in the morning. (EDP existing staff)

It's a nice place Ipswich but going there on a Monday evening and Tuesday at the university and on Wednesday back in Ipswich and then on Friday back down – not easy. (EDP new recruit)

Students also discussed the pressure on their time from commitments that they inevitably have as they are in their thirties or older. As a result of these conflicting demands on their time, a few students explained that they were prioritising the FdEng as they felt that that would be more highly valued than the other work they were doing as part of the EDP:

Really, for me, passing this course is the priority. They've given us a thick file with loads of stuff that we're supposed to get signed off that we've seen and understood it but ultimately this is the important thing and the other stuff is just...at the end of it, if I've got a foundation degree or a load of signatures signed off in a book that probably no one is going to look at ...(EDP existing staff)

The experience of different students on the programme appeared to vary depending on where they were placed within the company. In some instances students described how the people that they were working with understand the demands on their time and are flexible - allowing them some extra study time:

I mean...you have individual arrangements, people understand how much you've got to do so I have had time to do a bit of extra study during work time.

Other students, however, reported having to take holiday time in order to revise for their exams.

The students on the EDP programme described how they support each other in their learning and work together. Two students described how much one of the other students on the course had helped them with their maths:

Student 1: I wouldn't have passed today's test if it weren't for

Student 2: The thing is, you seen, we've all got, because of our backgrounds, me and ... have really just done trade exams in the past and so moving up – ... done a degree in maths before so for him the maths is quite simple but for someone like myself it's quite a struggle so we sort of bat with each other really.

The fact that small groups of students are on placements together within the company also appeared to provide some opportunity for study and peer support:

Student 1: I think it is very good. I think it is very good to be together especially because we can share information with each other and our group, in our position, we have three in each placement so we can study together; we can meet.

Student 2: Actually we study together. (EDP new recruits)

Non- EDP students

The students enrolled on the FdEng who are not part of the EDP made many of the same observations as their counterparts on the EDP. Though the other study demands imposed by the EDP were not an issue for this group, the competing demands of work, travel and family commitments were all discussed.

Again, this group talked about the support provided by other students on the FdEng and discussed meeting up regularly to work together.

Yeah and we'll have a chat on the phone won't we or we'll e-mail each other and - I mean I had to do my HV Refresher with work up in York so I missed a week. Jason scanned all the stuff and sent it over to me so it's all...(pt FdEng)

We all get each other together, I mean, we'll normally be there before the exams; we always meet up in the student thing and we just sit there all together and everybody goes for – whoever knows whatever and we just throw it up in the air and try and help each other out. That's what it's all about – that's life isn't it? ...(pt FdEng)

... we meet quite a lot at work – every Friday and like two or three hours. ...(pt FdEng)

As with some of the students on the EDP there were accounts of employers being flexible and allowing time off for study, though this was not an experience shared by all students:

Yeah if we can all swing some time off work and go for an hour – my network have been pretty good so ...(pt FdEng)

This peer support was again clearly very significant to students with one student explaining that he felt he learnt more from his peers than tutors:

I seem to have learned more with my colleagues actually than the tutor – there are some things that sound like French when the tutor is teaching; when my colleagues explain it, actually it comes out more better. ...(pt FdEng)

Positive feedback and Issues raised

Communication/ contact with staff

Students were, overall, very positive about the course. As discussed, students were enthusiastic about the contact that they had with university staff. This was an aspect of the course that was commented on by students in the EDP and non EDP students:

... the system of communication with the lecturers as well – the in-house e-mails. Many a time I have spoken to the lecturers ... and a lot of other lecturers as well when I have needed some clarification and they have responded to me on time, which is good. (pt FdEng)

Yeah communication is easy (pt FdEng)

All lecturers are very approachable if you are chatting to them – they're all good aren't they? (pt FdEng)

The opportunity to ask questions to clarify understanding was valued and the extra maths tuition that the university had supplied was particularly commented on as being valuable:

the way they formulated it you have a lot of opportunity to ask questions and do sessions where you have one to one with your tutor – which I found invaluable – especially the extra tuition that's been put on. (EDP existing staff)

The availability of information on blackboard was discussed by students who were pleased that they could access information online:

I think something, which I have never come across before which is quite good, is the blackboard – you know, making use of blackboard because I remember when I went home to South Africa, the syllabus was there; I didn't have to carry books - anything, no paper with me – it was all in there and I could study internationally so that was a good thing about the blackboard. I think that's great. (pt FdEng)

Relevance of work

Students talked about the relevance of the course to their work; while the course is yet to relate specifically to the workplace, some connections were already being made:

We were doing things about current and voltage in electrical principles and then I saw that being applied ... how they were working it out and how they could change the system so for me I was like, oh right – that's how it works and (EDP existing staff)

Students also talked about the approach taken by the lecturers and how the maths content of the course was made relevant and accessible through the approaches taken:

I think one of the definite plus points for me and some of the others I've spoken to is ... style of teaching - I find very effective. ...his style of teaching is very effective for me....He gives plenty of analogies; it's not just a case of this is it and if you don't understand it that way then you screw. He gives you it in what he calls the south London way and he'll also give it to you in the sort of text book way and for you then you have two options: you can look at it that way or you can look at it that way and for me, having been through the ONC at Manchester Open Learning and not really learn anything I actually find I am really beginning to understand how things work. (EDP existing staff)

Issues were raised, however, about certain aspects of the course.

One day a week and the length of the day

The length of the day at the university combined with the demands of work were discussed as impacting on the amount of study that students could do; students expressed concern that this would affect their results:

Research and all the other stuff is very difficult for me if you're working four days a week and you're here until nine in the evening – it's very difficult to put that time in or to improve your results – you might get a minimum pass but it depends on the individual; if you think that's good enough or not...(pt FdEng)

Students also discussed how the length of the day at the university impacted on their concentration and performance on the course:

being six hours, seven hours, even eight hours in the university – actually all day long – is not easy at the end of the day you can't concentrate; you can't focus on what you have to do. (EDP new recruit)

There was agreement between a number of students spoken to on the EDP that the course would be better if it ran over two days a week rather than one. One student explained that as most of those on the EDP had not been in a

formal learning context for several years, two days at university would enable them to engage with the course more effectively:

I thought it would be much more useful to go two days a week university and maybe do one day less at work at this stage and concentrate more on the study even because most of us we are not coming out from study so we just, you know a few years that we don't do anything, you know and I think one day a week is a bit difficult... ... if you go two days a week, the gap between one lesson and another one is not so long ... you know and on the other side after four days in the workplace could be reduced. (EDP new recruit)

One student described how he was struggling, particularly with the maths on the course and would benefit from more input and more structured learning that would be available if the course ran over more than one day:

me personally, I am struggling with this because ... I was used to attending a full week and this is the one day a week that has made me – it's a bit too much. ... It's almost like an imposed discipline whereas I just don't have any self discipline when it comes to allocating a bit of time (EDP new recruit)

Also discussed was the possibility of doing the course full time. One student explained how this would lead to his having to think about maths every day rather than 'one extremely condensed day where it's easy just to put those books down and leave it until the next week'. One student also talked about how this might benefit the company and those involved in their training on the EDP: 'take off some of the pressure we put on them'.

Blackboard and maths solutions

There was much discussion in all groups of the use of blackboard in the delivery of maths. Students unanimously agreed that there should be worked out solutions on blackboard as this would help them to develop their understanding and work as a revision tool:

... they would be absolutely invaluable when it comes to revising for exams – to be able to look at the solutions. (EDP existing staff)

Going back to the work solutions briefly would be very useful because on those weeks where you really don't have a lot of time and you've given it your best and you've tried to work it out but you can't, at least then to be able to look at that work solution and get a good appreciation before you go to the next class...(EDP existing staff)

This had clearly been an ongoing debate and had been discussed at a course board meeting where students had aired their views. However, the lecturer concerned has been reluctant to change his approach:

we went to the course board meeting – I can't remember the name of the chair now- he said that would happen, that we would receive solutions and then ... said – you won't, regardless of what was said at the meeting. (EDP existing staff)

Students explained that his reluctance was rooted in a concern that if solutions were available online students would not work through the problems themselves. However, this led to further discussion about their positioning as mature students and the need for them to be treated accordingly:

We are all adults and we should be able to make that decision ourselves. If we want to try and cheat the system and try and cram it all in two weeks.... We come here because we want to come here; we are not forced so if they give me something to do at home for my benefit I will do it. If you give me the answer I can cover the answer and try to do it and then I look at the answer only if I cannot do it so I don't see the point of not giving me the answer ... we are over thirty years old here (EDP existing staff)

As the lecturer is not supplying this information, one of the students on the course, who already has a degree in maths, is supplying the other students with worked through solutions:

Believe me, we had one guy with us ... he is very good at maths and what he does, ... he does all the breakdown solution and he pins it up and he gave to us so we can actually see... (EDP new recruit)

Industrial Studies

Industrial Studies was another point of contention on the course and again, one that students had clearly discussed with their employers and university staff. Students complained that the course was too basic and a waste of their time. The fact that the course ran until seven o'clock in the evening appeared to compound students' irritation with having to attend:

The thing is, I've ended up doing Industrial Studies, which is pretty much an insult to human intelligence. (laughter) It's badly planned, structured ... its things like sending an e-mail using basic excel or something like that. I mean I've been using excel for something like ten years but because I haven't got any certification or anything I've ended up doing the course and it's just, you know, completely pointless...(EDP existing staff)

The system of accredited prior learning (APL) was reliant on paper based evidence to support students' claims to knowledge but students felt that this process had not been systematic. Students were unanimous in their view that the unit was of little value in its aim to prepare people to work in a business environment:

...I mean, I think the aim of it is to prepare people to work in a business environment but even if you went in and knew absolutely nothing and passed that course you still would not be in any way shape of form prepared for working in a business environment so it's a worthless unit.

Tutorials

Students were unanimously critical of the maths tutorials. A number of problems with the tutorials were identified. The size of the group (over 20

students) and the fact that they only occurred fortnightly and lasted only one hour were identified as issues as students did not have the opportunity to ask questions:

... it is only one hour. Even if you are, in the luckiest case, you are less than twenty, you know in one hour you're not going to even cover and doesn't even know...And it's once every two weeks because you work one week as maths so it's once every two weeks. By the time you want to ask something every one in twenty person you never can...(EDP new recruit)

Another problem was that the tutorials in maths and the maths lectures were given by different people and the approaches taken were different, leaving students feeling confused:

They have got a different approach and this level we are ...one tutor want very basic and the other one, because he is more mathematical he wants it a different way so we don't know which way to approach and it has been very confusing and that is why most people don't even turn up because they are just making things confusing especially this year. (EDP new recruit)

A further issue raised was that students were disruptive during class making it difficult to hear the content of the tutorial:

... you're not learning enough and it's disruptive – there's a lot of people chatting in the class. Sorry I am just – and there's people chatting and the lecturers aren't really controlling the class and that well annoys me..... if you're at the back and they're wittering away (ptFdEng)

Class size

Contributing to students' desire for worked solutions on Blackboard appeared to be the fact that there are over 70 people in their maths lectures and because of these large numbers, students felt that they sometimes miss what the lecturer is saying:

I mean, there's a class of over seventy people when we started – I don't know if it's still over seventy but there was over seventy people in the room and when you've got that amount of people with just one guy at the front, if you miss something you don't get another opportunity, that's it and if someone's talking or distracting you, again, if you're miss it in your notes – people walking in late, even to exams – people walking in late with mobile phones going off, you get that distraction and you miss it (EDP existing staff)

The suggestion was made that the lecturer should have access to a microphone to make lectures more audible:

If the rooms were set up for it though I think it would be a lot easier like if the lecturer had a microphone, especially the guy we have for maths. (pt FdEng)

Students also discussed how the number of students in lectures also precludes the possibility of asking questions:

... You can't ask a question 'cause if one person's asks a question, by the time the question's over the lesson's out, there's sixty nine other people but...(EDP existing staff)

There appeared to have been some problems over seating students in the lecture at the start of term with students struggling to find chairs:

The first couple of lectures when the people were turning up at ten o'clock – there was like, no desks left in the room - they were carrying desks and chairs.

Come coffee break someone would steal someone else's seat. There were almost fights. (EDP existing staff)

There were several complaints about how uncomfortable the chairs are; especially in the maths lecture and it was suggested that this contributed to some students' lack of focus::

... I can't really rate how uncomfortable it is. I mean, our timetable only gives us a fifteen minute break because it's very intense and to sit there learning in an uncomfortable situation, you find yourself – and this is why people end up sleeping because they're moving and then they lose their interest and especially the maths one – the maths room is the worst room isn't (pt FdEng)

Lab sessions

A few observations were also made about the lack of connection between lab work and work done in classes

... For example the physics; when we do a lab for physics there seems to be no ...In the lesson we're doing more like forces, motions, velocities, accelerations and then in the lab they're testing diodes, which is more electronics. (ptFdEng)

Students' different 'starting points'

An observation made by a number of students is the acute differences in students' starting points. During the focus groups it emerged that several of the students had already studied to degree level in a range of related subjects including maths, mechanical engineering and power engineering. Other students, however, had worked up from apprenticeships and had had no experience of academic work since leaving school – which for most students was over a decade ago. The differences between the backgrounds of these students appeared to be particularly polarized:

... done a degree in maths before so for him the maths is quite simple but for someone like myself it's quite a struggle (EDP existing staff)

This gap between students was also evident in their comments about the course. One student complained that the practical experiments were too easy, whilst another explained why he found the same experiments useful:

Student 1: I have a big issue with the practical experiments – electrical principles DC because I am sure I did those same experiments when I was doing GCSE science. I certainly did them when I was doing A level physics and that's one thing that's wound me up a little bit because it seems a little bit of a basic level – just doing Ohm's law experiments in a degree. (EDP existing staff)

Student 2: But there are plenty of us that didn't do A level science and I find it quite useful, in all honesty.

Student 1: But during your GCSE you must have done Ohm's law experiments.

Student 2: Yeah we did but I did my GCSEs in 1991 (EDP existing staff)

This contrast was repeated in all the groups with some students explaining that they were struggling whilst others clearly found the course content relatively easy to access:

Student 1: ...it's all good

Student 2: I'm finding it tough. It's the first thing I've done in eighteen years and it's been hard for me. (pt FdEng)

As discussed, these differences enable some students to support their peers to great effect. However, the difference in students' being able to access the course was also provided as a reason for some to lack focus in class and the disruption of the learning of others:

... you've got people learning at different speeds so some people at the back or at the front or whatever might already know what's going on so they are just bored and chatting away ...(ptFdEng)

Summary

Motivation for joining the course

- The course appealed to people already working in a related job or with an established interest in working in Power Distribution.
- Some students explained that their line managers had suggested the need for further training. In a couple of instances the FdEng had been suggested by line managers but most students, including those employed by EDF, had found the course themselves.
- All the students had looked at the course on-line initially but talked about how direct contact with the Course Director had been instrumental in their registering on the programme.
- Though students on the EDP had not elected to start the course independently they talked about how the qualification would progress their careers; improve their safety and competence at work and provide access to the BEng. Students on the EDP appeared committed to continue working for EDF.
- While they had applied for the FdEng independently in the first instance, joining the EDP had been a key motivator for three of the external students to take up their places on the programme.

FdEng vs Other Courses

- The students not on the EDP identified the increased relevance of the FdEng to their work over other available courses.
- There was some discussion amongst the students on the EDP about whether as the FdEng is a new course it will be as well recognised by their employers as the HND/C. Some students viewed the FdEng as providing the same benefits in career progression terms as the HND.
- A benefit of the FdEng over alternative courses was identified as being its relevance to application in the workplace and how this should improve competence and safety.
- Several students compared the FdEng favourably to an ONC course they had previously started. The benefits discussed were the contact with lecturers and regular attendance at college.

Student Experience

- Students on the EDP viewed the EDP programme as being beneficial; providing them with insights into different areas within the company which was enabling them to make informed choices about where they wanted to work. Being on placements in small groups also provided opportunities for peer support with academic work. However, the programme was seen as demanding and students were struggling to balance the demands of the EDP, home commitments, travel and the

demands of the FdEng. Several students explained that, as a result, they were focusing more on the FdEng as that was an official qualification.

- The students not on the EDP also discussed the difficulties of balancing the demands of the course with work and home commitments. Peer support was also identified by this group as important; students described how they found opportunities to meet up so that they could work together.
- Students talked positively about the course overall. Particularly mentioned was the contact that they had with lecturers and the opportunities provided to ask questions and clarify their understanding.
- Blackboard was mentioned as being a valuable resource.
- Students were able to make some connections between the course and their work already. Also commented on was how the lecturer made the maths content relevant and accessible.
- Students were unhappy with the length of the college day. It was felt that this impacted on their concentration and performance on the course. Students on the EDP suggested that it would be preferable if the course were to run over 2 days or for them to do the course full time. It was suggested that this would particularly help those struggling with the maths content.
- The need for worked out solutions for maths problems to be put on blackboard was widely discussed. All groups felt that this would support their learning.
- Industrial Studies was viewed negatively by students who felt that this course did not help to prepare people for work in a business environment.
- Students were unanimously critical of the maths tutorials: it was suggested that the group is too large and the fact that the maths tutorials and lectures are given by different people confused students.
- Class sizes were also commented on; the size of the group in maths lectures was identified as problematic as student cannot hear and there have been problems over seating.
- Students in one group commented that the lab sessions did not relate to the work done in class.
- The acute differences in students' levels of educational achievement before starting the course was discussed by students. This led to very different perceptions amongst students about the challenge posed by the course and students commented that these differences contributed to some students losing focus in class and disrupting the learning of others. Having very well qualified people on the course, however, clearly provided additional support for struggling students.

London Engineering Project HEI Guidelines to promote inclusive engineering courses: Towards an Inclusive Engineering Curriculum

These guidelines form part of a body of practical approaches and resources, developed by the London Engineering Project, to assist with achieving its key aim of increasing and widening participation in engineering Higher Education. Informed by research and drawing on existing good practice the aim has been to provide a practical tool for departments to use in reviewing and developing engineering curricula. The guidance responds to concerns raised by a diversity of students, not only those from under-represented groups, hence their application is likely to improve the student experience for all students, equipping them with the necessary skills to become engineers and to reach their potential.

Goal	Rationale	Actions to promote inclusion
1. Place engineering theory within its practical context	<p>A number of studies identify that students of engineering and physical sciences fail to perceive these subjects as relevant to their daily lives and wider goals, and this can influence how, and how well, students learn (ref. 1,9,10,13,17,24). Demonstrating the ways that day-to-day engineering practice impacts on some of the great global challenges can make a real difference to the way students engage with that practice. Moreover, an appreciation of context and purpose can make difficult concepts easier to understand, and there is substantial evidence that women, in particular, value an approach that recognises this. Finding effective ways of linking theoretical principles to real life applications requires an understanding of the ways that gender, background and ethnicity shape the perceptions and real life experiences of students (ref. 11,12,14). Links that seem obvious to the lecturer may not appear so to students because of those perceptions and experiences.</p>	<ul style="list-style-type: none"> ▪ Demonstrate how engineering relates to society and to a broad range of social and environmental needs. ▪ Use a broad range of contemporary examples and contexts. ▪ Include problems which consider human, social, environmental and global considerations. ▪ Incorporate opportunities for students to identify applications which reflect their experiences, interests and aspirations. ▪ Ensure the practical applications of theoretical principles are an integral part of teaching practice. ▪ Build inter-disciplinary links and apply them to existing courses and teaching material. ▪ Highlight, showcase and recognise the contributions of a range of cultures to the development of engineering principles, concepts and applications.
2. Provide opportunities for problem-based learning	<p>An approach that uses a specific, real context or problem situation as the organiser for technical learning has been found to be effective in engaging students, and particularly women (ref.10,13,22,24). In problem-based learning, the path to a solution leads to an appreciation of underlying</p>	<ul style="list-style-type: none"> ▪ Provide opportunities for project and laboratory work in which students learn theoretical principles through tackling relevant ‘real-world’ problems. ▪ Provide students with work placements and projects in industry to enrich theoretical studies by

¹ Co-operative approaches need not exclude some element of competition, for example, co-operating within a group, whilst competing with other groups.

	<p>theory, and for a well formulated problem, an added benefit is that purpose and relevance can be self-evident. There is also consensus within industry and university engineering departments of the need for closer collaboration in order to enable students to gain experience in the application of theoretical understanding to real applications encountered in industry (<i>ref. 17</i>).</p> <p>The opportunity for group work allows the development of more co-operative¹ approaches which can be more attractive to, and inclusive of, women (<i>ref. 19,22</i>). Problem-based learning is also helpful to BME students who are more likely to start a degree with non-standard qualifications and who therefore may be relatively disadvantaged by more traditional ('chalk and talk') approaches to learning (<i>ref. 2</i>).</p>	<p>providing insight, relevance and purpose.</p>
<p>3. Discuss engineering practice in society</p>	<p>Engineering is often presented as the neutral, value free application of technical principles, with engineering education requiring solely the transmission of technical knowledge. In practice, since engineering decisions shape society, the implementation of positive engineering solutions requires engineers to engage with both social and technical implications (<i>ref. 14, 17</i>). A recognition of engineering practice being open to change, being shaped by social and political factors and not necessarily involving a unique, correct answer is likely to lead to increased motivation, particularly amongst female students (<i>ref. 4</i>). For BME students, a crucial factor in their engagement is the extent to which engineering practice takes account of their own communities' values and perspectives (<i>ref. 21</i>).</p>	<ul style="list-style-type: none"> ▪ Include discussion of the social, political, environmental and cultural factors that influence engineering practice and how engineering has affected/shaped world history. ▪ Discuss value conflicts and uncertainties relevant to the subject and build understanding of the role that ethical dimensions have on the implementation of engineering solutions. ▪ Showcase engineering practice from a range of countries, including developing countries.
<p>4. Equip students with the full range of skills to become professional engineers</p>	<p>The diverse work of a professional engineer requires a broad set of generic skills to support and enable the effective application of technical principles (<i>ref. 18</i>). Recognising these generic skills as a necessary part of an engineering identity, and valuing them as such will encourage students to develop them alongside their technical skills, and in so doing enhance their</p>	<ul style="list-style-type: none"> ▪ Build into the curriculum opportunities to develop general skills e.g. communication skills, social skills, problem solving, negotiation, project management, teamwork skills, report writing and presentation skills. ▪ Embed skills development and articulation in programmes, in a consistent way such that

	effectiveness as engineers. Evidence suggests that whilst all students would welcome more training in these generic skills, and realise that employers require them, they are not always clear about how these generic skills relate to their curriculum. BME students, particularly, are less likely to feel that they have improved their generic skills at university and to understand their relevance (<i>ref. 2,4,7,14,18,16.</i>)	<p>students are aware of the direct relevance of a given skill to their future employability.</p> <ul style="list-style-type: none"> ▪ Develop a structure to embed existing institution-wide skills provision within programmes. ▪ Promote interaction between HEI's and employers at the programme level.
5. Support the transition from education to employment	There is evidence that all students, female, male and BME want a more practical curriculum, and that women, in particular, benefit from opportunities to get experience of 'hands-on' laboratory work (<i>ref. 1,7,14,16,18</i>). Industry visits and placements offer significant opportunities for students to experience 'real engineering' and to meet positive real models, however it is vital that this initial contact with industry is well planned to ensure positive experiences that challenge rather than reinforce stereotypes (<i>ref. 1,2,5,7,24</i>).	<ul style="list-style-type: none"> ▪ Provide timely links between lecture materials and laboratory activities and make links explicit. ▪ Demonstrate the links between curriculum content and range of potential career opportunities. ▪ Maximise use of visiting lecturers (including via video-conferencing) and exchange programmes to enable learning from a diversity of female, male, and BME lecturers within academia and industry. Video-conferencing² can be used to maximise international links, including those from developing countries. ▪ Organise industry visits to enhance students' awareness and to enable contact with a diversity of female, male and BME engineers. ▪ Enable students to undertake industrial placements, whether for a full year or shorter periods, to facilitate the transition from education to work. Evidence shows that the majority of graduates who found a job immediately after graduation had done a placement ▪ Provide BME SET role models through interaction between HEI's and BME Networks and business forums at the programme level.
6. Develop delivery strategies to include all students	It is reported that many students would like more opportunities for interactive learning, and there is evidence to show that teacher-centred activities and whole-class instruction are more detrimental to learning for women than men (<i>ref. 10,17,19</i>). A wide range of studies show that	<ul style="list-style-type: none"> ▪ Use a range of teaching methods to accommodate students' varied interests, values, prior experiences, ambitions and learning styles. ▪ Include interactive teaching techniques and questioning methods that enable interaction and

	<p>on STEM courses, in particular, male students exert control over discussions, are given more attention by lecturers and are asked more challenging questions (<i>ref. 4,13</i>). A similar picture emerges for BME students, with reports of them being marginalised and becoming 'invisible' in traditional STEM learning situations (<i>ref. 6,23</i>). A learning environment and teaching strategy that take account of a range of learning styles will engage the broadest range of students.</p>	<p>reflection e.g. use of white boards; discussion of questions in pairs / small groups; building in individual thinking-time before asking for responses.</p> <ul style="list-style-type: none"> ▪ Incorporate group work and plan groups to enable all students to participate equally and to increase their ability/confidence in a range of skills e.g. where groups are not self-selected, rotate group roles; provide opportunities for women/BME students to choose to work together. ▪ Define and clarify technical terminology and jargon when it is introduced. ▪ Be aware of student-student interactions and vary teaching strategies to promote inclusion of all students. ▪ Have high expectations of all students with clear feedback mechanisms to praise achievement and enable improvement as required. ▪ Regularly review teaching practice and/or use peer observation to ensure active engagement of all students e.g. monitor who tends to ask questions, answer questions, and lead groupwork. ▪ Enable 'Fast Track' provisions for mathematics, ICT skills and English to be made at an earlier, pre-entry, stage including collaborative provision within FE and sixth forms.
<p>7. Develop a positive learning environment and culture that is inclusive to all students</p>	<p>The culture of an Engineering department the 'how we do things round here' develops, largely unconsciously, around the needs, interests and experiences of the people who teach and learn within it. Alongside technical knowledge, taught through the formal curriculum, students learn the informal rules, beliefs and attitudes, 'the hidden curriculum', from the experience of attending and learning within a specific department (<i>ref. 14,20</i>).</p> <p>Engineering in academia (and as a profession), is white and male-dominated and, unsurprisingly, reflects and reinforces Western male norms (<i>ref. 4,19</i>). Curriculum</p>	<ul style="list-style-type: none"> ▪ Participate in staff training/workshops to increase awareness of gender and culture related differences in learning styles, educational experiences and self-confidence of students and to identify strategies to promote inclusion. ▪ Use language and course materials that are inclusive in terms of gender, culture and ethnicity e.g. make reference to a diversity of female, male and BME engineers; ensure that images reflect a diversity of engineers; use examples and analogies that are likely to interest a diversity of students. ▪ Use inclusive language e.g. avoid 'Morning Lads';

	<p>influences culture, as does teaching style and course content, but a range of other taken-for-granted, less-tangible, issues have a significant effect on the extent to which an environment challenges stereotypes of who should or could be engineers, or reinforces them (ref. 4,24). These include the physical environment, the nature of day-to-day conversations and banter, the pictures on the walls, the style and content of notice boards, departmental publications and ease of contact with other women and/or minority ethnic students (ref. 19).</p>	<p>continually referring to engineers as 'he'.</p> <ul style="list-style-type: none"> ▪ Challenge comments and 'jokes' about female engineers – whilst offence may not be intended, they contribute to a feeling of being unwelcome and not taken seriously as an engineer. ▪ Display current work and achievements of a diversity of students. ▪ Use positive images of a diversity of engineers; promoting the contribution of female, male and BME staff. ▪ Ensure that any materials used by, or on display within the department are inclusive and do not reinforce stereotypes. ▪ Display opportunities for networking, attending conferences and linking with employers that are inclusive to female, male and BME students. ▪ Create a clean, well-organised physical environment. ▪ Provide sufficient women's toilets and facilities.
<p>8. Offer support and networking opportunities</p>	<p>Membership of social and professional networks contribute to a sense of belonging within the engineering community and impact on academic progress, career choice and progression. Whilst all students need support to thrive, being in the minority can be a particularly isolating experience, and seemingly small inequities may have cumulatively large negative effects upon students' confidence and career aspirations (ref. 4,7,24). Appropriate support structures and ready networking opportunities help prevent this, and will particularly benefit women and BME students, who tend to have limited/less access to informal networking opportunities or role models (ref. 1,19,22).</p>	<ul style="list-style-type: none"> ▪ Conduct induction processes that extend over the first term. Pay attention to students from minority groups in order to be sensitive to their needs and to assist them to build a support network. Involve current students and lecturers from minority groups. ▪ Offer a range of support mechanisms to students e.g. mentoring, support groups, flexible allocation of tutors, access to professional networks. ▪ Ensure that support is structured into industrial placements – this will enable students in the minority to develop effective strategies for their transition to employment. ▪ Offer a range of ways for students to mix socially that appeal to a range of interests and backgrounds. ▪ Encourage students to become members of their associated professional body (or bodies). ▪ Promote and encouraging participation in SET

		<p>activities outside the degree programme.</p> <ul style="list-style-type: none"> ▪ Make students aware that undertaking a placement provides opportunities to network.
9. Facilitate links between students and lecturers	Clearly, lecturers are a key influence on students' motivation and achievement, hence an environment where contact with lecturers is regular and commonplace is likely to benefit all students.	<ul style="list-style-type: none"> ▪ Enable clear, accessible routes for all students to approach lecturers. ▪ Encourage students to contact lecturers and ask questions. ▪ Offer ongoing student support, pastoral as well as academic, and an effective tutorial system with tutors briefed on, and appropriate to, their role. ▪ Develop openness in departmental management and communication.
10. Promote co-operative working amongst students	There is substantial evidence of women's preference for a co-operative rather than competitive approach to learning and work, and team-working skills are regarded as essential by employers (<i>ref. 4, 13, 17</i>). A curriculum that integrates the social applications of engineering into the learning process and enables discussion of the values implicit in these requires, and also promotes, a more-co-operative style of learning, is generally more attractive to women and does not disadvantage male students (<i>ref. 4, 14, 18</i>).	<ul style="list-style-type: none"> ▪ Encourage co-operation among students e.g. build small-group discussion /problem-solving into lectures ▪ Support the formation of peer study groups. ▪ Provide study areas for students that promote interaction and co-operative³ working. ▪ Conduct careful timetabling to ensure (part-time) student carers can engage fully. ▪ Combat isolationism through group projects and teamwork.
11. Use a range of assessment methods	In recognition of students' different learning styles, use of a range of assessment methods will avoid disadvantaging certain groups (<i>ref. 4, 13, 14</i>).	<ul style="list-style-type: none"> ▪ Use a range of assessment methods to reflect different learning styles in both technical and non-technical aspects. ▪ Make explicit the grading scheme of any assessment method. ▪ Include student self-assessment and review. ▪ Implement anonymous marking, where possible, in individual assessments / examinations.
12. Develop mechanisms to make use of	Mechanisms that allow feedback from students (and industry) to shape the curriculum and the learning environment are key to developing courses which enable a	<ul style="list-style-type: none"> ▪ Devise a comprehensive, timely and inclusive student feedback procedure. ▪ Evaluate and review curriculum, teaching style and

student feedback	diversity of female, male and BME students to thrive, fulfil their potential and aspire (<i>ref. 24</i>).	culture based on feedback from a diversity of students. <ul style="list-style-type: none"> ▪ Take account of student feedback on the informal learning environment as well as the formal parts of the course. ▪ Incorporate opportunities for rapid feedback e.g. '<i>instant whinge</i>' systems allow students to give instant feedback electronically to a moderator who will direct comments to the lecturer without revealing the identity of the student. The presence of the moderator provides a degree of anonymity for the student whilst ensuring some accountability for comments made. ▪ Consult widely on course design and research areas including feedback from a diversity of students and from industry.
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APPENDIX Q

LEP publications

There have been a total of 9 publications through out the appointment of the Education Innovator.

1. 'ReLOAD: Real Laboratories Operated At a Distance', submitted to the IEEE Transactions on Learning Technologies, under review, Hanson, Culmer, Gallagher, Page, Read, Weightman, Leversley.
2. 'A Remote Access Laboratory for Collaborative Learning', 11th International Conference on Computers and Advanced Technology in Education (CATE), 2008, Hanson, Culman, Gallagher, Page, Read, Weightman and Leversley.
3. 'Remote Laboratories in the Curriculum', 11th International CATE Conference, 2008, Hanson, Culman, Gallagher, Page, Read, Weightman and Leversley.
4. 'The impact of remote and virtual laboratories in Engineering Education: A Workshop', Engineering Education Conference, 2008, Nagy, Abdulwahed, Blanchard and Read.
5. 'The London Engineering Project – a case study for engineering in the future – the HEI perspective', Engineering Education Conference, 2008, Read,
6. 'Reviewing the Effects of Revision Packs and Streaming on First Year Engineering Maths', SEFI / IMA Conference 2008, Read and Greig.
7. 'Use of Creative Curriculum to Support Widening Participation in Engineering', Engineering Education: Journal of the Higher Education Academy Engineering Subject Centre, Vol. 3, No. 1, (2008), Read, Hanson and Leversley.
8. 'Delivering Inclusive Engineering: A practical tool to promote best practice when developing and enhancing engineering courses', Society for Reshaping Higher Education Conference, 11-13 Dec 2007, Prendergast and Read.
9. 'Reshaping Engineering Curriculum To Enhance The Student Experience And Reflect Changing Student Profiles', Society for Reshaping Higher Education Conference, 11-13 Dec 2007, Read.

1 is still at review stage with the Journal, 6 were presented as full papers at International, peer reviewed conferences, 1 was presented as a workshop at an International, peer reviewed conference and 1 has been published in a peer reviewed Journal.