epilogue

*"We – Trevor part-time at Coventry and Moira full-time at both universities – have led the operational activities of **sigma** and have been delighted to be involved in its development and growing influence across the sector, in the UK and beyond. Being afforded the opportunity to work with such enthusiastic and creative practitioners has been a delight. The fact that our work has been recognised through continuation funding is a fitting testament to the benefits that **sigma** has brought."*

Trevor Hawkes (Associate Director) and Moira Petrie (Assistant Director)

"The one-to-one approach was essential as was the non-judgemental attitude of the lecturer who took pains to explain what would no doubt have been ordinarily an elementary point with patience and understanding."

PhD student, Loughborough University

"Alun and Gale did their best to make a rather dry topic interesting and accessible.They were also very patient and approachable which I feel was very important and they deserve praise for this."

Statistics Workshop Delegate, Coventry University

*"**sigma** has supported nursing students at Coventry University by helping to make the Maths Support Centre a more friendly place to study with approachable staff and resources, including worksheets, books and equipment."*

Mollie Gilchrist, Faculty of Health and Life Sciences, Coventry University

*"There is established ever growing evidence that **sigma** is having a substantial impact upon the level and nature of mathematics and statistics support offered to students from across the whole of the UK. The model of mathematics support pioneered by **sigma** has been widely adopted within HEIs across the UK, and it is clear that these HEIs are further developing the '**sigma** model´and tailoring it to their specific needs."*

Michael Grove, HE-STEM Programme Director

"There is no doubt in my mind that the CETL project and the MLSC activity in general is of major benefit to students of Economics and consequently it is a major support to the Department."

Prof Tom Weyman-Jones, Department of Economics, Loughborough University

"The one-to-one support provided by the Centre is much appreciated by the students who use it. The numbers attending and the fact that many come back regularly testify to the perceived value of the assistance."

Dr Bill Dunn, Mechanical Engineering and Design, Coventry University

*"The development of MASH and **sigma-sw** with the support of the **sigma** team has allowed me to develop professionally both in terms of leadership potential and in providing opportunities to learn from colleagues to help me provide the best possible service to students both directly at Bath and indirectly through regional collaborations."*

Jane White, University of Bath

*"May I offer all at **sigma** many congratulations."*

Professor Celia Hoyles, Director, National Centre for Excellence in Teaching Mathematics

*"We would like to thank the management committee and steering group and, in particular, all **sigma** staff, colleagues and students with whom we have worked without whose enormous effort and prolonged enthusiasm none of these successes would have been possible."*

Duncan Lawson and Tony Croft

Loughborough University

Coventry University

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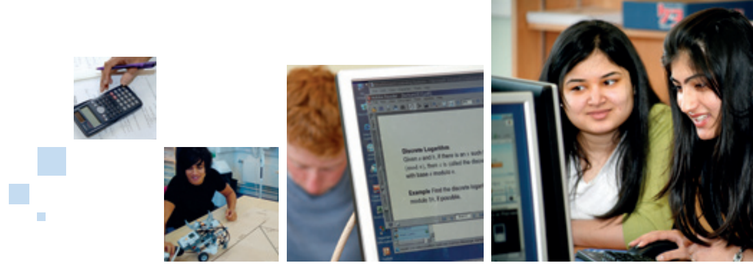


centre for excellence
sigma Σ
in mathematics & statistics support

celebrating success in

mathematics and statistics support

preface

sigma – the centre for excellence in university-wide provision of mathematics and statistics support, one of the 74 HEFCE funded Centres for Excellence in Teaching & Learning – is an outstanding example of collaboration between Loughborough and Coventry Universities in their endeavour to enhance the student experience of learning mathematics and statistics at university level. As we approach the end of **sigma**'s five year funding period, this Final Report is intended to record and celebrate some of **sigma**'s many achievements.

Prior to the establishment of **sigma** in 2005, staff from the two universities had worked together to enhance mathematics education in the lecture hall and tutorial room and to support many thousands of non-specialist students who needed to study mathematics or statistics as part of their degree programmes. With the advent of **sigma** funding, this effort was given a major impetus so that now, in 2010, students from all disciplines within Loughborough and Coventry can take advantage of excellent environments in which they can access the highest quality support and build their confidence.

Our staff have worked together on the development and resourcing of our mathematics support centres, on the establishment of statistics advisory services, and they have shared experiences of technological innovations in the mathematics classroom and the support of students who have additional needs. They have implemented and evaluated novel teaching approaches designed better to engage those students who find mathematics boring, intimidating or alien. They have collaborated on pedagogic research into mathematics support, have supervised PhDs in this area, and have provided generic training for a community of research students. There have been many professional development opportunities for non-**sigma** staff in the two universities – opportunities which have enabled **sigma** to reach out and influence a much greater constituency and to bring about institutional change designed to enhance the student experience.

We are well aware of the considerable influence **sigma** has had throughout and beyond the higher education sector. **sigma** has assisted the establishment of mathematics support facilities at several other universities and has succeeded in raising the profile of an area of work vital to the success of so many students. Through formation of regional hubs and four annual conferences, many more colleagues have gone on to enhance the experience of their own students. **sigma** is now recognised in many other parts of the world for the outstanding contribution it has made. With mathematics and statistics being key components of the national STEM agenda, we are delighted to acknowledge that much of **sigma**'s external activity will continue until at least 2012 funded by the National HE STEM Programme.

We are very proud of the efforts of the **sigma** teams at both Universities and are delighted to introduce this Final Report which showcases some of the highlights of the work done over the past five years and outlines the legacy of these efforts.

Shirley Pearce
Vice Chancellor and President
Loughborough University

Madeleine Atkins
Vice Chancellor
Coventry University

contents

*"The vision for a Mathematics and Statistics Support Centre at the University of Lincoln has been modelled, unashamedly, on the good practice we saw developed through the **sigma** CETL."*

Professor Mary Stuart, Vice Chancellor University of Lincoln

"We stand on the shoulders of giants.
From our point of view, the giants are Coventry
*and Loughborough Universities and **sigma**.*
We have unashamedly copied
our ideas from them."

Professor John O'Donoghue, Director Irish National Centre for Excellence in Mathematics and Science Teaching and Learning, opening address of 2nd Irish Workshop on Maths Learning Centres, December 2008

directors' welcome

We are pleased to welcome you to this report of some of **sigma**'s achievements over the last five years. We hope that you find this document interesting and that you will want to find out more about our work, either by visiting our website or by visiting one of our centres in person.

Mathematics is universal – the vast majority of academic disciplines including the obvious ones of engineering and science, through economics, business, social and health sciences to the less obvious ones of nursing and history require students to use mathematical, statistical or quantitative techniques. And even graduates in the few disciplines that do not explicitly need such skills often find that when they apply for graduate employment an integral part of the selection process is a mathematical reasoning test.

Mathematics has acquired the reputation of being the "marmite of academic subjects" – you either love it or you hate it. **sigma** offers something to those in both camps. For those more negatively disposed, we provide opportunities in a supportive, non-judgmental environment for students to work through some of their problems, to increase their confidence and skills; and whilst they may not quite make it all the way to "loving mathematics", we hope they will at least lose their fear and dread of the subject. For those who already love the subject, we give the chance for them to take their studies further, to work on their own or with their peers, with tutor support at hand, to build on what they already know and to achieve excellent results.

sigma aimed to achieve a culture change and raise aspirations amongst our students, to enhance the teaching and learning of mathematics and statistics, and to encourage growth of similar proactive activity across the sector. We hope that by reading this report, you will realise what has been achieved by **sigma** and the many staff and students with whom we have worked.

Professor Tony Croft
***sigma** Director*
Loughborough University

Professor Duncan Lawson
***sigma** Director*
Coventry University

drop-in centres

Supporting students to improve

Drop-in centres are the core of **sigma** activity. They are the most obvious signs of our commitment to provide all students with exceptional levels of mathematics and statistics support. Long before the CETL award, both universities had well-established support centres – in fact the award of CETL status was, in large part, a reflection of existing excellence in this field.

From these strong foundations, it is no surprise that the drop-in centres have flourished. They now provide a model of student support that has been adopted by many universities throughout the UK and beyond.

At Loughborough the existing centre was refurbished and extended and a second centre opened. At Coventry the existing Centre was also extended and refurbished. At both universities resource rooms were opened for specialist mathematics students studying in later years. Special provision has been made for those students who are particularly anxious about mathematics.

The centres offer extra, optional support in a variety of forms: drop-in assistance, appointments where necessary, classes on specific topics, diagnostic testing and a huge store of learning resources, both paper-based and electronic. All this is offered in an informal, non-judgmental setting that students have warmly received. There is pleasant working space both for individuals and for groups. For many students the drop-in centre has become the 'place to be'!

Evidence that the centres have been a great success story can be found in many external audits. For example,

The ready accessibility of useful help was praised by both undergraduate and postgraduate students that met the audit team. Other students described the benefits of the support rooms and associated equipment. Postgraduate students were appreciative of the one-to-one help and individual study programmes provided for them by the Centre.

QAA Institutional Audit, Loughborough

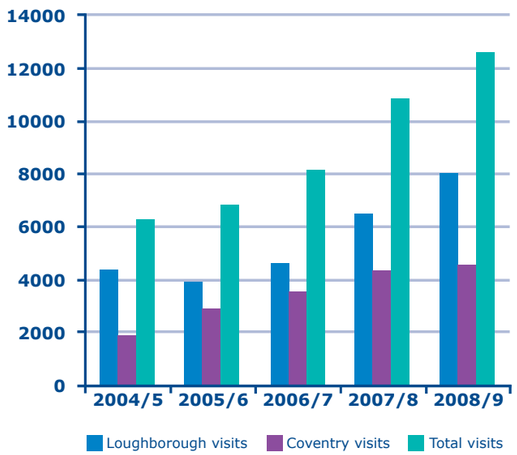
With continuation funding at both universities secured, the prospect of future generations of students benefitting from mathematics and statistics support is guaranteed. At Coventry this includes a new site offering mathematics support in the University Library, an improvement that will open up access to even more student groups.

"Prompt and effective mathematical support should be available to those whose background is found wanting."

Measuring the Mathematics Problem, Engineering Council 2000

From a pre-**sigma** (2004/5) base-line figure of 6277 student visits to the support centres (Loughborough and Coventry combined) there has been strong growth and by 2008/9 numbers had more than doubled.

Whilst the core clientele has continued to be the "traditional" users (i.e. mathematics and engineering students), the number of students from other departments and faculties has increased markedly. To encourage such students, **sigma** introduced outreach desks (in the Library and elsewhere) as well as workshops and drop-in sessions in individual departments (such as Nursing and Midwifery and Information Science).



The growth in the number of visits at both universities shows that two of **sigma**'s objectives, effecting a culture change amongst students and raising aspirations, have been achieved.

The drop-in centres have had a positive effect on students' experience of mathematics at university and on their relationship with lecturers. As one student put it:

"When they [staff] are in maths support, you know they're there to help people and you're not bothering them. If you go to their office…… there's a queue of people behind you, they were doing something before you arrived, if there wasn't anyone in the queue ahead of you, you feel like you're bothering them, it's their space as well…their office. The support centre is neutral ground for everybody, you've got your stuff out and …can say 'can you just help me with this'."

Enhancing support across the sector

sigma has always worked at being inclusive and at spreading the benefits of its CETL funding as widely as possible. Our funded centres initiative has been central to this. Over the past 5 years, centres at the Universities of Leeds, Bath and Sheffield have been established through **sigma** funding and each of these centres has now been incorporated into main university funding structures. Here, those involved talk about the impact of these centres:

Maths Support @ Leeds University: sustaining the initiative

Liz Meenan
Maths Support Tutor
University of Leeds

"In July 2005 the University of Leeds received funding from the **sigma** CETL and I was appointed as a part-time support tutor for two years. My brief was to establish a Mathematics Support Service based at the Skills Centre. Using materials and resources developed by the CETL, mathematics support was made available to all students, with an emphasis on helping those struggling with the transition from school to university mathematics. The Support Service was delivered through a variety of formats, including drop-ins, workshops, booster classes and taught modules. The initiative was so successful that the University decided to continue funding the service via TQEF funding for a further two years. During this time the Skills Centre merged with the Library Service and became a part of Skills@Library with providing maths support as one of its priorities.

The impact on students and staff of the 4-year initiative had been significant. Taking into account all the evidence gathered i.e. the increasing student attendance at drop-in sessions, the several hundred students that had been helped in taught modules and booster classes, increasing number of departments supported and the opinions of the students and staff involved, the Maths Support Strand of the Skills@Library had been a great success. With year-on-year better take up, with its growing reputation within the University and with its increasing effectiveness, it was regarded to be essential that the Service was retained. So in August 2009 the University not only decided to permanently fund the Service but to expand it as well. I now have two other maths support tutors working with me to deliver and sustain the Service.

Over the course of the five years the initiatives and highlights include developing innovative digital resources 'Maths Solutions' and 'Maths Quizzes' for Skills@Library web site and the VLE, arranging the first North East and Yorkshire Regional Maths Support meeting with **sigma** support and establishing a NE hub for maths support, organising booster classes for selected struggling students on level one BA Earth and Environment, running successful workshops on 'Taking Numerical Tests' for Business students, arranging PhD and level four students to help in the drop-in sessions and using first year student ambassadors to promote the service.

The work has been extremely challenging but enjoyable and very rewarding. I look forward to expanding the service in years to come."

MASH @ Sheffield University

Chetna Patel
University of Sheffield

"The additional funding from **sigma** to help the University of Sheffield establish a maths and statistics help (MASH) centre enabled the University to recruit me as full-time manager of MASH. This move from Aberdeen to Sheffield has at times been difficult but very exciting and fulfilling nonetheless. I have had fresh opportunity to implement maths and statistics support in an encouraging and well structured environment.

Along with the funding from **sigma**, I have benefited greatly by the professional, academic and personal support I have received from members of the **sigma** team, and of course receiving the **sigma** prize for outstanding contribution in 2009 was a wonderful recognition of my professional activities. This in turn has helped raise MASH's profile within the University, reflected by my post being made permanent as well as the employment of a part-time statistics support tutor. An event hosted by the Pro-Vice Chancellor (Learning and Teaching) celebrated our achievements and future plans together with those of other Centres in the University. **sigma** has also sponsored my research which has enabled me to continue working towards my doctorate."

MASH @ Bath University

Dr Jane White
University of Bath

"In summer 2007, I was delighted to be told that I had made a successful bid for **sigma** funding to help set up an institutional mathematics and statistics support centre at the University of Bath. The money was used predominantly to fund a term-time co-ordinator for the centre and I was delighted to be able to welcome Dr Christine Venney to this post. Without a doubt, she has played a pivotal role in the success of the centre. At the same time, a student survey of possible names for the centre led us to name our centre as MASH, bold and bright in lime green and purple.

In addition to Christine, we have been very fortunate to be able to employ three very talented and committed individuals to work in MASH: Dan Sutton to develop our web presence and online registration tools, Emma Cliffe both as a drop-in tutor and a mathematics specialist for the student support team and Anita McGrogan to establish our Statistics Advisory Service. One of the greatest personal rewards of the MASH development has been to offer me opportunity to guide and facilitate the work of these individuals. MASH funding has also allowed me to support development projects for colleagues at the University of Bath – for example, I have enjoyed the opportunity to work towards a distance support service for our motor sport foundation degree students in Wiltshire, which we hope to pilot in the autumn of 2010.

MASH has always received support from the University and I have been proud to be responsible for the development of such a core service. I frequently receive feedback from colleagues, praising our work and it has been gratifying to work with staff from a range of disciplines – computer science, chemistry, careers to name a few – to enhance the student academic support provision at the University."

"Do not worry about your difficulties in mathematics – I assure you mine are greater still."

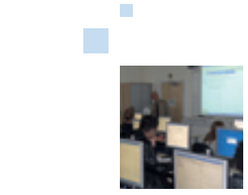
Albert Einstein

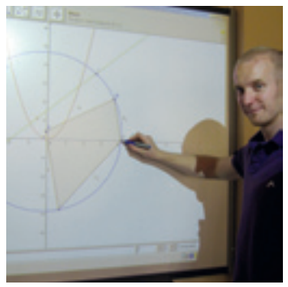
technology

Harnessing technology to improve support

One of the key aims of **sigma** was to investigate how emerging technologies could be used innovatively for teaching.

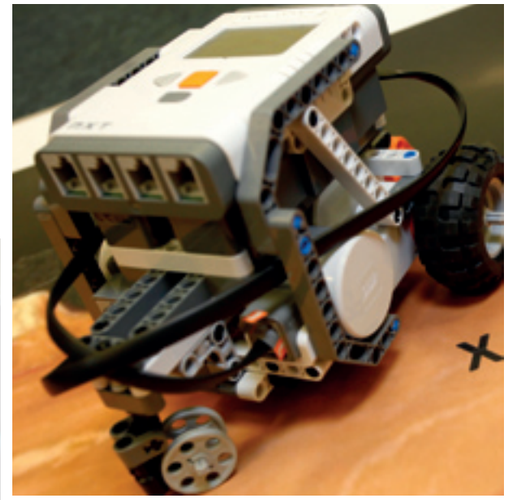
sigma has installed exemplary facilities at both Coventry and Loughborough universities for staff and students to use for both teaching and study purposes. In addition, a number of technologies were bought to test out their usefulness within innovative teaching strategies, including mobile video editing facilities, personal response systems, robotic LEGO®, handheld mobile devices and interactive whiteboards (fixed, portable and virtual). The ethos of CETL funding enabled us to test these technologies notwithstanding the risk that some might be unsuccessful. This freedom allowed us to evaluate a wide range of technologies in different settings and to highlight those which are seen to be of benefit.





"A vision for science, technology and mathematics education that it believes will lead to exciting, challenging and rewarding learning experiences for all."

Roberts' Report SET for Success (2002)



How robots are helping students learn maths

We became involved with LEGO® NXT through LEGO® themselves and subsequently the National Space Centre, based in Leicester. Both of these organizations became involved with **sigma** for the same reason – a lack of resources and activities incorporating the NXT kit in the teaching and learning of mathematics.

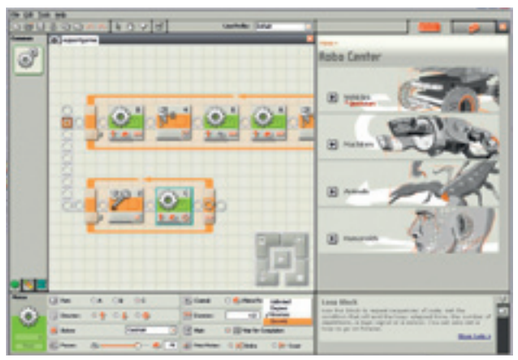
LEGO® NXT has been a successful tool for engaging learners in scientific subjects at school level but the main focus for the majority of these activities is placed on the building and programming of the associated models. In contrast, our objective was to develop some engaging mathematics-specific activities using the kit, whilst making an effort to exclude any elaborate NXT programming or construction. The primary focus has been on the mathematical content. The programming software has been used to allow learners to input values from mathematical calculations into pre-written programs that we have developed.

The mathematics activities cover topics such as:

- Mechanics of an inverted pendulum
- Angles and Trigonometry
- Projectiles
- Graphs and Networks

The LEGO® models are used as demonstration devices that learners can control through the values they input. This reinforces the power of the mathematics involved in the problem and gives confidence to the learners about the accuracy and relevance of the mathematics used.

The LEGO® initiative has made significant progress in the past year with many stimulating and exciting ideas becoming reality. Bringing students into the process of designing new activities has brought a fresh perspective to the project and has also been of considerable benefit to the students involved.



iTunesU: learning on the go

We are always looking at new ways of reaching students. We wanted to provide resources to students on platforms that they are comfortable with, such as MP3 players, mobile phones and online.

This was partly the rationale behind installing **sigma**'s recording and editing studio, to enable us to develop video based resources in a variety of formats. At the same time, Coventry University was investing in the development of an iTunesU channel as a way of distributing multimedia content.

The Coventry University iTunesU site launched in June 2009 and contained the set of 12 complex number videos in a branded **sigma** area. Since its inception, the **sigma** area has received over 235,000 views. We have since added a series on matrices and are hoping to add more.

Supporting students across the world

mathcentre is a national support website for mathematics, containing resources to support students with topics from GCSE to university level studies.

These resources are free of charge to all, both students and lecturers. The original website had been developed by a group of academics at the Universities of Loughborough, Coventry and Leeds, the HEA MSOR Network and the Educational Broadcasting Services Trust in 2003.

It is difficult but important to keep ahead of developments, technology advances much quicker than updating resources can. We are happy to say the site has subsequently been upgraded following the receipt of funding from JISC in 2010. Part of this upgrade means that **math**centre resources are now also being stored in the JorumOpen and FETLAR repositories. A wide variety of resources are available including self study guides, test yourself diagnostic tests/ exercises, video tutorials, iPod and 3G mobile phone downloads. The site facilitates resources that can be downloaded or printed directly.

We are keen to build on the great success of the **math**centre site and have been fortunate enough to receive funding to develop a pilot **stats**tutor website, focussing on the development of resources specifically covering statistical techniques and applications. This pilot site will be available from late Summer 2010 and, working with colleagues across a number of institutions, we hope to continue to grow the range of resources available on this site.

"You cannot teach a man anything; you can only help him find it within himself."

Galileo

additional needs

Supporting those with additional needs

Each and every one of us has strengths, and all of us face challenges to a greater or lesser extent – these are what make us all individuals. **sigma**'s work in supporting students means we come across a diverse range of individual learning differences and needs.

sigma's aim has been to extend existing specialist support for students with disabilities and those with specific learning difficulties. It is complex and challenging to provide such individualised support, but we believe that much progress has been made, a great deal has been learned and many students have been helped. Such support will continue to be provided in the future via the drop-in support centre provision and the Eureka Centre for Mathematical Confidence.

sigma has been able to provide support to a number of students who otherwise would not have received any. Glynn Smith, Mathematics Support Centre Manager at Coventry University, describes two examples of the support offered:

"One student who was having difficulties with his mathematics on the Foundation Year of a Computing Degree was subsequently found to be dyscalculic and we were able to tailor a one on one programme with our Dyslexia expert."

*"We were especially pleased with the outcome of being able to offer one-to-one tuition to a severely disabled student on the first year of the Virtual Engineering Course. This student communicates via a voice synthesiser and there were many obstacles to overcome with obtaining appropriate equipment in order to study mathematics. However it was a tribute to both the student and the tutor, who was employed through **sigma** funding, that the student passed his mathematics with a score of 91%."*

Eureka!

The Eureka Centre for Mathematical Confidence based at Loughborough University, was established to provide specialist support for students with additional needs.

Over the years it has become clear that many students have low levels of confidence when faced with the mathematical or statistical aspects of their courses. Some students feel particularly anxious about attending the main drop-in centres.

A focus group of students designed the centre, choosing to have a "soft" area, a working space and some computers. These can be screened off as required. Designed as a very user-friendly environment, the group chose the name for the centre to reflect a very positive view and to encourage other students to develop their confidence.

Support for students with additional needs includes continuation and expansion of the one-to-one mathematics and statistics support provided for those with dyslexia, dyscalculia, dyspraxia and other specific learning differences and support for visually impaired students. There are workshops open to all students who would like to gain confidence in: using excel, employers' numeracy tests, using a calculator and budgeting.

Professional development sessions have been delivered for university staff, and the centre is well represented at external conferences and workshops.

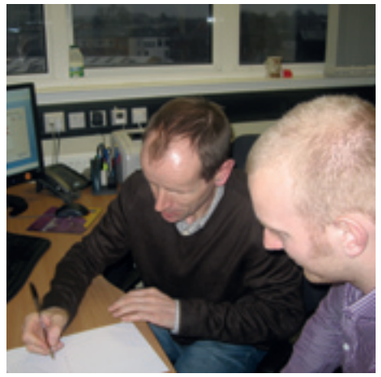
A chapter on "Dyscalculia", written by Clare Trott, has been contributed to the book *Neurodiversity in Higher Education: Positive Responses to Specific Learning Differences*, (Ed. Pollak, D., (2009) Wiley Blackwell, Chichester). To further advance **sigma**'s dissemination agenda, a secondment was arranged for a teacher from a sixth form college, Ghada Nakhia, to work with the Eureka Centre to develop resources which would be useful for her students.

The unique *Postgraduate Certificate in Mathematics Support and Dyslexia/Dyscalculia in FE/HE* has been set up in response to the demand for specialist training in supporting dyslexic/dyscalculic students with the mathematical and statistical elements of their courses. This course is the first that aims to address this need. It has British Dyslexia Association accreditation at the level of Approved Teacher Status (ATS HE/FE). The course is now running for the second time and five students graduated from the initial course.

Research, which is discussed in a separate section of this report, includes the development of a screening tool for dyscalculia, research into on-line calculators and dyslexia, and the use of tablet PCs with dyslexic students.

"Without support… even those with the greatest talents may miss out."

Unleashing Aspiration – final report of the panel on fair access to the professions (2009)



statistics support

Developing statistics support

Staff and students alike have benefited from the extensive statistics support at both Coventry and Loughborough.

This was a new initiative and has proved to be extremely popular. The co-ordinators of the Statistics Advisory Service have also developed close links with colleagues in other departments across both institutions to provide them with support and to ensure that the service provided meets the requirements.

The one to one appointments are widely used by a variety of final year undergraduate students as well as postgraduate students and even staff. A series of workshops provides development opportunities for staff and students, allowing them to improve their knowledge of data analysis techniques. On top of all this, there is also ongoing drop-in support available in the mathematics support centres at both institutions.

A personal perpective...

Alun Owen
Statistics Advisory Service Loughborough University

I have been part of **sigma** for the last two years, and have been fortunate enough to have had the pleasure of working at both centres at Loughborough and Coventry Universities. This has provided me with a unique insight into the different ways each centre has developed its statistics support provision, and also the different contributions each centre has made to the different initiatives and achievements of the **sigma** project.

When I arrived in Coventry, in summer 2008, much of the foundations of the service were already in place, thanks to the hard work of my predecessor, Karen Smith. It was a case of carrying on the good work that had gone before me and looking to develop the contacts across the campus. A special word of thanks goes to my ex-colleague, Gale Bryce, who came across from the USA for a year, making a significant contribution to the SAS. After an enjoyable, positive and rewarding year at Coventry, I moved to Loughborough University in summer 2009. I am pleased to say that the Statistics Advisory Service at Coventry is now in the safe hands of Michail Papathomas and Mollie Gilchrist.

The team of staff at Loughborough are just as dedicated and enthusiastic, and my experience so far of working with them has been extremely rewarding. Like Coventry, Loughborough has a well established Statistics Advisory Service, thanks to the efforts of Richard Gadsden and others. My role here is similar to that at Coventry, but working in both centres allowed me to see that although the type of support their students need is similar, they face different challenges, given the different aims of the universities.

So what are the key things I have learned in my time with the SAS? There is a significant need for statistics support across the full HE student population, and indeed from staff too! Undergraduate students often have very different needs to those of postgraduate students. Effective listening and questioning is vital in order to quickly establish and understand what a student wants to achieve and where their difficulties lie. Indeed, I developed a view, particularly with undergraduate students, that a "gold standard" statistical analysis is not always needed nor indeed possible given the timescales. Developing a good stock of additional sources to direct students to for further help makes the most effective use of the most important learning resource of all – the staff!

"Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write."

H G Wells

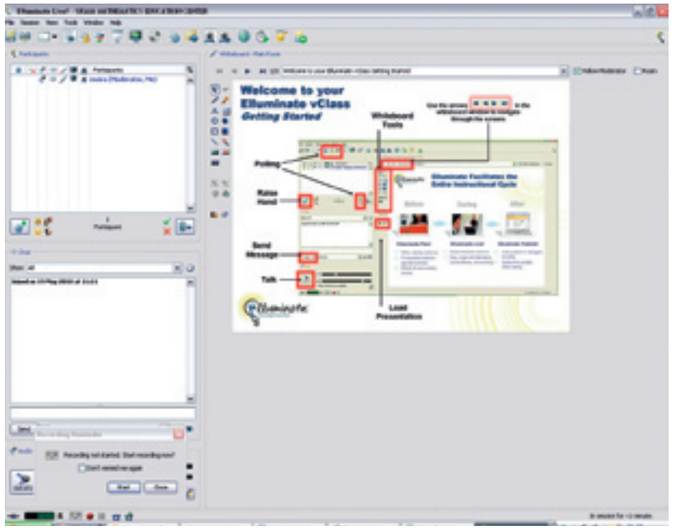
Providing statistics support to students studying off-campus

The type of statistics support provided by **sigma** has typically involved the student attending a face-to-face appointment or drop-in session with a member of statistics staff.

Access to this type of service is more problematic for students based "off-campus", such as those studying by distance learning or undertaking part-time postgraduate research. We have been keen to investigate ways of supporting these students.

A recent initiative by the Statistics Advisory Service at both universities has been to introduce the use of the online classroom application Elluminate® as a tool for the provision of one-to-one statistics support via web based meetings. This software not only offers the facility to communicate via headset or even the PCs microphone and speakers, it also provides an electronic whiteboard that can be used with for example a tablet PC or graphics tablet, and also allows software applications to be shared over the web to be controlled by either party in an interactive way, hence its suitability as a medium for providing statistics support to students not based on campus.

Following the successful pilot, this service is now part of the standard menu of services offered by the Statistics Advisory Service at Loughborough, and has been accessed not only by distance learning students, but also part-time research students living away from campus, students studying part-time on block release work-based learning programmes and even a member of staff on maternity leave who was engaging in research. Students that have used this facility to receive statistics support have unanimously found it a positive and worthwhile experience. In particular they have valued the whiteboard for sharing written information and the facility to share statistical software.



sigma prize winners

Celebrating outstanding contribution

In 2009, **sigma** awarded prizes to two individuals for their outstanding contribution to the field of mathematics and statistics support.

Janet Robertson
Senior Lecturer, Maths Learning Centre, De Montfort University, Leicester UK.

Chetna Patel
Maths and Statistics Support Manager, Maths and Statistics Help Centre, University of Sheffield, Sheffield, UK.

For the purposes of the **sigma** prizes, mathematics and statistics support refers to activities and/or resources which are provided to support and enhance students' learning of mathematics or statistics (in any one or more disciplines, at any level of higher education) and which are provided separately and in addition to traditional lectures, tutorials, examples classes, personal tutorial sessions etc. The spirit of the prize is to recognise, reward and celebrate outstanding contributions in this field. There was a strong field of nominations and the panel decided to award two personal prizes of £1000.

The winners of the award and of the title of "The **sigma outstanding contributors for 2009**" were:

Janet Robertson, Senior Lecturer, Maths Learning Centre, De Montfort University, Leicester UK.

Chetna Patel, Maths and Statistics Support Manager, Maths and Statistics Help Centre, University of Sheffield, Sheffield, UK.

The awards were presented at a ceremony at the CETL-MSOR conference in September 2009. For more details about the work the **sigma outstanding contributors for 2009** have been involved in please visit http://www.sigma-cetl.ac.uk/index.php?section=110.

In 2010 **sigma** will again award individual prizes of £1,000. One award is to be made to the **sigma outstanding contributor for 2010** and one for the **sigma rising star 2010**. The winners of these awards are to be decided shortly by a specially convened panel and the prizes presented at the CETL-MSOR conference in September 2010.

Stop Press: The 2010 **sigma** prize winners are:

Outstanding contributor

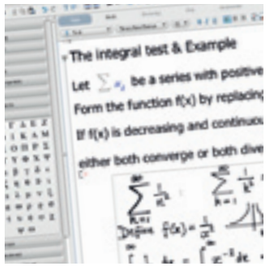
Dr Christie Marr, The University of St Andrews

Rising star

Dr Ciarán Mac an Bhaird, National University of Ireland, Maynooth

"Far and away the best prize that life has to offer is the chance to work hard at work worth doing."

Theodore Roosevelt



proactive teaching interventions

From reactive to proactive

Support centres serve well those students who know when they have a problem and are prepared to 'drop in' and get help. But there are many 'at risk' students who, for a variety of reasons, do not take advantage of the support on offer. **sigma**'s *proactive teaching interventions* (PTIs) are designed for just these students, taking the help directly to them before their difficulties get out of hand.

In the course of **sigma**'s five busy years, many different types of intervention were tried; in all, there were over 70 different PTIs. Some interventions targeted just the students believed to be at risk. Others addressed the needs of the whole cohort, such as the weekly maths lecture inserted into a Disaster Management module where previously students had been expected to pick up the techniques as and when required. Experiments with new technology were introduced, for instance:

- personal response systems ("clickers")
- visualisation of algebraic ideas using *GeoGebra*
- remote support using the online tutorial package Elluminate
- re-use of video and assessment resources in a 'blended learning' environment

Interventions were not restricted to **sigma** staff alone; colleagues from other disciplines in Coventry and Loughborough were involved, as well as secondees from HEIs further afield.

Not all PTIs were equally successful, not all students at risk were helped. Nevertheless, much was learned from the PTI experience: in particular, the interventions that worked best were usually the ones that:

- got course leaders on side and enthusiastically involved
- students saw as relevant to their modules and an integral part of their course.

"Any teacher that can be replaced by a computer deserves to be"

David Thornburg, University of Pennsylvania

Voting for change!

One innovative use of technology in teaching has been the electronic voting systems. Each student makes use of a handset to respond to multiple choice questions thus facilitating interaction with staff. The received answers are collated and displayed on screen allowing the tutor to facilitate discussion about right and wrong responses.

"The use of voting technologies (Interactive Response Systems such as TurningPoint) in the Faculty of Engineering and Computing has grown significantly over the past couple of years and its further development is seen as an important part of the pedagogical developments in the Faculty. Originally one set of voting handsets from the **sigma** CETL was trialled and based upon its successful use, 5 further sets were purchased, one for each department in the Faculty. In addition to using this voting technology in teaching sessions, we have also used it at open days with applicants. We plan to use voting technologies much more extensively which will probably necessitate each student having their own personal voting handset."

Ray Farmer, Associate Dean, Faculty of Engineering & Computing, Coventry University

"I have used EVS in a number of ways. In early 2008, I collaborated with Wendy Garner to help quality assess her MSc module via student feedback collected via Electronic Voting System (EVS). In the summer of 2008, I worked with a graduate intern, Sarah Kinsell, on producing appropriate revision questions and transferring them to slides for use with Turning Point EVS. The maths covered ranged from basic arithmetic through to algebra. I used the EVS in all 6 of the classes, enabling me to rapidly discover weaknesses in the group. Questions were answered anonymously by pairs or trios of students, who were encouraged to discuss the questions with each other."

*John Goodband, **sigma** Research Assistant, Coventry University*

"In 2006 keynote speakers at two conferences I attended drew attention to a method known as ConcepTesting, which encourages deep learning in lectures by asking questions which challenge common misconceptions. I decided to pursue this as I was keen to engage students in active learning during the lecture, rather than them being only passive note-takers. I introduced EVS into my teaching at the start of the academic year 2007-8. There were 150 students registered for the module and I used EVS in most lectures. Soon I was providing initial training for colleagues across campus. In 2008 I successfully applied for an internal Academic Practice Award, to enable me to visit experts in the use of EVS in the UK and America and to set up a staff interest group at Loughborough University. There were about 40 members of the group and average attendance at the meetings was just over 20.

I was keen to investigate the impact of EVS on student learning and was very fortunate to receive funding in 2007 from the Science Faculty for a PhD studentship, to carry out systematic and rigorous research into issues associated with the use of EVS in lectures. Moreover the more I used EVS it became clear to me that there was much more I needed to learn about questions which invoke deep learning. This led me to read the literature in this area and search for examples of mathematics questions. At Cornell University, for example, there has been a project to devise good maths questions for mathematicians. However there were no repositories for engineering mathematics, which I teach. In 2009 I successfully applied for mini-project funding from **sigma** CETL to develop and disseminate questions for engineering mathematics. These are available at http://mec.lboro.ac.uk/evs.

As can be seen from the above, EVS has been a driving force for my professional development in recent years."

Carol Robinson, Director of the Mathematics Education Centre, Loughborough University

Making mathematics dynamic

sigma has funded the equipping of specialist classrooms at Loughborough and at Coventry Universities. These classrooms are equipped with student PCs in carousels for group work and touch screen whiteboards, thus encouraging the teaching to be interactive and imaginative.

One example has been the installation of specialist software suited to demonstrating maths. *GeoGebra* (www.geogebra.org) is open source, easy to use software integrating geometry, algebra and spreadsheets. **sigma** has been able to contribute to its development by providing funding for Dr Chris Sangwin (University of Birmingham) and Michael Borcherds (Queen Mary's School, Sutton Coldfield) to develop *GeoGebra* for use on tablet PCs.

An initiative at the Mathematics Education Centre in Loughborough was to introduce *GeoGebra* to students on the Science and Engineering Foundation Studies programme. A significant part of the mathematics for this programme is the ability to manipulate algebraic expressions and to sketch graphs of functions. *GeoGebra* is an ideal tool for demonstrating the relationship between functions and their corresponding graphs. It also facilitates the varying of parameters in a function and seeing the effect immediately.

In 2008/9 Professor Barbara Jaworski used *GeoGebra* in the interactive classrooms at Loughborough to teach the first year module *Mathematics for Materials Engineering* in a way which would not have been possible without the new classrooms. Barbara writes *"through juxtaposing visual/geometric representation alongside notational/algebraic representation, conceptual understanding has been encouraged. By engaging with investigative tasks using GeoGebra as a medium, students were encouraged to explore meaning through manipulation of representations".*

At Coventry, the collaborative classroom has proved to be a very versatile space accommodating a wide variety of activities in a flexible manner facilitating smooth transition from one type of activity to another several times in the course of a teaching session. Dr Jim Tabor, Head of the Mathematics and Statistics Department writes *"The room has proved very popular with many departments with a very fully booked timetable – the proof of the pudding has been in the timetabling. We have used the experiences gained in this learning space to inform the design of various classroom/laboratory spaces in the new Engineering and Computing Building that will start construction soon."*

Other perspectives…

Other examples of facilities and interventions **sigma** has contributed to are:

Katie Baker, one of **sigma**'s staff helped revise the content and support the mathematics needed in the Disaster Management degree programmes at Coventry University. The students' mathematical preparation for later years of the course had been found wanting. According to one of the course team "Although only 2 CATS points for maths may sound trivial, it is make or break for them as they can't pursue the engineering option for the Disaster Management and Engineering course of study without it".

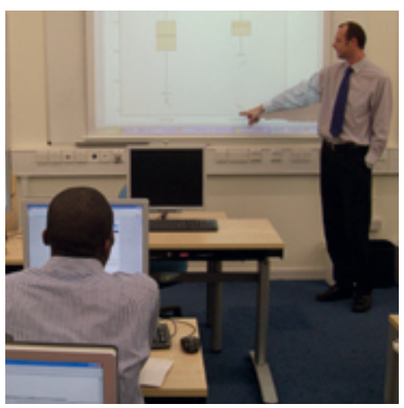
After consulting with the module team, Katie has revised the mathematical content of the course revising the syllabus to focus more on applications. The success of this intervention is described in the following comment:

"I have just completed marking the 108DST exam scripts and calculated the final module marks. The results show a remarkable improvement on last year and I believe it is largely down to the maths support the students received in term 1."

Dr Andrew Fox, Senior Lecturer, Department of Geography, Environment & Disaster Management, Coventry University.

*"My secondment has been rewarding and inspiring for three main reasons. First, it has massively helped my ability to both design the Political Analysis module and deliver it effectively. I have been able to develop innovative learning and teaching strategies. Second, the students have responded positively to the quantitative elements and relished the opportunity of manipulating SPSS and interpreting the outputs. Finally, my immersion in statistics has helped me improve as a teacher on other modules, and as a researcher. For example, on one Year 3 module, my students now conduct an opinion poll in the town centre and we analyse the results quantitatively. I could never have carried out this type of teaching or research prior to my **sigma** secondment, so I can safely say that it has been one of the most valuable experiences of my career."*

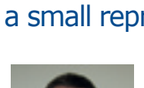
Dr Oliver Daddow, Senior Lecturer, Department of Politics, History and International Relations, Loughborough University



pedagogic research

Building a research base

sigma has always strived to underpin its activities with a strong research base. We have worked with a wide range of colleagues across a number of institutions to this end. The comments below are a small representation of the work we have carried out.



Peter approached **sigma**'s aim of developing a sound pedagogical basis for mathematics support by building relationships with the general education research community. This led him to discover the learning development community and to write a journal article (with Chetna Patel) about scholarship in mathematics support. Other main research interests have been the use of technology in mathematics support, discrete mathematics pedagogy, serious games, and PhD student training, especially in academic writing.

Peter Samuels, Senior Research Fellow, Coventry University

Helen, as **sigma** Visiting Fellow, has worked on comparisons of the statistical reasoning skills of students in Australia and the UK, analysis of the effects of learning support, and improving the understanding of evaluation of mathematics and statistics learning support.

Helen MacGillivray, Queensland University of Technology

Carol's research focuses on the teaching and learning of mathematics by students from STEM disciplines. She is particularly interested in the impact, on staff and students, of in-class technologies, including electronic voting systems and tablet PCs. Her research includes the effectiveness of support centres and mechanics at the school-university interface.

Carol Robinson, MEC Director, Loughborough University

As **sigma** Visiting Fellow, Yvette has been involved in the collection and analysis of data from survey questionnaires in several universities. A major finding is the way in which university mathematics is differentially experienced by men and women, with, for example, women reporting that they are less confident in their relationships with tutors. Combining this with an investigation of mathematics support centres, she has begun to explore the possibility that women gain particularly from use of these centres.

Yvette Solomon, Manchester Metropolitan University

Clare has undertaken several projects in support of students with additional needs. "2-line calculators and dyslexia" collected data to inform university policy about the suitability of these calculators for dyslexic students. Another involved dyslexic students working with a tablet PC. The joint venture with Dr. Abi James from Iansyst (a company supplying assistive technology solutions) was used to inform needs assessors and disability practitioners. Clare's pioneering work in dyscalculia screening has resulted in a screening tool which provides a profile of a student's strengths and weaknesses.

Clare Trott, Eureka Centre, Loughborough University

How We Teach seminars have brought together university mathematics teachers to present key elements and ideas for their teaching and to open up discussion on teaching. This is creating a mathematics teaching discourse among mathematicians and mathematics educators together. Video recordings of seminars are being analysed to produce a synthesis of ideas and issues and disseminate to practitioners more widely.

Barbara Jaworski, Professor of Mathematics Education, Loughborough University

Roy's work explores whether the formation of "implementation intentions" to promote goal directed behaviours can be transferred from the health arena, where it has been used successfully to increase the take up of exercise and the reduction of smoking, to increase student engagement with mathematics support services. His work goes further to investigate whether implementation intentions are likely to be more successful with particular personality types.

Roy Bhakta, PhD Student, Coventry University

Ria's PhD focused on evaluating the effectiveness of some of the mathematics support initiatives promoted by **sigma**. Her work was both qualitative and quantitative and she explored reasons why some students do not take advantage of the wide range of support opportunities that are available. A key element here proved to be a student's wider cognitive engagement with their studies. In addition, her work showed that some interventions succeeded in improving student confidence, although this confidence can be easily dashed.

Ria Symonds, PhD student, Loughborough University

Tony and Duncan have worked together on a number of topics including the development of effective learning environments, the evolving mathematical identities of undergraduates, evaluation of support centres and the use of technology in teaching and learning support. Their work has addressed issues relating to the way in which the physical environment of a support centre can influence the dynamic of the interaction between students and tutors and thereby improve the student learning experience.

*Tony Croft & Duncan Lawson, **sigma** Directors*

John is a keen user of social networking services, in particular Facebook. He has used this technology as a means of providing support to students at unusual times of the day. Working with some **sigma** colleagues, he has carried out an analytic auto-ethnographic study of the use of Facebook by undergraduate mathematics students. This work has highlighted a very different culture in mathematics (more competitive and unwilling to admit to shortcomings) than has been reported in, for example, social sciences (where students frequently make posting describing how little they understand). These cultural effects have a tendency to limit the effectiveness of Facebook as a peer support tool.

*John Goodband, Research Assistant, **sigma***

For more details on **sigma**'s research activities, please visit our website at www.sigma-cetl.ac.uk

The CETL-MSOR Conference – promoting emerging good practice

From its inception, **sigma** has been committed to disseminating good practice in mathematics teaching and support throughout the HE community. Working with the Maths, Stats & OR Network of the Higher Education Academy we established the CETL-MSOR conference in 2005.

This has now become an annual event with conferences held in Birmingham, Loughborough, Lancaster and Milton Keynes (Open University). We have been joined in sponsorship and organisation of the conference by two other CETLs: the Postgraduate Statistics Centre at Lancaster University and COLMSCT at the Open University.

The conference has grown in size each time with almost 150 delegates attending the September 2009 conference. This year's conference is "2020 Vision: Maths, Stats & OR in Higher Education over the next 10 years". Our keynote speakers are Dame Julia Higgins, Chair of the Government's Advisory Committee on Mathematics Education (ACME) and Professor David Speigelhalter, Professor of Risk at Cambridge Universtiy.

The conferences have drawn delegates from a wide range of disciplines – not just from maths and stats departments. They give colleagues the opportunity to promote and share best practice, to engage in debate and discussion, to learn new skills in hands-on workshops, to make useful contacts – all in a relaxed, informal and enjoyable atmosphere.

More details of previous conferences, including the proceedings, and of the forthcoming conference can be found on the MSOR Network website www.mathstore.ac.uk

Students as partners

Working with students

In addition to our student support provision, we were keen to harness the creativity and enthusiasm of students to help us in a wide variety of ways.

We employed students as ambassadors to help create marketing strategies, to promote the services we offer, as proctors to provide support within the maths support centres, as interns to help us deliver projects and as PAL leaders to run peer assisted learning sessions. We also worked with the Nuffield Science Bursary programme to provide 4-6 week placements for Year 12 students. Finally, we employed two students on year long industrial placements.

One innovation at Coventry was the 'Maths Health Check' that was used around the campus to promote the drop-in centre.

Our placement student at Coventry, Nicholas Blenkin, talks below about his experience of working in **sigma**:

"Throughout the year, I have worked on many different projects under the banner of mathematics and statistics support. These range from simple projects, including updating spreadsheets, to tasks where I needed to learn on the job, such as using the professional video equipment including editing and production, as well as data collection and web development. The diversity of the work has meant that each week has been interesting with different projects at different stages requiring different skills.

Working within **sigma** has improved many of my key employability skills. As the year has progressed, I have been given more responsibility and have become more confident in my abilities. I believe that the time I spent with **sigma** has had a big impact on how I will approach my final year of university. My time management has improved, which will help with any coursework I receive next year, and I would now feel confident to ask questions in lectures when I don't understand."

"Students shouldn't just be passive. Most of us are motivated by the opportunity to be active partners in our learning."

National Student Forum Report

Student ambassadors at CU

Student proctors at CU

Nuffield students 2008 at LU

student ambassadors 2008 at LU

Summer interns 2008 @ CU

Nuffield student 2008 at CU

Summer interns 2009 @ LU

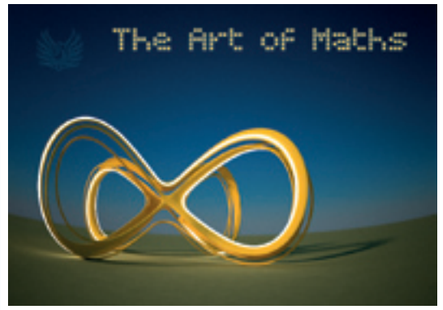
Nuffield students 2009 at LU

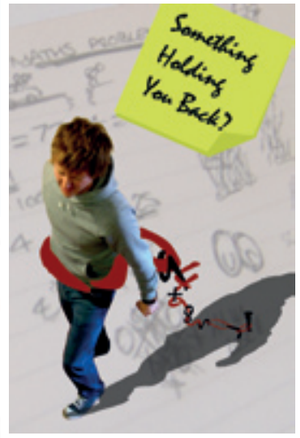
PAL Leaders @ LU

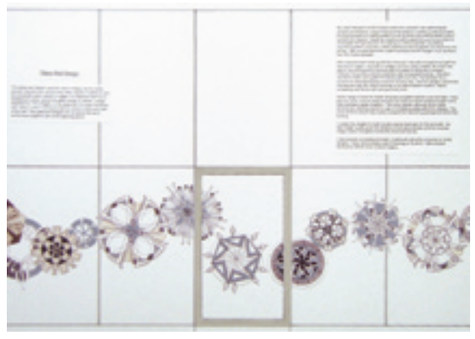
student ambassadors 2009 at LU

Secondary school interns @ LU

Students' artwork promoting the Centres







extending our reach

sigma has always strived to extend the benefits of CETL funding as widely as possible.

This has been done through a range of means, including the funded centres initiative, external and internal secondments, mini-project funding and the development of the hub pilot. In addition, we have provided support and advice to institutions from across the globe, looking to set up a mathematics support provision. This includes supporting colleagues at the Fachhochschule Nordwestscheiz Hochschule für Technick, in Windisch, Switzerland who set up the first ever support centre in their country and have seen it blossom.

Friends from Switzerland

Providing local access to **sigma**

"Development of a regional hub for **sigma** activities was one of the ideas I suggested when bidding for funding from the new centres initiative. This idea was warmly received by **sigma** and MASH and the University of Bath became the first regional hub for **sigma**. I have been delighted to see one of my ideas both come to fruition and to develop across the country. **sigma-sw** has been running for almost two years now. It is an absolute pleasure to work with a core of like-minded academics from across the South West and South Wales to come together and discuss a whole range of issues affecting good student support in mathematics and statistics – such as peer support and tutoring, new technologies, evaluation of support effectiveness, diagnostic testing and statistics support. By getting **sigma** support for this proposal, I have been able to develop skills in project management and feel that I have managed to facilitate a collaborative approach to maths and stats support, offering opportunities for others to host their own events and to drive forward with a visionary approach to such collaboration."

Jane White, University of Bath

"No man is an island, entire of itself, every man is a piece of the continent, a part of the mainland…"

John Donne, Meditation XVII

The Irish experience…

"In February 2009, an open meeting of those involved in mathematics support and research in mathematics education in Ireland took place in the National University of Ireland Maynooth, with a view to discussing the formation of a national mathematics support network. Moira Petrie from **sigma** attended the meeting to provide information about current networks operating in the U.K. (such as the South West Hub and the Scottish Maths Support Network) and offer advice on the most suitable approach for our network. Moira's input was of considerable help in determining the overall structure. As a result, the Irish Maths Support Network was founded, with the aim of facilitating easier communication within the community and allowing for greater collaboration and joint research opportunities. A committee of six people was elected in May 2009 for a two-year period. The network assumed responsibility for the organisation of the annual conference, known as the Irish Workshop on Mathematics Learning and Support Centres, which was hitherto organised on a more informal basis.

The active members of the committee have already found the more formal structure of the network a great help in fostering collaboration among different universities in both Ireland and the UK. So far this year, as members of the network committee, we have been personally involved in: organising a workshop on developing surveys and questionnaires in the University of Limerick; hosting our annual conference in Dublin City University on the theme of the use of technology in mathematics support; setting up a contact email address for the network (irishmathssupport@gmail.com), which all of the committee can access; setting up a mailing list, to which over eighty academics have subscribed; and developing a common mathematics support evaluation survey with other members of the committee, which we hope to roll out on a national basis in the coming year. We are also planning to develop a website for the network and organise a workshop on the levels of intervention required in mathematics support. As the committee members are located all around Ireland, we do not meet frequently, but the network structure encourages us to keep in regular contact and has enhanced our collaborations greatly as a result."

Eabhnat Ni Fhloinn, Dublin City University and Dr Ciarán Mac an Bhaird, NUI Maynooth

sigma in the future

What the future holds at Coventry

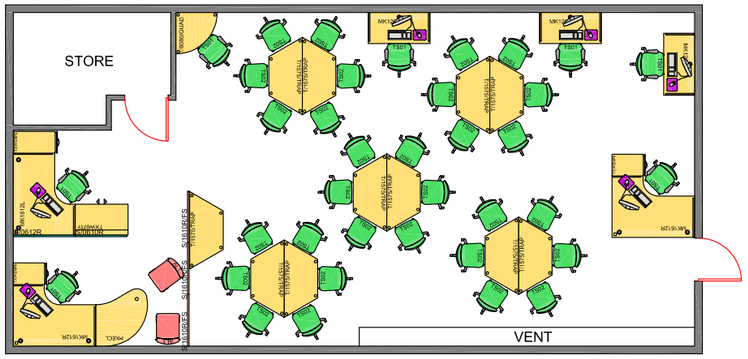
One of Coventry University's strategic priorities in its Learning and Teaching Strategy is to enhance the learning experience and within this a key objective is to provide well-structured academic support to take account of diverse learner needs.

The University has recognised the vital role played by **sigma** as one of the key agencies delivering this well-structured academic support and has made a significant on-going commitment to enable the continuation of **sigma**'s direct student support. Part of this commitment is a brand new drop-in centre in a prime location within the Library, making it easily accessible to the whole student body and also situating **sigma** near to the University's Centre for Academic Writing, another key player in the delivery of academic support.

Within the University, there is a considerable legacy from **sigma** activity. There are improved facilities in terms of refurbished study spaces, interactive and collaborative classrooms and a video recording facility. New approaches to teaching, such as the use of electronic voting systems, have been embedded within normal practice and frequently downloaded resources are available through the University's iTunesU site. There is a well-established (and heavily used) Statistics Advisory Service working with undergraduates, taught and research postgraduates and also with staff.

We can look back with pride on what **sigma** has achieved and, in the light of the University's backing, we can look forward to the future with the expectation of being able to continue to provide and develop the excellent support we offer to all Coventry students.

Floor plan of the new centre in Coventry University Library



"You must be the change you want to see in the world."

Gandhi

What the future holds at Loughborough

The legacy of **sigma** activity within Loughborough University is extensive. Prior to 2005 there was a single drop-in centre, limited provision for students with additional needs and no statistics advisory service. Pedagogic research was only nascent.

The impact of **sigma** has been such that the University's senior management have committed to significant ongoing support. This funding will allow the continuation of the two drop-in centres, including provision for bought-in teaching and secretarial support. The post of Mathematics Support Coordinator will be maintained. In addition, there will be recruitment so that the Statistics Advisory Service and related statistical activities can be continued. Students who lack confidence or who have additional needs will be able to rely on the Eureka Centre for Mathematical Confidence. The foundations of pedagogic research, encouraged by **sigma** funding, which saw seven staff returned for the first time in the 2008 Research Assessment Exercise, will be built upon.

The University's Strategic Plan, Towards 2016, states *"nationally, we will be known for specialist support in areas such as mathematics and statistics"*. Through the very welcome continuation funding provided by the University, we can ensure that the legacy from **sigma** continues to support future cohorts of Loughborough students and that this ambition of Towards 2016 is realised.

sigma network

What the future holds for **sigma**

sigma is now a delivery partner for the National HE-STEM Programme, a £21million project funded by HEFCE and HEFCW.

The HE-STEM Programme aims to improve the quality of the workforce in STEM disciplines by increasing the output of graduates in these subjects and by enhancing the skills and knowledge base of those already in employment in these fields.

Mathematics underpins all STEM disciplines and the Programme has identified mathematics as a key enabler in achieving its aims. Recognising our expertise, the Programme has contracted **sigma** to co-ordinate mathematics support across HEIs in England and Wales by building on our hub pilot scheme to create a network of six hubs covering both countries. Each hub will hold a minimum of two events per year as well as contributing to the annual conference and newsletter.

In addition, **sigma** is providing pump-prime funds to Lincoln University, the University of York, London Metropolitan University and the University of Central Lancashire to enable them to establish and develop mathematics and statistics support provision. As with previous funding rounds, each institution provided match funding for the two years of the **sigma** funding.

Underpinning both of these initiatives is the creation of a national mathematics support network. This network will provide mutual support, share resources and work together to enhance mathematics support. There will be a regular network e-newsletter, a web-site and a continuation of the highly successful CETL-MSOR Conferences.

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

National Audit Office (2007) Staying the course: the retention of students in higher education

sigma support regions

	Institution	Contact	Nature of link
1.	Coventry University	Duncan Lawson	CETL partner institution Hub co-ordinator
2.	Loughborough University	Tony Croft	CETL partner institution Hub co-ordinator
3.	University of Leeds	Liz Meenan	Funded Centre Hub co-ordinator
4.	University of Sheffield	Chetna Patel	Funded Centre Hub co-ordinator, **sigma** Prize winner 2009
5.	University of Bath	Jane White	Funded Centre Hub co-ordinator
6.	University of Glasgow	Shazia Ahmed	Scottish Maths Support Network
7.	University of St Andrews	Christie Marr	Scottish Maths Support Network
8.	University of Aberdeen	Wendy Lawrenson	Secondment
9.	University of Plymouth	Paul Hewson	Mini project
10.	University of Birmingham	Chris Sangwin	Mini project
11.	University of Nottingham	Stephen Hibberd	External Evaluator, East Midlands CETL Network member
12.	University of Reading	David Stirling	Steering Group member
13.	University of Central Lancashire	Vicki Tariq	NTFS project (sigma Assistant Director was an advisory group member)
14.	Lancaster University	Gill Lancaster	Conference partner
15.	The Open University	Steve Swithenby	Conference partner
16.	University of Birmingham	Michael Grove	HE-STEM Programme Director
17.	Strathclyde University	Jim Boyle	Visiting Professor
18.	Manchester Metropolitan University	Yvette Solomon	Visiting Fellow
19.	Newcastle University	Bill Foster	Project partner (JISC)
20.	University of West of England	Iain Weir	Project partner (statstutor)
21.	Loughborough University	Adam Crawford	East Midlands CETL Network member
22.	Nottingham Trent University	Karen Moss	East Midlands CETL Network member
23.	University of Leicester	Annette Cashmore	East Midlands CETL Network member
24.	University of Leicester	Nicholas Tate	East Midlands CETL Network member
25.	University of Leicester	Robert Lambourne	East Midlands CETL Network member
26.	MSOR Network, Birmingham	Liz Willis	Conference partner
27.	University of York	Hannah Ainsworth	Joint research project
28.	University of York	Andy Pomfret	New funded centre
29.	University of Central Lancashire	Claire Worthington	New funded centre
30.	University of Lincoln	John Flynn	New funded centre
31.	London Metropolitan University	Pargat Singh Calay	New funded centre
32.	Imperial College London	Esat Alpay	Mini project
33.	University of Kent	Allia Wilson	Collaborative fund project
34.	Edinburgh Napier University	Kate Durkacz	Scottish Maths Support Network
35.	Liverpool John Moores University	Leslie Fletcher	JISC project partner
36.	Brunel University	Martin Greenhow	Hub co-ordinator
37.	University Campus Suffolk	David Bowers	Hub co-ordinator
38.	University of Liverpool	Janet Strivens	Hub co-ordinator
39.	De Montfort University	Jan Robertson	**sigma** Prize winner 2009
40.	NUI Maynooth	Ciarán Mac an Bhaird	Secondment Irish Maths Support Network
41.	Dublin City University	Eabhnat Ni Fhloinn	Secondment Irish Maths Support Network
42.	University of Limerick	Olivia Gill	Secondment Project partner (ELVM)
43.	University of Limerick	John O'Donoghue	Visiting Professor
44.	University of Cardiff	Robert Wilson	**sigma**-sw member
45.	Portsmouth University	Lynn Pevy	**sigma**-sw member
46.	University of Exeter	Rachel Canter	**sigma**-sw member
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52.	Slovak Society for Geometry and Graphics	Slovakia	EVLM* Project
53.	University of Limerick	Ireland	EVLM* Project
54.	Universidad de Salamanca	Spain	EVLM* Project
55.	Miskolci Egyetem	Hungary	EVLM* Project
56.	Tulossilta	Finland	EVLM* Project
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