The Royal Academy of Engineering

The London Engineering Project

EVALUATION REPORT

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LONDON ENGINEERING PROJECT

Partners in the London Engineering Project are:

The Royal Academy of Engineering
London South Bank University
The African-Caribbean Network for Science & Technology
The Brightside Trust
The British Science Association (formerly the British Association for the Advancement of Science)
Cambridge-MIT Institute
EDF Energy
The Engineering Professors' Council
HEFCE
The Higher Education Academy Engineering Subject Centre
RWE Thames Water
STEMNET
The Smallpeice Trust
Transport for London
Tubelines
The UK Resource Centre for Women in Science, Engineering and Technology
University College London
The University of Liverpool
The University of Sussex
Young Engineers

LONDON ENGINEERING PROJECT

Foreword

The London Engineering Project (LEP) ran as a pilot from the summer of 2005 to July 2009.

In its pilot phase, the LEP worked with 50 schools in south and east London and with 25,000 school pupils. In addition, it created a new BSc course, a new FdEng course and also enhanced 750 timetabled learning hours on other BEng and MEng degree programmes. It attracted deep engagement from 5 large engineering employers (Transport for London, Metronet, Tube Lines, EDF Energy, Thames Water). Funding from HEFCE of £4.34m (plus an additional £80k from EDF Energy) supported the work of 10 organisations and 4 HEIs over nearly 4 years.

One message from the pilot phase of the LEP is that ambitious output targets can be met by big projects when they are well managed.

In terms of project *outcomes* the LEP set out to widen participation in engineering higher education in south and east London, attracting more students from under represented groups: women, students from the lower half of the socio-economic scale, students with no family experience of higher education, certain BME groups, adult learners.

There is evidence that this is happening because:

- The largest launch of the 14-19 Diploma in Engineering in the country happened in LEP schools.
- In 2011, Southwark will get its first 11-19 Academy that has engineering at the core of the curriculum. This is being formed out of one of the LEP schools.
- The FdEng degree at London South Bank is recruiting adult learners very strongly.

All three are built on the success of the LEP. However, there is still room for improvement, particularly in the area of targeting interventions at certain student groups under-represented in engineering higher education, particularly those from the lower half of the socio-economic scale.

The final impact of the LEP won't be known for several years. However, the evaluation evidence set out in this report shows the following building blocks are in place:

- Engineering has been positioned as a viable career choice in the minds of thousands of young Londoners. Fore example, engineering is the second most popular (after business) career choice in one LEP school. At the start of the project it did not feature at all in student surveys.
- The issues that affect the transition of under represented groups into engineering higher education have been identified and remedies put in place in London universities.

Participation in engineering education is being widened in south London through the work of the LEP. This is a good platform on which to build the new National HE STEM Programme led by the University of Birmingham and funded by HEFCE and HEFCW.

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LONDON ENGINEERING PROJECT

Progress Report

Outputs from the programme

The project Scorecard of outputs is shown in Annex A. These are cumulative results dating back to the very beginning of the LEP shown against the targets for July 2009 set out in the LEP extension period proposal to HEFCE (December 2007).

Overall the scorecard tells the following story:

- The management of the project has been effective in delivering outputs to target.
- The project has been working with appropriate target groups: the percentages of female and BME students engaged in each activity type are all high.

Outcomes from the programme

The London Engineering Project has been subject to extensive external evaluation. In order to aid dissemination of the findings and to provide an effective archive for the project, all of the evaluation reports have been included here. Summaries of each evaluation report are provided below, with the full text of each laid out in appendices.

By assessing the evaluations, the longer term impact of the project may be seen in:

Pupils

The effectiveness of the following interventions has been assessed by external evaluation:

- Engineering role models (Student Ambassadors from LSBU, STEM Ambassadors from STEMNET, Transport for London, Tubelines)
- E-mentoring (Brightside Trust)
- STEM days (LSBU, Smallpeice Trust, STEMNET, University of Liverpool)
- After School Clubs (BSA, Young Engineers)
- Residential courses (Smallpeice Trust)
- Summer schools and large events (LSBU, Transport for London)
- A dedication to gender and ethnic inclusion (ACNST, UKRC)

The evaluation reports show that all were successful at positioning engineering as a viable career choice in the minds of young people. With constant advice and input from UKRC and ACNST this result proved remarkably independent of gender and ethnicity[1]. However, the effect was often fragile

[1] The London Engineering Project (LEP) team in partnership with the UKRC for Women in SET and ACNST developed training approaches to help colleagues working on the project to understand the issues around gender and cultural awareness in engineering and developed training for the different audiences involved in the project. This included training for LEP fieldworkers, engineering lecturers, practising engineers (STEM ambassadors) as well as student ambassadors. This approach provides an invaluable way to help people change their mindset and therefore their practice, it helps to build confidence to tackle issues around gender and challenge stereotypes as well as helping them to understand how to promote engineering positively to young people.

with young people losing the image of themselves in the role of engineer over time. Frequent refreshment of that image was required.

The influence of engineering role-models as so-called 'hot' sources information was evident. In addition it seems that these role models can have greatest impact when the mentor and mentee are actively engaged in a relevant activity (STEM day, after school club, residential course, design and make activity etc).

Final evidence of the effectiveness of the interventions is that many continue in LEP schools without any further funding from the project. This long term sustainability has been a goal worked towards throughout the project.

Schools

The evaluation report

- Improved gender-inclusive and culturally-relevant teaching and learning practices by individual practitioners and wider dissemination of good practices more widely both regionally and nationally.
- A bank of reusable teaching materials and related resources[2].
- Acknowledged reflection on general curriculum issues by managers.
- 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.

Universities

The evaluation reports

- A new BSc course, a new FdEng course and the taught material for 750 timetabled learning hours on other BEng and MEng degree programmes enhanced or refreshed.
- Deep engagement from 5 large engineering employers (Transport for London, Metronet, Tube Lines, EDF Energy, Thames Water).
- All of these are being sustained beyond the period of HEFCE funding.

[2] CREST Star Investigators – http://www.britishscienceassociation.org/web/ccaf/creststarinvestigators/index.htm
Young Engineers Activity Bank - http://www.youngeng.org/index.asp?page=138
Getting girls into Engineering Booklet - http://www.thelep.org.uk/about/girls

LONDON ENGINEERING PROJECT

Third party independent evaluation, summer 2009:
The LEP's work with schools: longer term outcomes

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.

- 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 manger 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.

- 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.

- 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:

- 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.

APPENDIX A – LEP work with schools, longer term outcomes

Third party independent evaluation, 2006:

Stage 1 Report: School students' perceptions of and orientation to Science and Engineering at the onset of the LEP work in schools

Summary

This report from early 2006 outlines school students' attitudes and views about STEM (science, technology, engineering and maths) at the beginning of LEP activity in their schools. Qualitative data was collected from Year 9, 10 and 11 students who were attending Young Engineers Clubs (YEC) at two South London schools.

These students were all in the top maths sets in their schools. They reported attending the YEC for a variety of reasons: a number of students had attended a STEM days run by the LEP; others wanted to find out more about engineering or had been asked to attend by a teacher. They described being motivated by science and maths at school because they were viewed as important subjects and because they enjoyed the investigative aspect of science. Their individual teachers appeared to be very influential to their level of engagement with the subjects. Students who were confused by lessons appeared to lose motivation while students who felt successful in these subjects identified this as contributing to their engagement and enjoyment. These students were positively orientated to HE but lacked specific knowledge about routes into courses and careers. These school students' perception of the work of scientists was that it was an unglamorous occupation. Their perception of engineering appeared to be more positive. This seemed to be linked to the fact that a few of the students spoken to had family members who were 'engineers'. However, their understanding of the term 'engineering' was predominantly limited to an understanding of engineers as technicians who 'fix' and not of engineers as professionals. Female students also identified engineering as a male dominated area of work.

APPENDIX B – Stage 1 Report: school students' perceptions of and orientation to Science and Engineering at the onset of the LEP work in schools.

Third party independent evaluation, autumn 2007:

Stage 2 report: School students' responses to ongoing LEP activities

Summary

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

The students' responses to the LEP were overwhelmingly positive. Students described being motivated by the challenge, competition, accessibility and active and practical nature of tasks. They talked particularly about how much they enjoyed the freedom to explore provided by LEP activities and contrasted this to the often didactic and prescriptive focus of lessons. The contribution made by fieldworkers was also cited as significant to their enjoyment and engagement.

Students described how they had learnt about teamwork and environmental issues. Primary teachers commented how active tasks facilitated work in mixed ability groups. Primary clubs and STEM days were identified as supporting the national curriculum especially in relation to the investigative work in KS2 Science. Learning related to the national curriculum was not so clearly identified in the secondary sector.

Students appeared to be gaining insights into engineering as a profession through activities and contact with LEP fieldworkers and student ambassadors. They actively questioned stereotypes they had associated with engineering as being gendered and manual or technical level work. There also appeared to be an increased awareness of the opportunities for creativity within engineering.

A number of issues emerged. One problem fieldworkers encountered was the number of other project activities in south/east London schools that the LEP was competing against. A related issue was that LEP partners were sometimes acting as independent organisations promoting their own range of activities rather than the LEP itself so that teachers in schools were unaware of the LEP as a separate project. There were some conflicting views in schools about which year groups should be targeted by activities: the pressure of SATs tests on Yr 9 and Yr 6 were identified as obstacles. Fieldworkers at LSBU reported difficulties with engaging academics in activities. Project partners were unwilling to provide the budget for the involvement of student ambassadors when fieldworkers suggested this would support and improve the students' experience of LEP activities.

APPENDIX C – Stage 2 report: School students' responses to LEP activities

Third party independent evaluation, 2008:

Stage 3 Report: School students' perceptions of and orientation to Science and Engineering after LEP interventions

Summary

This report outlines school students' orientation to and views about STEM (science technology, engineering and maths) and explores the impact of the LEP at the end of its first year in project schools. Qualitative data was collected through focus groups and in depth interviews held with students from five south London schools. The aim of this report is to provide some insight into whether, and to what extent, their involvement with LEP activities affected students' learning and attitude to STEM subjects and their consideration of engineering as a possible career. It also provided some insights into emerging issues and possible areas of development as the project continued into the next academic year.

The students who took part in focus groups and interviews had all volunteered to be involved in LEP activities and were all positively orientated to science, though generally a little less enthusiastic about maths, which was held to be more difficult. The overwhelming majority were intending to progress to university. Students talked about their extended families as sources of information about careers and universities. 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. Students' perceptions of engineering 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 wide variety of jobs covered by the term 'engineer'. 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 an ongoing possibility in students' minds.

Students spoke about enjoying the practical and active nature of activities, engaging with other schools, school students and fieldworkers. Students particularly commented on enjoying the competition involved in activities, activities that relate to 'real life', working in teams and the opportunity to be creative without teacher intervention. Students said 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 as well as some specific practical skills. In terms of learning about maths and science, students talked 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. Teachers said 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 were done, the activities would no longer be seen as 'fun' and would lose their existing appeal.

Pressures on teachers time impacts on their ability to run the Young Engineers Clubs on a year round basis. The organisation of trips is also time consuming. One teacher commented on how useful STEM days were as they are less demanding in terms of teacher time. One teacher commented on the sheer quantity of material he had been sent by the LEP partners and asked for some rationalisation of this.

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 as did 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 and 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.

APPENDIX D – Stage 3 report: schools students' perceptions of and orientation to Science and Engineering after LEP interventions at the end of the Academic year 2006-2007.

Third party independent evaluation, 2008:

Targeting of students

Summary

This report provides an account of how targeting of students for specific interventions has been interpreted and practised by the LEP during the pilot phase. While the issues surrounding targeting make the process highly complex, there are some clear findings that may inform the process in a national roll out.

The project has been highly effective at targeting BME groups. Students with no family background of HE, however, do not appear to have received quite the same focus. A key finding of this report has been that there is a need for a deeper understanding, by those involved with the project, of the characteristics of the very different communities that constitute 'target groups'; particularly sub-groups within the wider BME grouping. As well as a detailed knowledge of the different BME communities, for a national roll out, it is also important to consider divisions and relationships between groups and how, in different areas of the country, the boundaries may be more sharply delineated than in south east London and how this may affect participation.

Work around gender issues has been excellent. Targeting single sex schools has ensured that large numbers of girls have worked with the LEP. For a national roll out, however, it might be useful to look in more detail at the targeting of girls in mixed schools, what issues have arisen and how this differs from work in single sex schools. The development of a central database to monitor who attends individual activities would clearly inform the whole targeting process.

The targeting of pupils from the poorest families and particularly those with no family background of HE has proved challenging. One issue is the general tendency to assume that BME pupils generally fall into this category. Another is that it is precisely the most disadvantaged pupils who may also be the most difficult in terms of behaviour, attendance and attainment. Both teachers in schools and LEP partner organizations and fieldworkers are concerned to present positive outcomes in terms of the project and so may overlook the inclusion of precisely those 'difficult' pupils in the project.

Another key finding has been that to reach and engage target groups, there is an overall need to embed the project more widely in the schools. This requires a more detailed understanding of general priorities in the schools' curricula and how the project can work across as well as within different curriculum areas to support work towards existing school targets as well as designated project outcomes. The profile of the project in some schools needs to be raised so that it is not merely an adjunct to a single department and the responsibility of a single, often overstretched, teacher. This requires senior management engagement and a whole school commitment.

The LEP has been highly successful in bringing together a number of different organizations to work together on one project. It is clear, however, that cultures within individual partner organizations have also impacted on the way in which the project has worked within schools. The persistence of individual organizational visions and agendas can be seen as limiting progress towards a truly collaborative approach that builds on and integrates with teaching and learning strategies within schools.

APPENDIX E - Targeting report

Third party independent evaluation, 2009:

Ambassadors

Summary

The following report is part of an extended piece of work about ambassadors and their work with younger students and should be viewed as a work in progress.

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 (Science and Engineering Ambassdors) attended a number of the one day events.

The discourses surrounding student ambassadors (SAs) and SEAs have been traced in the 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. YSs responses to SAs and SEAs suggest that they can be open to the marketing of HE and engineering. 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.

Student Ambassadors

Discourses on marketing HE were dominant in conversations with SAs. SAs appeared to be 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' 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 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 modelling 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 was 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 pervious 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 as learners.

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. 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 (STEM 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' (as in the television programme 'Dragons Den') 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 a 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 with 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 and through the work many of them do for 'Recruitment' are powerful; they may also be attractive to SAs as being positioned in marketing may well seem more glamorous to them 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 from different backgrounds and that SAs and SEAs from different backgrounds may challenge their ideas about who they can be 'comfortable' working with.

APPENDIX F – Ambassadors Report
Appendix F1 – Stem days
Appendix F2 – Residential course
Appendix F3 – Summer school
Appendix F4 – SEAs (know called STEM Ambassadors)

Third party evaluation, 2009:

e-mentoring

Summary

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 e-mentoring 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)[3] and 80% of mentees stated they had either 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

[3] http://www.hefce.ac.uk/pubs/hefce/2007/07_12/07_12.pdf.

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 e-mentoring had directly provided a greater understanding of university life and the various careers available.

Mentees (31%;9/29) also felt that e-mentoring 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 for university and engineering of non-traditional HE entrants.

Key data

- 87% (27/31) of mentees reported that they were happy with the e-mentoring experience and would recommend Live Journals to a friend or sibling.
- 80% (25/31) of mentees reported that they had found the e-mentoring experience rewarding.

[4] LEP – London Engineering Project
[5] STEM – Science, Technology, Engineering and Mathematics
[6] Syvantek 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 E-mentoring: 27-43.

Conclusions

As with previous findings at the Brightside Trust, 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 e-mentoring relationships.

Live Journals had a high level of engagement (71%) which may reflect the integration of e-mentoring with other face-to-face LEP[4] 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 e-mentoring with a STEM[5] club as an extra tool to enthuse young people.

Supporting previous 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 mentees[6], 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, 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 e-mentoring 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 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 e-mentoring 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. E-mentoring has really helped*."

Live Journals Mentee - June 2009

APPENDIX G e-mentoring evaluation report

Third party independent evaluation, 2007:

Gender

Summary

The purpose of the evaluation was to inform the continuing activities of UKRC input into this and other HEFCE-funded STEM pilot projects and identify which approaches, structures and delivery methods would be most effective for UKRC to use in the potential national roll-out.

The UK Resource Centre contracted activity as a gender mentor to the LEP, delivered advice, training and hands-on support aimed at ensuring that all LEP activities, materials and approaches are inclusive to girls/women. Areas of work included:

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.
5. Delivering Gender Equality Training to LEP fieldworkers, partners and facilitators of LEP activities.

As a result of conducting the evaluation of UKRCs contribution to the London Engineering Project (LEP) the evaluators concluded that :

'Information and examples of the impact of the UKRC's gender equality input described by the UKRC's 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.'

There was absolute agreement amongst fieldworkers that the DRIVE process of quality assuring LEP activities had been very successful which was particularly helped by the Gender Equality Training they had all received which had been adapted to their specific needs. They felt that access to expertise in the gender area had, to quote one project worker ' created massive mind set changes'

The strengths of the work carried out to the date of the evaluation included:

- Providing Gender Equality Training Days which helped to provide a level playing field for all partners
- Creating confidence in the abilities of all partners (to address gender equality in their practice)
- Provide a benchmark for partners

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

Considerations for potential role out:

Partners should follow an agreed formal gender equality 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.

To signal to all partners the significance and importance given to Gender Equality at a strategic level the UKRC should have representation on the strategic board and be involved from the beginning to ensure all partners understand their role.

APPENDIX H Evaluation of the UKRC input to the London Engineering Project and 'Stimulating Physics'

Third party independent evaluation, 2009:

Curriculum links

Summary

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.

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

APPENDIX I Curriculum links

Third party independent evaluation, 2006:

Baseline Evaluation Notes: Engineering at LSBU at the start of the LEP

Summary

This report is based on qualitative interviews with senior staff at London South Bank University, marketing personnel and lecturers within the Department of Engineering. The report outlines the position of engineering within the university and the progress of LEP initiatives.

Engineering at LSBU is comparatively successful. The Faculty of Engineering, Science and the Built Environment (FESBE) is the second largest faculty in the university. The number of students applying for engineering courses has increased over the last two years and was actually up by 35% in 2007. However, there are issues for engineering at LSBU. Some students particularly struggle with the maths content of the courses and there is a sense amongst some interviewed that a need for accreditation by professional bodies acts as a constraint on innovation that might make courses more accessible. LSBU also struggles with its image. The pressure on academics to produce more research in order to attract funding is set to increase, putting pressure on efforts to focus primarily on teaching and learning.

In terms of the LEP, two areas of work were identified: curriculum developments and foundation degrees. The role played by the curriculum development officer in FESBE has enabled LEP approaches to be taken directly to members of the relevant departments. The curriculum development officer has circulated the curriculum checklist (Appendix P) created by the LEP and has successfully engaged members of the teaching staff in discussing and implementing its recommendations. He has also gained faculty wide agreement that the checklist will be applied to at least one course in each department: this includes the three foundation degrees and two other programmes. LSBU is providing curriculum material to local further education colleges to help them deliver HNC/HND (Higher National Certificate/ Higher National Diploma) level courses so that students can then progress directly onto the foundation degrees offered at the University. EDF Energy has indicated that they would be prepared to let FdEng (Foundation Degree Engineering) students use their 'in house' training facilities. However, relationships with Thames Water and Transport for London were not certain and the lead academic would like to bring in more partners. It was also suggested that there was a need for better communication across engineering academic staff about the project and that academic staff needed to engage more with teaching and learning issues in local schools and the implications these might have for their work at the university.

APPENDIX J - Baseline Evaluation Notes: Engineering at LSBU at the start of the LEP

Third party independent evaluation, 2007:

Baseline Evaluation Notes: Mechanical Engineering at UCL at the start of the LEP

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 becoming practicing engineers. The lead academic suggested that there was a need to link what UCL are doing in the department with what collegues 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 frequently 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.

APPENDIX K - Baseline Evaluation Notes: Mechanical Engineering at UCL at the start of the LEP

Third party independent evaluation, 2006:

Baseline Evaluation Notes: Engineering at Sussex at the start of the LEP

Summary

This report, undertaken early in 2006, is based on interviews with senior staff at Sussex University, as well as with marketing personnel and lecturers within the Engineering Department. The report outlines the position of engineering within the university and describes the progress of LEP initiatives.

At the time of evaluation, engineering at Sussex University was experiencing certain difficulties. The head of department outlined problems that he saw as only being likely to increase over the coming years. While the department was successful in research terms, the recruitment of undergraduates was difficult, with the department relying for numbers on students in Product Design and on the MSc course.

At this time, a key problem for the LEP at the university appeared to be lack of communication within the department. This led to a lack of awareness in the department about the LEP. Lecturers had no sense of ownership of the new degree programme (Engineering for Society) developed by LEP. There was support for the new degree programme amongst senior academic staff in the university though this was not resounding. The hope was expressed that the Engineering for Society degree will pave the way for other new degrees that are being developed and that the new degrees will attract undergraduates who may not opt for more traditional technical, mathematical and scientific subjects. 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.

APPENDIX L - Baseline Evaluation Notes: Engineering at Sussex at the start of the LEP

Third party independent evaluation, 2007:

Students' accounts of their experience of Mechanical Engineering at Sussex, LSBU and UCL

Summary

This report is based on focus groups held at each of three higher education institutions with 2nd and 3rd Year engineering students. A number of clear issues emerged from this data in terms of students' responses to their current courses. Students' discussion of their courses suggests they desire a full 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 by staff 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 as caring about whether they were engaged. Linked to this was a desire for more formative feedback so students could understand how to make further progress. Students identified their lack of knowledge of the current 'real world' of engineering and what jobs might be available as problematic. There were also issues specifically affecting the minority of female students in terms of interactions with technical and teaching staff.

It is important to note that the students' views provided here echo many of the points raised in the 'LEP HEI checklist of good practice' (Appendix P). 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 more 'inclusive' approaches by staff and for 'links between students and lecturers'. Students also all talked about their future careers and it was evident from their accounts that they see a need to learn 'skills to become professional engineers' and felt they needed 'support' to make the 'transition from education to employment'.

APPENDIX M - Students' account of their experience of Mechanical Engineering at Sussex, LSBU and UCL

Third party independent evaluation, 2008:

UCL: Female perspectives and students' responses to the centrifugal pump exercise

Summary

This report is organised into two parts. The first part collates female students' responses to the mechanical engineering course aired during two focus groups held with UCL (University College London) students. The second part of the report outlines students' responses to the new centrifugal pump exercise on the engineering course. The focus group was held in the summer term of 2007 and consisted of seven third and fourth year students on mechanical engineering and combined degree programmes. This group had all recently completed the new centrifugal pump exercise.
It important to note the commitment of female students to engineering. Unlike their male counterparts, many of whom expressed an interest in working in finance, all the girls spoken to wanted to progress into careers in engineering. However, these female students commented on specific aspects of the course they were unhappy with. One area of concern was the lack of creativity on the course. Other issues included the lack of interaction with lecturers, lack of opportunity for discussion and interactions with technical and teaching staff they viewed as problematic.

There were a number of aspects of the new centrifugal pump project that students were positive about. They appreciated the opportunity to work with CAD (Computer Aided Design) and to be involved in the whole process of design, manufacture and testing. They were also positive about the subject matter of the project and the opportunity to share their results with a wide audience and to be part of a national project. Students did, however, have reservations about the project. They identified a need for a better introduction and for further guidance with CAD. Students also commented that they had been directed towards a particular approach which had limited their creativity and that assessment of the project was problematic as it lacked clarity and formative feedback to facilitate them with the further development their work.

APPENDIX N - UCL: Female perspectives and students' responses to the centrifugal pump exercise

Third party independent evaluation, 2009:

FdEng in Power Distribution

Summary

The FdEng at LSBU (London South Bank University), set up jointly by 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. It is based on information gathered through qualitative interviews with LSBU staff, students and EDF staff who have been involved with the course.

The number of students enrolled on the FdEng at the time of interview had risen dramatically from the previous year. 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, the foundtion degree has now become established and is being taken seriously within the university at faculty level. Staff at EDF appeared equally pleased with the course. Foundation degrees were identified as ideally suited to sectors where there is a shortage of appropriately qualified people. The company itself has a shortage of qualified people and the FdEng has now been integrated into the Engineering Development Programme (EDP) at EDF which was developed to both train existing staff and recruit externally. The students are also pleased with the course, viewing it as relevant to their work and as likely to enhance their career prospects.

The cohort of students on the programme has shifted from the initial intended target group of younger local students, with some progressing through schools directly onto the programme, to predominantly mature students, already working in a related sector. This cohort still reflects ambitions for the foundation degree in many respects. The FdEng will enable adult students to access higher education 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 (Bachelor of Engineering) or possibly a new work based programme at I Eng (Incorporated Engineer) level. However, EDF were hoping that the FdEng would provide them with more external and local staff who are representative of the communities that they serve. Clearly recruiting locally would benefit the community as well as making EDF's workforce more representative. Some strategies that could help to achieve this were identified in discussions and the hope was also expressed that students who have been part of LEP projects in schools will start to apply to the course. The EDP and FdEng now offer a clear route into higher education for employees at EDF who enter the company at apprenticeship level, another entry point for local people.

APPENDIX O - FdEng in Power Distribution

Appendix O1 - FdEng Power Distribution: LSBU staff perspectives

Appendix O2 - FdEng Power Distribution: perspectives from EDF Networks Branch staff

Appendix O3 - FdEng Power Distribution: students' perspectives

APPENDIX P - HE checklist

See Appendix P.

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.

LONDON ENGINEERING PROJECT

Annex A

Scorecard – July 2009

	Cumulative performance to date	Target by July 31st 2009	Traffic light
Number of primary schools engaged	25	25	GREEN
The BA, number of Primary schools engaged	23	25	GREEN
Young Engineers, number of primary clubs active	25	25	GREEN
% female students involved	56%		
% BME students involved	75%		
STEMNET primary student days	9894	10,500	GREEN
% female students involved	51		
% BME students involved	66		
BME role models involved in primary school work	28	25	GREEN
% female	57		
Number of secondary schools engaged	17	15	
LSBU STEM days (student days)	7631	6750	GREEN
% female students involved	60%		
% BME students involved	75%		
Young Engineers, number of secondary clubs active	17	15	
% female students involved	48%	40	
% BME students involved	75%	30	
STEMNET secondary student days	2822	2630	GREEN
% female students involved	72%		
% BME students involved	53%		
Smallpeice secondary STEM days (number of student days)	7282	6750	GREEN
% female students involved	68%		
% BME students involved	84%		
Students attending Year 9 residential courses	254	250	GREEN
% female students involved	65%		
% BME students involved	82%		
Students attending Year 10 residential courses	244 (2 ill, 4 no shows)	250	GREEN
% female students involved	52%		
% BME students involved	75%		
Students attending Year 11 residential courses	112 (4 ill, 3 no shows and 3 drop outs)	125	GREEN
% female students involved	53%		
% BME students involved	80%		
BME role models involved in secondary school work	116	25	GREEN
% female	40%		

LSBU number of ambassadors & role models trained	42	194	**RED** Note 1
% female	50%		
% BME	80%		
STEMNET SEAs engaged	123	194	**AMBER** Note 1
% Female SEAs	29%		
% BME SEAs	37%		
Number of e-mentees engaged	294	147	**GREEN**
% female	46%		
% BME	Not Known		
Number of e-mentors trained	100	90	**GREEN**
% female	38%		
% BME	Not Known		
UKRC number of resources assessed	125		
UKRC number of practitioners trained	221		
UKRC gender training events	18	4	**GREEN**
Education training events	5	4	**GREEN**
Students recruited to LSBU Foundation Degree(s)	26 (2 ft & 24 pt) 2 continuing pt course	15	**GREEN**
% female	7%		
% BME	25%		
UCL / CMI/ HEA subject centre learning hours enhanced	750	700	**GREEN**
UCL students involved in enhanced learning	650	700	**GREEN**
University of Sussex, students enrolled	6	15	**RED** Note 2
% female	17%		
% BME	50%		

Note 1 Whilst there was a smaller number of individuals involved as Ambassadors than set as a target, those who did participate did so more often than expected. Despite the use of Ambassadors being prioritised in the project, the smaller pool proved sufficient.

Note 2 A first cohort of 6 students might be expected for a novel degree course.

Performance metrics that are more than 90% to their target are shown as green and no further comment is offered here apart from to recognise the success in output delivery achieved in almost every aspect of the project.

Performance metrics that are 50-90% to their target are shown as amber.