National HE STEM Programme

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SETTING UP A MATHS SUPPORT CENTRE




Duncan Lawson

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About the author

Duncan Lawson is Director of **sigma** at Coventry University and has been actively championing mathematics support both within his own institution and nationally for almost 20 years. He became Director of the BP Mathematics Centre at Coventry University in 1994 and has remained active in mathematics support ever since.

During this time, mathematics support has grown from a 'cottage industry' to virtually a discipline in its own right. It has an active and committed community of practitioners (some of whom have contributed the case studies in this guide) who are not only enthusiastically developing their practice but also engaging in scholarship and research to better understand the principles on which mathematics support is based.

In November 2011, **sigma** received the Times Higher Award for Outstanding Support for Students.

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Foreword

I am delighted to introduce to you this suite of transition and retention guides which have been produced under the National HE STEM Programme.

While increasing the supply of students to STEM Higher Education is important, ensuring that they experience a smooth transition to university and that as many as possible complete their studies successfully is of equal importance. There is a wealth of initiatives in this area that have reported on effective practice to help achieve this. The purpose of the guides is to collect and present effective practice models specifically from STEM departments. An important feature of this suite is the student perspective, which the authors have emphasised.

The issues related to induction, transition and retention are multi-faceted and therefore may have been addressed in slightly different ways in the different guides to take account of the specific context.

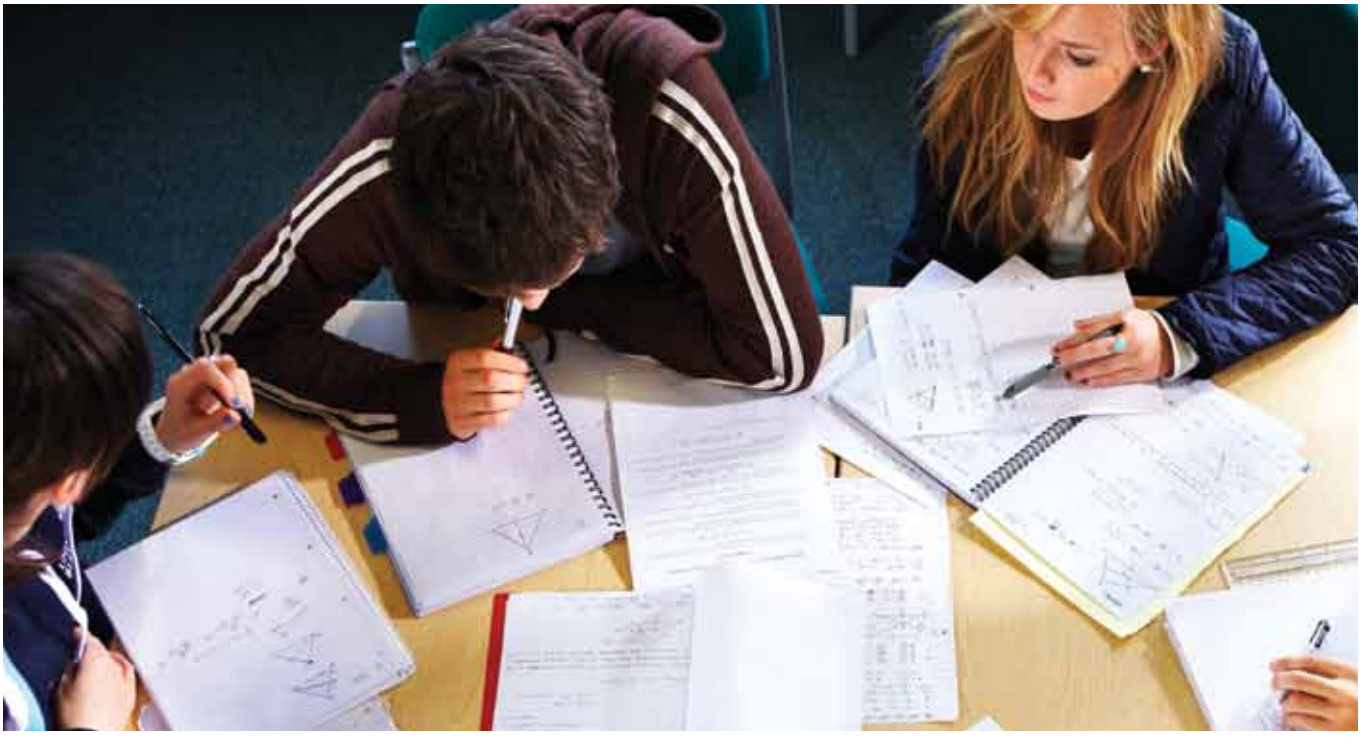
The suite consists of eight guides:

- Using data: an evidence-based approach to improving transition, induction and retention
- Happy landings – an introductory guide for students considering studying a STEM subject in Higher education
- STEMming the doubts – enhanced transition and induction to HE programmes
- Critical moments in the first year at university – towards a framework for effective transition.
- Promoting social engagement: Improving STEM student transition, retention and success in higher education.
- Improving retention: the curriculum development perspective .
- Setting up a Maths Support Centre.
- Optimising the part-time experience.

My thanks go to the authors of the guides for distilling their knowledge and expertise and to the Steering Group for their valuable guidance. The group consisted of Professor Liz Thomas, Director for Widening Participation Research Centre (Edge Hill University), Hal Igarashi, Project Director Employer Engagement (Royal Academy of Engineering), Henriette Harnisch, Director of Academies and Trusts (University of Wolverhampton), Fiona Lamb, Associate Director (Engineering Education Centre), Ed Stevens, Regional Officer for Widening Participation & Outreach (South West) and Sadaf Alvi, Regional Officer for Higher Level Skills (Midlands & East HE STEM Anglia regional spoke).

Our collective hope is that the wealth of case studies and the student perspective presented will stimulate colleagues to consider improvements to the transition processes where they find it appropriate for their institution.

Professor Kamel Hawwash
Regional Director
National HE STEM Programme
(Midlands and East Anglia)



Introduction

Mathematics underpins all STEM disciplines and is important in many others too. For various reasons, including personal, educational and social, many students arrive at university with negative attitudes about mathematics and a perception that they are 'not very good at maths'. Mathematics Support Centres are one initiative that many universities have introduced as a means of helping such students.

Although 'Maths Support Centre' is the term in common usage (and the one used throughout this booklet), it usually embraces support in statistics as well as mathematics. As a consequence, these support centres are relevant to the overwhelming majority of students since the collection, interpretation and analysis of data feature, to some extent, in very many programmes of study.

Mathematics support is something additional to students' regular teaching in lectures and tutorials. Although it is usually available to all, there is no expectation that all students will engage with it. However, it should not be thought that mathematics support is just remedial. Experience shows that students from across the achievement range will access this kind of provision. A primary feature of mathematics support is helping students to achieve their full potential – whether they are struggling to pass or have realistic hopes of gaining a first.

In this guide, we present a summary of the arguments about why mathematics support is necessary and demonstrate how it aligns with a number of sector-wide and institutional drivers. We then give a series of case studies showing how mathematics support operates in a range of institutions and at a variety of scales.

Following these case studies, we briefly discuss evaluation and then close with practical advice for those wishing to set up a mathematics support provision in their own institution.

Good practice project background

Mathematics is a great enabler, allowing insights to be gained into a wide range of disciplines that cannot be gained in any other way. This is particularly true in STEM subjects such as physics, chemistry and engineering. And it is becoming increasingly true in other sciences that previously were less reliant on mathematics, such as biology: most research projects in modern bioscience depend on applying quantitative methods.

However, in addition to being a great enabler, mathematics can also be a great barrier. Many English and Welsh students enter university having studied no mathematics for at least two years. Not only that, many of them actively chose not to study mathematics because they had developed negative attitudes towards it. These attitudes range from lack of interest and boredom through to active dislike and even fear of the subject.

The key purpose of Mathematics Support Centres is to assist students to achieve their full potential. For some, this will mean gaining the few extra marks needed to turn a good result into an excellent one. For others, it may be that a fail becomes a pass. The exact form of support offered may vary from institution to institution, but the ends are the same: to build students' confidence in mathematics and thereby to enable them to be more successful in the study of their primary discipline.

The value of Mathematics Support Centres to students can be seen both quantitatively and qualitatively. Literally thousands of students avail themselves of the support on offer, with many making several return visits. These students are 'voting with their feet' in indicating that they value the assistance available to them.

A qualitative measure is seen in the citation by NUS President Liam Burns in relation to the mathematics and statistics support provided by **sigma** at Coventry and Loughborough Universities:

*'**sigma** is a fantastic example of institutions recognising genuine concerns in standards and acting in a positive way to address them. Students' reports about the support they received were exceptionally positive.'*

THE AWARDS Winners Brochure 2011

The strategic fit

Mathematics Support Centres address strategic issues from the national and institutional level. National concerns about mathematics education are well-known and long-standing. Institutional learning and teaching strategies have been developed with these concerns in mind.

In 2000, the Engineering Council published a seminal report Measuring the Mathematics Problem. This stated that:

'Acute problems now confront those teaching mathematics and mathematics-based modules across the full-range of universities.'

And one of its recommendations was that:

'Prompt and effective support should be available to students whose mathematical background is found wanting.'

Mathematics Support Centres were the response of many universities to this recommendation.

Measuring the Mathematics Problem marked a turning point in terms of attracting the Government's attention. Whereas previous reports did not appear to have had significant impact on policy, this report was influential in prompting the Government to institute a national inquiry, chaired by Professor Adrian Smith, into mathematics education. The 2004 Smith report Making Mathematics Count lent further weight to the need for mathematics support:

'Higher education has little option but to accommodate to the students emerging from the current GCE process.'

Although the Government acted in response to many of the recommendations of the Smith Report, the mathematics problem has not been solved. The 2007 National Audit Office report Staying the course: the retention of students in higher education noted that mathematics was a key contributing factor to the low retentions rates in STEM subjects. It concluded that:

'Many students require some additional academic support, especially in the mathematical skills required in science, mathematics, engineering and technology.'

Mathematics remains a 'hot topic' with four major reports being published in the last twelve months.

In 2011, the Nuffield Foundation report Is the UK an outlier in upper secondary mathematics education? showed that England and Wales are near the bottom of the league table of developed nations in terms of the proportion of the cohort that study any mathematics after 16 years of age. Later that year the Advisory Committee on Mathematics Education published the report Mathematical Needs: Mathematics in the workplace and in higher education.

This sought to quantify elements of the problem:

'We estimate that, of those entering higher education in any year, some 330,000 would benefit from recent experience of studying some mathematics (including statistics) at a level beyond GCSE. At the moment fewer than 125,000 have done so.'

The Vorderman report A world class mathematics education for all our young people (2011) concluded that mathematics education is in crisis and called upon the Government to designate it as 'a subject of critical importance'. Finally, in February 2012, the RSA report Solving the maths problem: international perspectives on mathematics education concluded that England's mathematics qualifications are 'regimented and examination-driven', in stark contrast to the flexibility of high-performing countries such as Hong Kong.

Mathematics Support Centres can contribute to an institution's strategic response to Smith's call to 'accommodate to students emerging from the current GCE process'. Several institutions have included provision of mathematics support in their Access Agreements lodged with OFFA. Here are two examples:

'We will increase the level of support in the Maths Drop-In Centre by appointing student mentors.'
Aston University

'A pilot programme providing support for first year students from subjects (in the sciences and economics) whose modules include or require, elements of algebra and calculus has been very well utilised and we plan to expand this service.'
University of York

Case studies

How have different universities chosen to introduce and maintain mathematics support? In the sections that follow we offer five case studies, selected to illustrate how mathematics support is being managed in a variety of situations.

- The support centre at Coventry University, established over 20 years ago, has grown into one of the largest and most prestigious facilities of its kind in the country.
- The Maths Cafe at Portsmouth University – also well-established – has adopted a different method of operation, eschewing a fixed location for a peripatetic presence in many of the catering outlets on campus.

The other three case studies describe HE-STEM funded projects to establish mathematics support in institutions lacking such provision.

- In York, there is a dedicated member of staff working closely with the mathematics department.
- In Kent, the support provision is mainly delivered by PhD students from the strong internal mathematics department.
- And in Lincoln there is no mathematics department at all, and support is delivered from a central unit.

Case study: Coventry University

sigma: Mathematics Support Centre

There has been mathematics support at Coventry University since the 1980s. The original provision was informal, consisting of a few members of the maths department making themselves available at lunch-times on a rota that covered key parts of the academic year.

In 1991, mathematics support became more formalised with the creation of the BP Mathematics Centre. This was established with funding from the BP Engineering Education Fund and had two main goals: the early identification of student problems, and the provision of on-going support to enable students to address these problems.

Following the end of the BP grant, the Centre was maintained by the mathematics department as a service to all students in the university taking mathematics or statistics modules. In the late 1990s the University agreed to provide central funding and the centre was re-named the Mathematics Support Centre.

At this time, the Centre extended its reach by offering support to any student, whatever their programme of study, who needed help with mathematics, statistics or quantitative methods. In 2005, a joint submission from the Mathematics Support Centre and the Mathematics Learning Support Centre at Loughborough University for a collaborative Centre for Excellence in Teaching and Learning (CETL) was successful and the newly created CETL was named **sigma**. CETL-funding ran until 2010 at which point, in recognition of the service that **sigma** was delivering to students, the University agreed to substantial central funding so that the service could be maintained and enhanced. In 2011, the success of **sigma** (at both Coventry and Loughborough) was recognised by receipt of the Times Higher Award for Outstanding Support for Students.

Services offered

At the heart of our mathematics and statistics support are two drop-in centres: the long-established centre housed in the mathematics department; and a new (and now the main) centre in the Library, opened in 2010. Drop-in support is offered from these centres for a combined total of 58 hours per week, with the main centre opening 7 days a week during term time. This allows students to come at a time of their choosing and receive one-to-one attention from a member of staff. This relaxed, non-threatening support is always rated by students in evaluation surveys as the most valuable form of support that we provide.

The drop-in centres are attractive, welcoming environments which students are free to use as a place to work even if they do not want support from a tutor. Within the Centre we provide a wide range of short (usually 2 pages or less) handouts on a variety of topics from simple arithmetic through to advanced calculus. Students can simply select these from the display carousels and either work through them in the Centre or take them away to study at home. All handouts are also available for download from the Centre web-site at :
https://students.coventry.ac.uk/MathsSupportCentre/Pages/Home.aspx

For many years the website was open access, but a recent restructuring of the University's web presence has taken it inside the student area so access is now restricted to those with a University account. Every student, whatever their course of study, will find a link to the Maths Support Centre site from the Learning Resources link when they login into the University's VLE.

During induction week, large-scale diagnostic testing takes place. We have a range of tests tailored to the mathematics entry requirements for specific courses and the mathematical topics that are of relevance in particular disciplines. Students receive a printed personal diagnosis of their performance in a number of topic areas. This diagnosis may include the comment 'some revision may be needed in topic x'. At the end there is encouragement that, if the diagnosis has suggested revision may be needed, then visiting one of the drop-in centres is an excellent way to do that revision.

During induction week, there is an extensive programme of visits to the drop-in centres, organised in conjunction with course tutors, so that students find out where the centre is and what we offer. Wherever possible, we aim to hand out the personal diagnoses coming from the diagnostic tests during these visits. We also give short introductory talks that stress the nature of the support we provide; we emphasise that students can come with any level of problem – no-one is going to be told that their question is too basic. If something's a problem for a student, then it's a valid problem.

In addition to the drop-in centres, the Statistics Advisory Service (part of **sigma**) offers bookable, one hour appointments for students undertaking significant pieces of data analysis, usually in relation to final year undergraduate projects, taught masters dissertations or PhD theses. Staff colleagues also use this service quite regularly.

As well as these individual appointments, **sigma** delivers a series of 10 statistics workshops twice a year. Targeted at post-graduate research students and staff, these cover a range of topics from basic descriptive statistics, through questionnaire design to methods of inference and hypothesis testing.

The Centre also offers specialist support in mathematics and statistics for students with additional needs. This provision is generally quite bespoke. The most frequent requests come from students with dyslexia, in which case the Centre can call upon a specially trained dyslexia tutor. Other additional needs have included supporting blind and severely physically disabled students.

sigma will also provide highly targeted support to specific groups of students, such as workshops for nursing students struggling with drug calculations.

Mode of operation

The two drop-in centres are fixed locations that are dedicated maths support areas. The main centre is in the Library and opens 7 days per week. With **sigma's** full consent, the second centre, in the mathematics department, is used for mathematics tutorials during the hours before it opens for support. Not only is this efficient use of the space, it also gets students through the door of the support centre, making it more likely that they will return there for support on other occasions.

The one-to-one appointments provided by the Statistics Advisory Service mainly take place in a private office, although some are by phone or internet conferencing facilities. The statistics workshops take place in the interactive classroom equipped with CETL funding.

In addition, we operate an 'outreach desk' in The Hub (the main student building) four lunch-times per week. The outreach desk provides immediate support if the nature of the query is quite straightforward but, for more substantial inquiries, it refers students to one of the two main centres. This facility is a combination of high profile publicity in a venue visited by most students and also an opportunity for quick support.

The support service is delivered by a wide range of staff. There are a number of mathematics and statistics support staff, both permanent and sessional; many colleagues from the mathematics department make a much-valued contribution; a small number of academics from other disciplines also work with us. Finally, we employ some senior undergraduates to act as proctors working under the direction of a tutor in the drop-in centre or staffing the outreach desk. We provide in-house training for these students.

As a way of raising the profile of mathematics support in parts of the University that often do not engage very much with our services, we use students from the School of Art and Design to produce some of our publicity materials by designing postcards and posters.

Resources available

The resource that students most value is the personal one-to-one support from tutors. In addition to this, we have available a large collection of short, focussed handouts (almost all are no more than two sides long) which students can collect from either of the drop-in centres or download from the Centre website. The website also contains a substantial number of practice questions that the students do online and then receive immediate feedback on their answers – with pointers to appropriate resources should they get answers wrong.

In addition to the handouts, we also make available to students a range of the Facts and Formulae sheets produced by **sigma** in collaboration with the MSOR Network. Both Centres also have a small collection of key textbooks, available for reference. Students working in the Centre in the Library have a much larger collection of textbooks available nearby! Both drop-in centres have a number of PCs. Students primarily use these to work with mathematical and statistical software packages such as Matlab, MAPLE and SPSS. However, we also promote the mathcentre (www.mathcentre.ac.uk and mathtutor websites (www.mathtutor.ac.uk). We are fortunate to have our own small recording studio which we have used to make a number of short videos (in the style of the mathtutor videos), all available to students through iTunesU.

Service	Usage 2010/11
Drop-in centres	6403 visits
Statistics advisory	127 appointments
Statistics drop-in support*	130 visits
Statistics Workshops	55 delegates
Outreach desk visits	139 visits

*Students may attend the drop-in centre with statistics queries at any time, and many do. However, during certain advertised times, we offer specific statistics drop-in support to help students having difficulties using statistical software.

Evaluation and reporting

The University's Teaching Assessment and Learning Committee meets termly, and **sigma** is required to present a report at each of these meetings. The report covers matters such as the range of services provided (particularly highlighting new ventures), the level of usage of the various services, staffing, student engagement, external activities and future plans.

We seek feedback from students primarily through the use of questionnaires. We have, in addition, used focus groups to learn more about how the services are perceived. We also welcome feedback from academic colleagues in other departments.

Institutional and external recognition

As noted above, **sigma** won the 2011 Times Higher Award for Outstanding Support for Students. Other external recognition includes: Centre of Excellence status from HEFCE; positive mentions in the Advisory Committee on Mathematical Education Mathematical Needs report (2011); and in editorials of Mathematics Today.

Internally, the Mathematics Support Centre has been explicitly named in the University's Learning and Teaching Strategy since the late 1990s. The Centre is also prominently featured in the University's 2012-13 Access Agreement with OFFA.

The Mathematics Support Centre is often singled out for praise in course accreditation reports, particularly by engineering institutions, and also in QAA reports.

Student comments

Both past and current students speak appreciatively of the work of the Centre, its organisation and staff:

'Over my three years at Coventry University I spent a lot of time in the Maths Support Centre and I do believe that without it I would not have attained the qualification I did.'

'My memories of using the Maths Support Centre can be summed up in one word: 'excellent'.'

'Because of my stroke which I had when I was very little, my thought processes were dramatically changed and not for the better… I think that at the Maths Support Centre everyone helped me with some fundamental questions... the staff deserve all the praise due to taking their time and patience to assist with helping [me] to understand.'

'The Centre's service is nothing short of excellent. The friendly, welcoming staff are always available to support your studies where no query, question or problem is ever too much.'

'Maths is not a subject which you can teach yourself and it can be a daunting subject; therefore the one to one support is appreciated and the worksheets are really helpful.'

'Being an international student, sometimes it is difficult for me to catch and understand each and every thing in the class during the lecture. Therefore, Maths Support Centre provides me a great opportunity to learn the things that I was struggling with.'

'The Maths Support Centre has calm and friendly atmosphere and it is easy to approach any member of staff for help.'

'In the Maths Support Centre I am able to clear all my doubts and so it helped me to acquire success in all my modules.'

Challenges

- The biggest day-to-day challenge is getting all the students who need help to come for it. There is no easy answer to this. We use several approaches including promotion of the Centre by student ambassadors, regular advertising campaigns around campus and on 'message of the day' on the computer network, and recommendations by colleagues from other departments.

- Moving students beyond just wanting the answer to a particular question to gaining a broader understanding of the mathematics needed to solve that problem. We try to overcome this by spending time with students, talking to them and explaining the value of understanding over just getting the answer.

- Often students come for help with coursework assignments. It is usually possible to determine how to help these students understand the concepts they need to complete the work without doing it for them. However, sometimes students deliberately do not inform you that the work they are asking for help with is assessed coursework, and then things become more tricky.

- Funding. For many years, the Centre survived because it was underpinned by the Maths Department. In the end, we secured on-going funding by demonstrating (primarily through the volume of usage) that we met a real need in the student body.

Tips

- Cultivate friends in high places. Having support from the VC or a PVC can make a huge difference. Make an effort to show them what maths support can do. Keep the profile of maths support high within your institution.

- Develop good relationships with key staff across the University. A range of colleagues can help to make maths support a success. These include the head of the mathematics department, course tutors in a range of 'user' subjects, staff from the central study skills unit, the disabilities office, widening participation and the library.

- Network with colleagues in other institutions providing mathematics support through **sigma** regional hub meetings, CETL-MSOR annual conference etc. The maths support practitioner community is very open and encouraging.

- Encourage students to bring their lecture notes and tutorial sheets with them to the drop-in centre. This helps staff to see the context of the questions students are asking, enables them to use consistent notation and occasionally, when the topic is unfamiliar to the member of staff, provides enough information to be able to offer useful assistance.

- Keep verifiable usage statistics and feedback from client departments and students.

- Enjoy yourself. It's really rewarding seeing students gain confidence with a subject that has previously terrified them.

Case study: University of Portsmouth

The Maths Café

The Maths Café came into being to address mathematical skills deficiencies across the University. The main drivers for its establishment were:

- The needs of engineering students who were increasingly demonstrating significant variation in prior knowledge of mathematics both in material covered and level of understanding.
- The perception that gaps in expected mathematical skills, errors in comprehension, and lack of currency of mathematical experience were causing students to fail on courses on which they might otherwise be successful.

We were inspired by how a few other institutions had addressed such problems by setting up maths support centres, and set out to emulate them. From the outset, however, our ambition was to deliver support to successful students who wanted to be yet more successful, as well as supporting struggling students who needed help in order to stay on their courses.

In 2001 the Mathematics department considered and supported a proposal for setting up a mathematics workshop to be run by the department. During this year, a pilot support service was delivered, from which many valuable lessons about the essentials of location, publicity and friendly hours of operation were learnt. In 2002, the Faculty supported the venture with funding for laptops and publicity.

This was on the condition that, instead of being based in a fixed centre, we would work within the student union building on an informal basis. The Maths Café was officially launched at the opening of our new student union building, a team of four came into existence, and we started an extensive publicity campaign.

The support of the Faculty and the Mathematics department providing staff time and covering on-going publicity costs was essential while the Maths Café developed and proved its worth. After a short time of operation, it acquired a dedicated room within the Faculty which enabled us to extend the resources available to students while still continuing to operate in café locations.

We gained central funding after we had operated successfully for a couple of years. We had come to be appreciated not just for supporting students in numerate disciplines, but because we filled a gap for those disciplines with marginal need for mathematical skills – disciplines which would find it most inconvenient to tackle their students' mathematical deficiencies.

Services offered

- Face-to-face support for a total of 28 hours per week during term time with additional hours during the re-sit examination period.
- Dedicated resource room containing computers, printed resources, and facilities to display, print or scan materials open 12-2pm daily Peripatetic delivery across the campus between 1pm and 5pm using trolleys to transport essential resources so we can operate in locations including the Students Union café (1-3pm daily), the library café, the main Engineering building, a key Science Faculty building and another student café. This gives us high visibility and makes us easily accessible.
- The web page at: www.port.ac.uk/departments/academic/maths/mathscafe/ lists locations and hours of operation.
- A Maths Café 'course' in VICTORY, the Portsmouth University VLE, gives access to various resources and the staff duty rota.
- The Maths Café email address enables members of the team to respond directly to mathematical enquiries received by email.

Mode of operation

The Maths Café operates on a drop-in basis during term time and by appointment during the referral/deferral examination period.

Mostly we operate on a peripatetic basis. The member of staff on duty arrives in the advertised location with a Maths Café branded trolley containing a laptop and other resources, together with appropriate signage. Locations are reviewed annually to maintain maximum visibility and accessibility to potential users.

Maths Café is operated by the Mathematics department with all maths lecturers undertaking up to two hours of duty. There is a reserve rota to cover staff absence. Post-graduate students staff the café during the referral/deferral period and for approximately four hours per week during term time. There is an annual briefing session on 'what's new' for all maths department staff.

Resources available

Records are kept of the resources used during Maths Café visits. The most common entry throughout our ten years of operation is 'pen and paper', with 'student notes' coming in second. This seems to justify our early decision not to attempt to re-invent the wheel, but largely make use of extant materials produced elsewhere.

Of the printed materials available the First Aid leaflets, originating at Loughborough University (and now available at: www.mathcentre.ac.uk/), are the most commonly used. Other resources such as sections from HELM books are printed as and when required, although stores are kept of those most frequently requested. Locally generated materials include Refreshing Maths booklets (aimed at students on Computing courses), and some Stats Aid leaflets (designed to complement the First Aid leaflets).

The Maths Café base room additionally contains course notes and selected texts for some lecture courses at Portsmouth. These are essentially reference material to aid discussion and enable staff to comprehend the context of questions from diverse and less familiar disciplines. A summary of all the resources available is displayed in the base room and additionally stored electronically on laptops used peripatetically. Video clips, such as those from Maths Tutor or related to HELM can be shown in all locations.

The VLE includes links to MathCentre resources (developed at Coventry University), First Aid leaflets, nationally developed HELM resources, and Refreshing Maths workbooks.

Usage statistics

In 2002-3, our first year of operation, we recorded 198 student visits. Usage grew fairly steadily to reach just over 1000 visits in 2008-9. Since that time the number of visits has stabilised, and we expect approximately 1000 visits per year. Many go unrecorded due to the peripatetic nature of the Maths Café.

Approximately 51,000 students have registered on our VLE course since its introduction. Most were self-registrations, but now students are automatically registered on the course. The site currently has an average of 55 visitors per day, with over 10,000 visits in the last six months – a significant increase on the previous two years for which we had an average of 20 visits per day.

The number of email requests per week is still in single figures. Most weeks we receive at least one email request from a post-graduate student.

Evaluation and reporting

The Maths Café regularly reports its activities at Mathematics department staff meetings and the Mathematics Teaching and Learning Committee. The Maths Café presents a formal annual report to the University Student Support and Advice Committee, on which we are also represented. Reports on university wide support facilities received by this committee also provide us with more information about our effectiveness. Recently an internal university survey identified that 64% of respondents were aware of the Maths Café within the first two weeks of term.

Institutional and external recognition

Internal recognition was first evident when the Maths Café team received a University Teaching and Learning award. This funded some of the early resources and allowed the facility to develop further.

The University further recognised the institutional value of the Maths Café by providing central funding for the facility from 2005-6 onwards. In University documentation the Maths Café is generally listed on the same terms as centrally run support services.

The Maths Café's role in supporting students on courses with only minimal mathematics requirements is highlighted in internal quality reviews. We are now so well established that, for courses for which maths requirements are greater, we are frequently highlighted on course information sites (including post-graduate sites) as a distinctive feature.

The Maths Café now forms part of the University's 2012-13 access agreement.

Student comments

'If it wasn't for the Maths Café I would not have managed to get onto the second year of my course.'
Business school undergraduate

'I found the Maths Café very helpful. It was very easy to find. Both the time and place were convenient for me.'
Final year student of English seeking statistics support for dissertation

'I have personally found the Maths Café extremely helpful, especially during the first few months of my course this year. I would like to thank those people who helped me to understand certain topics. I think the Maths Café is a valuable resource to students.'
Engineering student

Challenges

The three biggest challenges in setting up the Maths Café were:

- Turning vague general support for the idea into sufficient financial support to launch.

This was addressed by repeatedly presenting and re-packaging the ideas. Piloting a maths support scheme and presenting budgeted proposals helped keep the idea alive in the minds of those with the power to kick-start the venture.

We were flexible, and compromised on the scale of the project – from which we benefitted in the long term. Once we had proved ourselves successful, getting full funding was a relatively small step.

- Convincing mathematics academics that this was an activity worthy of their full support and involvement, and not something that should be delegated to a subset of staff.

This challenge was addressed by circulating a written maths support proposal around the department setting out costs and benefits. The facility is open to maths students, and therefore provides a means of ensuring that lecturers are accessible to our own undergraduates.

- Publicity: making sure that potential users knew about us and then wanted to visit.

The peripatetic nature of the Maths Café meant that we knew, at the outset, that we needed to very 'obvious', and straightaway developed eye-catching publicity to get ourselves known.

Tips

Top tips for anyone wanting to set up a similar facility would have to be:

- Start by getting together a team of people who are committed to improving maths support.
- Invest time in preparing and presenting proposals. Go directly to anyone and everyone who might have a hand in making the decision to allocate the funds that can get you started.
- Launch loudly, keep a high profile and keep a positive profile – otherwise you risk only being known to major users, or being seen as only doing 'repairs' rather than also being useful for enhancement of skills for successful students.
- Keep evidence that you are useful – full funding might depend on this.
- Never let up on publicity. Every potential user should know about maths support before they need it – which is very likely to be in their first year of study.

Case study: University of York

In 2009, a cross-departmental working group at York identified a need to enhance certain students' mathematical knowledge and skills. Following the lead from other institutions who already offered supplementary support in this area, a funding application was submitted to **sigma** CETL in May 2010 which secured £15K over two years.

The bid was supported by members of the working group, the University's Pro-Vice Chancellor for Teaching and Learning, and by members of the Learning Enhancement Team. Essential to the bid was the agreement that the University would provide matched funding.

Services offered

During its pilot in the 2010/11 academic year, York's Maths Skills Centre offered drop-in support for first year students studying subjects that taught, or assumed knowledge of, algebra and/or calculus. A drop-in service ran from the fourth week of the first term to the sixth week of the third term, a total of 26 weeks. During the first two terms, drop-in was available for 14 hours per week; in the third term this was increased to 16 hours. Bookable appointments were trialled from the sixth week of the second term.

In the 2011/12 academic year, hours of drop-in have continued at the rate of 16 a week, including four for bookable appointments. Support is now offered to all first- and foundation-year students. Throughout the year, various workshops are available on a sign-up basis (for example, 'Descriptive statistics' and 'Hypothesis testing').

Online resources are available via the University's virtual learning environment (Blackboard VLE). The Centre has a public-facing website at: www.york.ac.uk/maths-skills-centre.

Mode of operation

The main form of support is a drop-in service, located adjacent to an open-plan student study space within the library: a subject-neutral location accessible to students from all disciplines. Students visit without appointment during opening hours and are seen by the Project Officer or a postgraduate student.

The drop-in is available to all students at the University, but priority is given to first year undergraduates (via a queuing system). One afternoon a week is dedicated to statistics support. There are four hours of one-to-one or group appointments with the Project Officer, booked by students via our website. These are typically chosen by those who wish to go over a topic in more depth, or who have been referred after a drop-in visit.

Postgraduate teaching assistants in the Centre are trained using **sigma's** guidance. In 2010/11 they attended a one-day workshop in Loughborough where they considered issues such as encouraging students to problem solve, do's and don'ts, and online resources. Further training is arranged ad-hoc by the Project Officer.

Resources available

Physical resources:

- Textbooks (all recommended first-year textbooks, together with appropriate-level additional texts, eg, complete collection of the Schaum's outlines series)
- Printed copies of HELM workbooks
- Printed and Bound copies of Engineering Maths First-Aid Kits
- Netbook computer and Apple iPad to access online resources and apps (Maple, Matlab, Wolfram Alpha, Geogebra etc)
- MathCentre Fact and Formulae booklets for students to take away

Online resources:

- PDF versions of the HELM workbooks (single sections only, in a password protected area)
- Imperial College's METRIC suite of online mathematics resources
- Bespoke web-resources created by the Project Officer to address common questions from students where these resources are not available elsewhere (for example, from mathcentre or khan academy)

Usage statistics

Usage information is based on scans of student library card barcodes. When a student visits the Centre their barcode is read and written to a password-protected database. From the database, the University's student record systems can be queried, and graphs and tables containing additional data (eg, departmental breakdown) are automatically generated, thus protecting the identity of individual students.

We do not collect, query or save any other personal information (such as name, age or gender).

A caveat with the statistics presented in this section is that, when students visit the Centre drop-in, they typically have more than one question to ask the tutors. So, the following usage data should not be interpreted as accounting for 'units of help' offered to students.

In the 2010/11 academic year there were 163 unique visitors, with 731 total visits over 23 weeks of operation (7 in term 1, 10 in term 2, and 6 in term 3). This averages at 4.4 students in each two-hour drop-in session. 94 students have visited the Centre more than once, with 48 visiting five or more times, and 17 more than ten times over the year.

	Term 1	Term 2	Term 3
Number of weeks operational	7	10	6
Total drop-in hours	98	140	96
Total student visits (visits/hour)	226 (2.3)	365 (2.6)	140 (1.5)
Total unique visitors in term	72	82	55
Students new to the Centre	72s	51	40

Evaluation and reporting

Together with routine analysis of quantitative data, in the 2010/11 academic year, the effectiveness of maths support provision was evaluated via student surveys, interviews with students who had used the Centre's drop-in, and focus groups with students who had not.

After the first term's operation, an interim report was written for the University's Teaching Committee. The report contained a description of the service, usage data, analysis of the first term's questionnaires and a six-month plan for expansion of provision. It was well-received, and resulted in additional funding to expand the Centre's opening times to include Fridays.

Later on, a full-year report was written, updating the Committee on the first two-term's operation. This larger report contained a business plan for the continuation of York's Maths Skills Centre, including sustainable models for reduced, continued and expanded service. The report recommended model 2 (continued service) in the 2011/12 academic year, and model 3 (expansion) in 2012/13. This recommendation was approved. The University has now committed to fund the full costs of the Centre post-2012.

Institutional and external recognition

The value of providing maths support at The University of York has been recognised by the University Teaching Committee which, in conjunction with the Academic Registry, increased funding for the project during the pilot year.

In terms of University policy, the development of maths support was itemised in the University's OFFA agreement for the 2012/13 year, and the Maths Skills Centre was also itemised in the University's recent QAA institutional review self-evaluation document as evidence of the steps taken at an institutional level to improve the quality of students' learning opportunities.

On a national level, the project was included as a case study of impact and sustainability in **sigma's** submission to the National HE STEM Programme. The project's evaluation methods have been included as worked examples in AMOSSHE's Value and Impact (VIP) toolkit, and the project's evaluation plan, focus group schedule and interview schedule were given as worked examples.

Student comments

As noted in the Introduction to this report, the Maths Skills Centre is not intended to replace departmental support and tuition, but to complement what is already provided. The following quotes suggest that, for some students at least, the Centre has been a success in this respect:

'Because of the course loading and the amount of work you've got to do, you don't really have the time to be searching and crawling through books, trying to find a book that explains it to you in an appropriate way. Just going [to the Maths Skills Centre] to speak and go through it can take them five, ten minutes… it's saved me hours.'
Physics

'Especially in the second term it [the Mathematics] is very difficult. There's nothing I can't learn, but it's taking a lot of time. That's why I've been going to the Maths Skills Centre.'
Foundation Electronics

'We asked our tutor if there was any chance of extra maths tuition… we were feeling out of our depth. He basically said 'No, but there is this Maths Skills Centre, why don't you go along?'.'
Astrophysics

'At the time [when she heard about the Maths Skills Centre], I was like 'I can't do any of this', so I just popped in really.'
Economics

When a student visits the Centre the type of support offered depends on the topic the student is struggling with, how busy the Centre is, and the type of question asked. Therefore, there was a variety of experiences when students used the service, but all valued the service and study space in the Maths Skills Centre.

'I just sat down for an hour and we went over loads of stuff, which was amazing.'
Environmental Geography

'I've met new people there with a similar ability to me and people who have been stuck on the same questions, and I've been doing work with them, which has been really helpful… It's much better to work, and if you get stuck, you can ask someone who knows what they're talking about.'
Economics

'I find the Maths Skills Centre a lot more helpful [than problem classes]. It's every day of the week that you can go, and they can help you with whatever you're struggling with.'
Physics

'I usually go in with a problem, solve it, and then just carry on working while I'm here. So I have it as a bit of a study room as well.'
Astrophysics

'It's very convenient, and I think really nice that you can just drop in. You don't have to wait very long.'
PPE

Challenges

- In order to begin providing maths support it will often be necessary to employ a person to both manage the project and to teach mathematics in the centre. (Although other models are possible, for instance a project manager supported by PGWT and/or bought-in staff). Individuals with experience in both teaching and managing are rare, so institutions should be aware that the post holder may need support in those areas in which they are less skilled.

- There are a wide variety of perspectives on what constitutes 'appropriate maths support'. These can be contradictory. Some, for example, may feel that support should only be offered for transition-level content; others may think that advanced modules should be supported to the same extent as modules from the first year. When starting a maths support service, it is therefore important to consult with staff widely (different academic departments, non-academic and support staff). Then, a steering group can decide on an eventual scope for the support offered that is a compromise between these ideals.

- The timescales involved in planning, creating, advertising and running a maths support centre are tight. Although it may be desirable to start providing support for students as early as possible in the academic year, this may result in less time for planning of evaluation activity, and advertising the service to students. Ideally, a project manager should have the summer to prepare provision for the following academic year.

Tips

- The support and guidance of senior management is important to steer any provision in the direction that is institutionally desired for longer-term continuation of the service.

- Plan a framework for evaluation early, and stick to it.

- Keep the remit (eg, subjects and levels covered) small in the first year and expand slowly.

Case study: University of Lincoln

A mid-2009 visit to the University of Loughborough's Mathematics Education Centre helped University of Lincoln staff recognise that developing maths support was worthwhile because their own institution had no service like that of its regional competitors.

Explicit strategic support at Lincoln was quickly gained from the Heads of Schools in Engineering and Business, amongst others, to establish a new Mathematics and Statistics Support Centre (MSSC).

In March 2010, with urgent direction from the Vice-Chancellor, Estates and the University's Library which leads on Learning Development, a Library room was commissioned to house the MSSC. This space allowed drop-in support to 78 students to be provided from mid-March for 10 weeks by 2 staff for 3 hours a day, 3 days a week.

In July 2010, the MSSC successfully won £15k of matched-funding from **sigma**, the delivery partner with the National HE STEM Programme. The MSSC co-ordinator attended **sigma** events so as to engage with colleagues in mathematical education who were further along in their provision, service, evaluation and development of Support Centres. The 2010 CETL-MSOR Conference (Birmingham) and **sigma** regional meetings (Ipswich and Coventry) provided a rapid and effective foundation for the new work in its first year, 2010/11, both operationally and from a research perspective.

Services offered

The service adopted a revised version of Lincoln's 2009 Learning Development Code of Practice which outlined that its MSSC would offer advice on:

- structuring an assignment, especially its numerical contribution
- proof-reading a quantitative report
- planning and delivering a presentation that includes numerical outputs
- relevant resources of a mathematical and statistical nature
- structuring a report in terms of its tables, graphs and outputs from SPSS
- referencing mathematics and statistics work.

A handful of students have benefited from guidance on dyslexia and dyscalculia, via Loughborough's helpful literature, and some questions were asked about diagnostic tests for employers.

In early 2010, service provision over the 9 weeks from launch date was 2 staff each giving service for 3 hours a day, 3 afternoons a week.

In 2010/11, in the 34 weeks from Induction to June, the Co-ordinator alone provided 9 hours of service weekly across 3 afternoons. An Assistant Advisor started work in February 2011, adding another 9 hours capacity per week. In the quiet summer period, weekly opening hours were three 3-hour sessions.

The MSSC's first web page (in WordPress) was enhanced significantly in 2011 by the addition of a dedicated Blog (http://mathsandstats.blogs.lincoln.ac.uk/) and use of Twitter to supplement the original static display of Opening times, Contact points, Resources and Code of Practice.

Mode of operation

The MSSC has always provided a drop-in mode of service from one central room in the Library on the main Brayford Pool campus. At the most busy times, a simple booking system operates.

Usage has been seen across almost all Schools on this medium-sized campus. Students of Equine and Biological Studies have to travel for service from another campus at Riseholme Park, Lincoln does not have a mathematics degree in its portfolio, but from 2010 does house the first new UK Engineering School in over 20 years, teaching some demanding mathematics. The anticipated support for engineering students in 2010/11 did not materialise due to Engineering's very strong internal support system. But, in 2012, a closer link-up should occur between the MSSC and Engineering, conditional on a funding application to implement web-based on-line support in testing.

John Flynn co-ordinated the MSSC from its 2009 conception. He was well-placed for the role, being a statistician in Health, Life and Social Sciences and also having 15 years lecturing experience in the Lincoln Business School. Being a sole Advisor and Co-ordinator, he needed considerable project management skills to advance the MSSC by a publicity campaign, organisation of resources, attention to the budget, spend and achievement.

Laura Daley, a part-time Advisor, has now taken over the entire co-ordination responsibility, enhancing the impact of the blog and social media, as well as adding other web-based resources on statistical work to the MSSC's portfolio.

Training for the role has chiefly come through involvement in the regional events and annual conferences organised by **sigma**-CETL, which have provided excellent career development.

Resources available

The room for the MSSC was refurbished and made fit for purpose with a plasma screen and 3 PCs, and includes a small library of 15 core texts, many of which are SPSS based to support assignment work. The HELM (Helping Engineers Learn Mathematics) materials and other resources (adopting a 'Loughborough model') are conveniently available. Resources on dyslexia and dyscalculia have been useful on several occasions.

Turning to web-based resources, the Mathcentre and Mathtutor websites are often turned to and quickly displayed on the plasma screen when small doses of teaching are required. Interestingly, the BBC Bitesize resources

and AQA/Edexcel exam papers can be useful for students as they recall their recent school maths experiences (and revisit what they have forgotten). The current Advisor has added several video resources such as the Khan academy and Hans Rosling's famous 'The Joy of Statistics'.

Usage statistics

The MSSC keeps paper records of each student visit (duration, content and advice given, at what level and School/Faculty). A registration form records consent and preferred mode of contact.

The vast majority of requests have been statistical in nature (78%) rather than mathematical (18%), reflecting high demand from the Lincoln degrees in Business, Psychology (about one third of all visits), Sports Science, and Natural and Applied Sciences.

In its first full year of operation, the 34 weeks to June 2011 produced 225 visits from 177 different people. The breakdown of these visits by level of study is shown in the table below.

Level of study	Frequency (%)
Level 1	36 (16.0)
Level 2	38 (16.9)
Level 3	112 (49.8)
Postgraduate	39 (17.3)

Usage occurred across 11 Schools. Psychology, Natural and Applied Sciences and Sports, Coaching and Exercise Science (all in one Faculty) generated over 75% of visits, with about one in seven visits coming from the Business School.

Evaluation and reporting

For 2010/11, the University's Registry distributed the MSSC's evaluation questionnaire using its Viewpoint software. Students who had consented to being contacted were emailed via their student ID or anonymous exam IDs and invited to participate in a 15 question questionnaire.

Assuring anonymity and confidentiality was an important priority; reviewers of a research proposal had noted the potential conflict of MSSC attendees being taught and formally assessed by an MSSC Advisor – and then subsequently completing an evaluation of his service.

Reporting requirements have been formally limited to **sigma** (the matched-funding body), who require interim reports prior to funding payments being authorised, in fulfilment of the requirements of the Letter of Agreement.

Institutional and external recognition

The MSSC has received vital support from the Vice-Chancellor and Senior Management, and it is clear that, in a short time, it has established itself as a key part of the University's support for Learning Development. As the **sigma** funding comes to an end, it is hoped that funding will be put on a permanent basis, through discussions as part of the University's Annual Planning round.

The MSSC has begun to play a wider role as part of the **sigma** network, and to expand its contacts within the University.

Student comments

Anecdotally, students seem happy with the MSSC's service, given that none of the 3 Advisors has detected dissatisfaction with it. In terms of hard evidence, the 2010/11 questionnaire produced these findings (17 responses from 97 targeted email addresses):

The MSSC's website was not influential in promoting the service, but Advertising in the Library and promotion by Academic Staff were influential. A large majority (15 out of 17) stated that the support and guidance they received noticeably helped their work. There was a 50-50 split on whether the support helped people stay on their programme.

Confidence in work improved after the visit (noted by 14 out of 17), the same number who said they would revisit the MSSC.

Three written remarks from students, including a medical researcher, provide encouragement :

'My results are through for my resits and I passed, receiving a mark of 56.0 for my assignment. I could not have done it without your invaluable help, so thank you. You do a really good job at the help desk.'

'Thank you very much for all of your help, I could not have done it without you.'

'I was at a loss as to how to go about presenting my data in a proper scientific way, so consulted (name removed) for guidance. The advice I received from (name removed) proved to be extremely helpful, and he provided one-to-one support in addition to drop-in sessions. This served to instil confidence in my approach to the statistical aspects of the project.'

Challenges

The three most challenging things faced at Lincoln when setting up its maths support were that :

- Lincoln does not have much mathematics in its programmes. Statistics is much more dominant, and here there are fewer resources comparable in excellence to HELM, Mathcentre and Mathtutor on which to draw. For all that, the support of statistics work is easier if a statistician with a teaching gift is available.

- Anticipating 'busyness' and staffing level is required. To some extent, you might plan a staffing schedule – and hope the students arrive! Timeliness of publicity is important to draw attention to the merits of the service.

- The willingness of 'volunteers' to work in the MSSC is not guaranteed; no comment needed here on why that's a challenge!

Tips

Three tips for new starters are that you ensure you have a:

- 'Work breakdown structure' to identify all work packages of the project and the hidden risks in, for example, publicity, communications, quality of the room, recruitment of staff.

- Good knowledge of the assessment regimes so as to be prepared for seasonal demands. Lincoln's MSSC experienced heavy demand for coaching in the use of Analysis of Variance to produce statistical analyses for dissertations.

- Suitable record-keeping system that produces information about attendance and achievements to convince your management and Vice-Chancellor that you can seriously manage a new provision.

Case study: University of Kent

Student Learning Advisory Service (SLAS), UELT, University of Kent

The Student Learning Advisory Service (SLAS) is a free, friendly, advice service providing guidance and information on all aspects of effective learning and study skills to ALL students (undergraduates, postgraduates, home, international, full-time, part-time, or mature students).

However, there was a perceived gap in what we offered students in terms of specific maths and stats support. Many students at the University need to use maths and stats effectively in their programme of study (eg, Psychology, Biosciences), but do not necessarily have the relevant skill set on which to draw.

Students had requested maths and stats support for a very long time. This was previously provided by a virtual stats helpdesk in the School of Mathematics, Statistics and Actuarial Science (SMSAS). However, in the past few years, the nature and volume (from a few enquiries to around 40-50 per term) of requests for support have expanded significantly, partly due to the impact of the Widening Participation (WP) initiative and the increase in students from non-traditional educational backgrounds. As a result, students require a more thorough, coherent and comprehensive approach offered in the non-judgemental and impartial setting that a clinic within SLAS could provide.

Consequently, SLAS evaluated the feasibility of running maths and stats clinics during the academic year of 2009-2010. In partnership with SMSAS, SLAS recruited three postgraduate students to staff the clinics. These started towards the end of October 2009 and identified a strong student engagement with the initiative. SLAS managed to secure limited funding to pilot a number of clinics where students were able to access help and support in maths/stats within SLAS.

Being able to consult someone in a neutral, dedicated, and inclusive environment proved popular with students, with many taking advantage of the pilot service. During the Autumn and Spring terms of 2009-2010, we ran the clinics for 20 weeks, where a total of 86 students attended the sessions for maths and/or stats. A proposal was subsequently made to **sigma** to secure funding to embed the clinics as a fundamental element in learning support, thereby responding to students' needs and enhancing their learning experience.

Services offered

SLAS offers academic advice and guidance to students through 1:1 confidential appointments with a learning advisor, as well as workshops and seminars. Opening hours are 9.00am to 5.00pm Monday to Friday, all year round. Additionally, SLAS provides a number of study guides and other resources. The link to SLAS website is: www.kent.ac.uk/uelt/learning/index.html

Mode of operation

SLAS offers maths and stats clinics for a total of 8 hours per week – 4 hours maths and 4 hours stats respectively – throughout the Autumn and Spring terms, and for the first 3-4 weeks of the Summer term. Postgraduate students are recruited from SMSAS to serve as mentors/tutors. Regular meetings take place with the manager of SLAS as well as with the maths and stats coordinator.

Based on general student attendance patterns and mentor availability, the clinics were initially run on Wednesdays and Thursdays. Subsequently, they were offered only on Wednesdays as these afternoons are free from regular teaching sessions and thus allow students greater flexibility to attend. Students arrange an appointment by email, phone, or in person.

The clinics were initially located in SLAS' consulting room in the Unit for the Enhancement for Learning and Teaching (UELT) on the Canterbury campus. As space has been a major issue, rooms within the vicinity of SLAS were booked to respond to the difficulties arising from this problem. Mentors are offered the opportunity of attending any of the **sigma** training workshops.

Resources available

- Leaflets from Mathcentre
  - What is available in 2007?
  - Facts and Formulae
  - More Facts and Formulas
  - Mathematics for Computer Science Facts and Formulae
  - Mechanics Facts and Formulae
- Worksheets – Help with Maths: Foundation Maths; Open Learning Series; Maths Extra

The maths worksheets are designed to help students from any academic discipline to brush up or boost skills and confidence in some aspect of maths related to their studies. The level of mathematics covered in the worksheets varies widely: some materials are aimed at GCSE level, others are much more advanced.

- Books – the range includes:
  - Engineering Maths First-Aid Kit, Anthony Croft
  - Working with charts, graphs and tables, Kathleen Gilmartin and Karen Rex
  - Maths: A Student's Survival Guide, Jenny Olive
  - Concise Dictionary of Mathematics
- Additional and online materials devised by mentors

Usage statistics 2010/11

- 176 students attended a 45 minutes appointment during the clinics over the two terms: autumn and spring.
- 59% of students were in year 1 with 24% being postgraduate students.
- The proportion of male to female was 29% to 71%.
- 36% of students were from SMSAS.

Demand for appointments remained fairly consistent over the academic year. In fact, there were more requests for appointments than timeslots available which meant that, unfortunately, some students had to be turned away. Attendance across the three terms stood at approximately 80%, which is consistent with the levels in other one-to-one appointments with students across the University.

Evaluation and reporting

The manager of SLAS, in conjunction with the maths and stats coordinator has these roles:

- Monitors attendance
- Studies patterns of attendance – eg, demand for more than one session
- Supervises student evaluation
- Identifies from student feedback areas for refinement or development
- Produces a brief Annual Report for discussion within the SLAS team
- Is responsible for feedback to schools/academic departments on general issues arising from the mentoring scheme, which may have implications for teaching and departmental support systems
- Is responsible for feedback to **sigma**
- Aims to produce a paper for one of the relevant academic journals reporting on the project and outlining any significant findings from the project.

Institutional and external recognition

As the maths and stats clinics have become an integral part of SLAS, they will continue to enhance significantly students' experience of studying at Kent. The partnership with SMSAS will ensure the sustainability of the clinics, as it makes use of current postgraduate students thus keeping costs affordable and sustainable. UELT is committed to continue to support the expansion and development of maths and stats support in future years and to promote the service to all students through continuing partnerships with Schools.

Student comments

Anonymous feedback questionnaires (75 respondents) have been overwhelmingly positive. 92% agreed/strongly agreed that the clinics provided an opportunity to discuss their concerns, while 94% agreed/strongly agreed that they found the advice useful and practical. 81.3% preferred the face-to-face format, but there was also support for additional online resources. Overall, students highly valued the availability of the clinics as an additional, external and individual source of targeted learning support.

'I was given a very useful perspective allowing for a personalized solution'.

"I was given the opportunity to speak out my concerns and not just filled with information."

"Tutor was perseptive [sic] in identifying my difficulties."

" I think it should be advertised more, so people who experience problems with maths or stats know about this brilliant place and what it can offer to help them."

"I was very happy."

"Increase the amount of appointments available!!"

Challenges

The main challenges and their resolution were as follows:

- Sustainability of the maths and stats provision: This was achieved through the recruitment of postgraduate students and SLAS' partnership with SMSAS
- Use of a dedicated space for the clinics: resolved through using timetabled facilities on Wednesdays within close proximity of SLAS. Non-Wednesdays appointments can be arranged on request.
- Timing of the clinics: setting up of the clinics on Wednesday afternoons to ensure maximum accessibility for students and avoiding potential timetable clashes.
- Greater need than available slots: offer 30- rather than 45-minute appointments to increase capacity.

Tips

- Seek support from the higher echelons within the university
- Develop strong partnerships with relevant schools/academic departments
- Raise awareness of the maths/stats provision through advertising, especially amongst teaching staff, and by giving regular feedback to schools/academic departments on any key issues/findings as appropriate.
- Monitor student demand, and use this to develop the future provision and expansion of the clinics.

Overall reflections and challenges

Mathematics support is a labour intensive activity. Feedback from students shows that the feature they value most is the opportunity for one-to-one interaction with a tutor who is prepared to spend time with them, going as far back as necessary, to enable them to build from what they know and thereby to grow their confidence as well as their understanding.

This, of course, means that mathematics support comes at a cost. If an institution is serious about providing mathematics support, then it has also to provide adequate funding. This can be a major challenge as it is not easy to demonstrate a clear cause and effect in the outcomes of mathematics support.

On the one hand, the arguments appear quite powerful. The income lost to an institution when a student drops out mid-year or fails at the end of the first year (and so does not enrol in subsequent years) means that if maths support enables only a handful of such students to stay on course then it will pay for itself.

On the other hand, establishing that maths support has actually made the difference between continuation and drop out is very difficult. Students will sometimes state on feedback forms that it is the maths support centre that has kept them on course and enabled them to succeed, but even such definite statements are questionable. If maths support had not been there, might they have found some other source of input to facilitate their learning?

This is not to say that established mathematics support centres have not undertaken evaluation of their activities. A range of different methods are used in evaluation including quantitative measures of student usage and qualitative data from student feedback questionnaires. As part of the HE-STEM programme **sigma** has produced an evaluation guide, Gathering student feedback on mathematics and statistics support provision, which can be downloaded from www.mathcentre.ac.uk/resources/uploaded/**sigma**-brochure-for-accfeb5-finalv1opt.pdf. This guide contains a wealth of information and guidance for evaluating mathematics support centres and should be read by all involved in establishing new provision.

However, the 'holy grail' of showing incontrovertibly that a maths support centre is responsible for a specific increase in pass rates or in examination marks remains an impossible task. A collection of published work on the evaluation of mathematics support is available on the mathcentre web-site at www.mathcentre.ac.uk/staff/types/staff-resources/measuring-the-effectiveness-of-support-centres/. Notwithstanding the evaluation difficulties, there is a growing acceptance that mathematics support can be an important part of a university's student support provision. Through the HE-STEM programme, **sigma** has provided funding to 14 institutions in England to start mathematics support, and the Welsh spoke of HE-STEM has helped to fund the establishment of 8 maths support centres. This is in addition to many other institutions which have developed their own provision independently.

The hard cause and effect data may be missing but the volume of softer, proxy measures is becoming overwhelming: there are now very few who doubt that maths support is a good thing for students.

Mini action plan

The steps below are suggested for those wishing to establish a mathematics support provision in their institution.

Raise awareness of the need for mathematics support at all levels from the VC down. Point to external reports such as ACME's Mathematical Needs (2011) and the National Audit Office's Staying the Course (2007). Highlight Access Agreements at other institutions that refer to mathematics support. Contextualise with local evidence (eg, poor progression and retention rates due to mathematics/statistics difficulties).

Cultivate good relationships with course leaders and tutors in departments where mathematics and statistics are used. Ensure that the needs of individual disciplines are recognised and accommodated – a one-size fits all approach will not be the most successful.

Likewise, engage with the central study/academic skills unit if there is one.

- Engage directly with students both to gain further evidence of demand and to seek their input to planning the provision
- It may be advantageous to create a (semi-)formal working group.
- Formulate a realistic (but not over-ambitious) costed proposal.

Issues to be covered in the proposal include:

- A clear scope of which student groups you are targeting (eg, all students, first years, certain subjects, etc.)
- Mode of operation (eg, fixed location or peripatetic, drop-in service or appointments)
- Opening hours – be realistic, you do not want staff to have nothing to do because demand is too low for the number of hours available but equally you do not want too many students at the same time as they will get a poor quality of service.
- Staffing – who will deliver the support (eg, academic staff as part of their normal duties, hourly paid tutors, PhD students)
- Staff training – this is particularly needed for PhD students but all who are to deliver support would benefit from training as this activity is quite different from normal teaching. It is essential that staff who work in mathematics support can promote the supportive ethos of the centre.
- Resources – do not re-invent the wheel, there is a large quantity of high quality free resources available over the internet; use these rather than creating your own.
- Equipment – as a minimum you will need a PC with internet access.
- Location – you may have to settle for whatever the university will give you, but there is no harm in specifying your ideal location: somewhere that is regularly passed by students – this could be a room in the Library or in the department of a targeted group of students.
- Environment – wherever your location make it as physically attractive as possible, aim to create a welcoming, inviting atmosphere.
- Publicity – consider how you are going to ensure that students are aware of the provision and how they are going to be encouraged to use it. This can be particularly difficult when the provision is starting mid-year.

Top tips

- Do not re-invent the wheel – make use of freely available resources and of experience published on the internet, in conference proceedings and in journals.
- Cultivate a senior champion of mathematics support – ideally the VC or the PVC (Learning and Teaching).
- You will not be able to do this on your own – bring together interested colleagues from across the university (other academic departments, student support, etc).
- Make your branding about 'improvement for all' rather than 'saving failing students' – the latter creates an impression of remedial activity and thus possibly embarrasses potential attendees.
- Be clear about your ethos (eg, non-judgemental, supportive, 'No question too basic')
- Beware of becoming a replacement for normal teaching – mathematics support should be additional not substitutionary.
- Network with those in other institutions who are providing maths support (for example, through a **sigma** regional hub and the annual CETL-MSOR conference).
- Have a clear plan for advertising and publicising the support provision – deploy as many different methods as you can think of, including using students to promote the provision and to produce publicity materials.
- Keep accurate records of how much the provision is used.
- Enjoy yourself – helping students to achieve their full potential is a very rewarding experience.

Conclusion

Recent discussions by the Secretary of State for Education suggesting a major reform of assessment in secondary education in England indicate that the need for maths support is likely to remain for many years to come.

The DfE has already set in train a process to review all A levels (including mathematics) and the Minister's latest proposals regarding GCSEs will, if implemented lead to even more wide-reaching reform. Previous experiences with major curriculum change, such as the introduction of Curriculum 2000, have created significant problems at the school/college to HE transition. Maths Support Centres will have a role in addressing the issues caused by impending and future curriculum reform and in helping students to successfully transition.

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