







FOR ENGLAND

## The **sigma** Network

## for cross-university mathematics and statistics support

## Annual Report 2014/15



## contents

#### Introduction

Key Groups and Personnel

The sigma Network

News and events from around the **sigma** Network

North East and Yorkshire Hub

North West and North Wales Hub

Midlands Hub

Eastern England Hub

South East Hub

South West and South Wales Hub

Supporting students

The funding of new and enhanced provision Student internships

Supporting practitioners

Conference

Prizes

Mentors

Support tutor training

Resources, resources, resources!

Resources development activities

**math**centre

**stats**tutor

Mobile Apps

Facts and Formulae Leaflets

What does the future hold?

Find out more Get involved

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2

4

24

## Introduction

This report is published as we come to the end of the second year of our three-year tranche of funding from the Higher Education Funding Council for England (HEFCE) to support, enhance and develop the **sigma** Network.

2014/15 has been a busy year for all those involved in the Network. Each one of the six regional hubs has delivered on its commitment to offer at least two events in its region.

These have included "get to know you events" where different approaches are compared and good practice is shared; statistics training workshops especially for non-statisticians who find themselves needing to offer statistics support; use of software packages for mathematics and statistics; on-line assessment; inclusive support for students with specific needs; events aimed at the needs of particular disciplinary groups such as pharmacists; and much more besides. The reaction from delegates to all these events has been positive and it is clear that the **sigma** Network is playing a valuable role in the mathematics and statistics community, not only in the area of mathematics and statistics support, but also in addressing wider aspects of the learning and teaching of these subjects. We would like to express our appreciation to the hub co-ordinators and their colleagues who have made these events possible.

Disbursement to institutions of the HEFCE award has enabled members of our community to develop and share new resources. Many of these can now be accessed from the **math**centre and **stats**tutor websites. The funding has enabled student interns to gain valuable work experience and, at the same time contribute to the development of mathematics and statistics support. And of course, this funding has supported a particular highlight of our community's year – the CETL-MSOR Conference. The 2014 conference in Cardiff, attended by over 100 delegates, was a great success with many 'old hands' rating it as the best ever.

A significant output this year has been the commissioning and publication of the report Senior Management Perspectives on Mathematics and Statistics Support in Higher Education by Professor Harry Tolley and Dr Helen Mackenzie. This is the first piece of research to ascertain what university pro-vicechancellors think about mathematics and statistics support, its place in their institution, and their visions for its future. Senior managers from 23 institutions were interviewed and the distillation of their views makes very interesting reading. For example, all those questioned reported having students who are challenged by mathematics and statistics; they were clearly aware of these challenges and very many were aware of, and valued, the work of the **sigma** Network. They made it clear that students will continue to require support in their learning of mathematics and statistics if an adverse impact on students' satisfaction, retention, achievement and employability is to be avoided. The report and the sigma Directors' response is available from the **sigma** Network website. We believe that this work is important not least because it can be drawn upon to highlight the national backdrop if and when you are required to make a local case for continuation funding.



Looking to the future, there are positive developments to report in respect of creating a sustainable community. The reincarnation of MSOR Connections – a publication muchloved by those interested in learning, teaching, assessment and support - has been secured through **sigma** funding and the efforts of its new editorial board Noel-Ann Bradshaw, Joe Kyle, Alun Owen, Peter Rowlett and Robert Wilson. We would encourage you to read it and to consider whether you have anything to offer for publication. The **sigma** Network Chair has been working with the Directors and hub coordinators to draw up a formal constitution for the Network. Officers will be identified during the year 2015/16 to ensure that the hard work of our community can be continued and further developed even in these times of austerity.

Finally, we would like to thank all those colleagues involved with **sigma** at institutions around the country and including those in the central team, those at HEFCE and members of the Advisory Group. Members of the **sigma** Network will be present at the CETL-MSOR Conference to be held at the University of Greenwich on 8-9 September 2015. We will be keen to meet you and hear your ideas for the future.

Tony Croft and Duncan Lawson (**sigma** Directors) David Bowers (Chair, **sigma** Network)



Tony Croft



Duncan Lawson



David Bowers



"It has allowed us to see the potential for maths support and given us the confidence to believe in its importance" 2015 survey respondent

## Key Groups and Personnel

The HEFCE funded **sigma** network project is managed through the **sigma** directorate and governed by the project's Advisory Group, with the hub network represented by its Chair, David Bowers.

Loughborough University

University of Birmingham

Loughborough University

University of Birmingham

Chair, sigma Network

Loughborough University

University of Birmingham

Loughborough University

Institute of Mathematics and its Applications (IMA)

National Centre for Excellence in the Teaching of

Mathematics / Mathematics in Education & Industry

Coventry University

Newman University

HEFCE

Coventry University

Newman University

#### sigma Directorate

Professor Tony Croft Michael Grove Trevor Hawkes Professor Duncan Lawson Moira Petrie [Project Manager]

#### sigma Advisory Group

Professor John Blake [Chair] Linda Allebon David Bowers Professor Neil Challis [External Evaluator] Sheffield Hallam University Professor Tony Croft Samantha Davis [Student Representative] Loughborough University Students' Union Michael Grove Trevor Hawkes Professor Duncan Lawson Moira Petrie [Project Manager] Professor Nigel Steele Charlie Stripp

#### **Hub Co-ordinators**

Noel-Ann Bradshaw Emma Cliffe Ruth Fairclough Leslie Fletcher Chetna Patel Abdel Salhi

University of Greenwich University of Bath University of Wolverhampton Liverpool John Moores University University of Sheffield University of Essex

South East South West & South Wales Midlands North West & North Wales North East & Yorkshire Eastern England

Since July 2015, the North West and North Wales Hub has been co-ordinated by Ian Jarman, Liverpool John Moores University.

## The **sigma** Network

2014/15 saw the second year of the three year HEFCE funded **sigma** Network project. The sigma Hub Network has continued to develop its constituencies and extend its reach.

Over the past year, 12 hub events have been organised, with a total of 89 institutions represented 114 times at events across the country. This is an increase from the 74 institutions (represented 94 times) whose staff attended hub events in 2013/14. In terms of overall delegate numbers, these have increased from 114 in 2013/14 to 224 in 2014/15. We have introduced a streamlined procedure to enable the bub co-ordinators to collate and share information about their activity in a more systematic fashion.

In addition to the continued development of the Hub Network, this past year has seen another successful CETL-MSOR conference (September 2014) and the provision of funding for 11 institutions to develop and enhance their mathematics and statistics support. So far, 11 resource development projects and 12 student intern projects have also received funding.

An exciting development this year has been suggestions received from the community to develop events centrally, outside of the hub event programme. This has resulted in the organisation of two central events, an evaluation and feedback workshop and a two-day NUMBAS workshop. In addition, a third request (for a workshop on the statistical

4

package R) will be met by the Eastern England Hub who were already planning a similar event. It is hoped that this R-workshop can be offered in a number of locations across the country in the coming year. These requests clearly demonstrate a view within the community that the **sigma** Network is seen as a key port of call in meeting the needs of mathematics and statistics support practitioners.

To gather evidence that the services being provided by the **sigma** Network were generating an impact, an online survey was organised in March 2015. 95% of respondents agreed that engagement with the sigma Network has had a positive impact on their own practice and/or on practice at their own institution. Respondents were also asked to identify any activity they would like the **sigma** Network to support. Responses included the possibility of web-based access to events, more defined professional development (CPD) and accreditation activities as well as interest in collaborative research opportunities within the discipline of mathematics and statistics support. All responses are being taken into consideration during the planning stages for the future direction of the Network.



# News and events from around the **sigma** Network

"It is these events/conferences that let you explore and discuss maths support with knowledgeable and 'interested' colleagues. I have learnt a huge deal and this has really impacted my approach to teaching and given me wider perspectives that have impacted my practice at institutional level. It has given both evidence and great examples from across the country of best practice." *2015 survey respondent* 

The main responsibility of the hubs is to offer a programme of events to their constituents. These meetings are open to anyone and allow more local access to workshops and events of interest, whilst facilitating networking and the sharing of information and experience. For those working towards HEA Fellowship, information is now provided as to how attendance at and engagement with each event, and reflection on its implications for practice, could help to provide evidence towards elements of the UK Professional Standards Framework.

In addition to their virtual meetings, the Hub co-ordinators and their deputies also meet up every 6 months to plan a co-ordinated programme and to shape the future development of the Network. The following pages give a flavour of some of the events held over this year.

6



## North East and Yorkshire Hub

The North East and Yorkshire Hub is co-ordinated by Chetna Patel, University of Sheffield, assisted by Vijay Teeluck, University of Leeds.

#### **Being Inclusive**

This event, Being Inclusive – the Whole Kit and Caboodle (in the Maths and Statistics Support Environment), was hosted by the University of Sheffield on Monday 19 January 2015. The day was a combination of talks and activities and gave the delegates an opportunity to consider their inclusive practice of maths and statistics support and learn ways of developing it further. It attracted 42 participants from 13 different institutions.

The opening talk by Rod Nicolson set the scene for the day by defining maths anxiety and its devastating effects, then highlighting how intervention can enable a positive turnaround from anxiety to comfort and even happiness. Clare Trott's talk detailed the differences between dyslexia and dyscalculia and how these relate to the interventions that may be used. Bryan Coleman discussed the Equality Act 2010 and how it affects universities. Victoria Mann, Dylan Griffiths and Eleanor Machin, all Specific Learning Difficulties (SpLD) tutors, presented on the approaches and methods they employ to help individual students. Bernadette Leckenby, a maths support tutor with extensive experience of supporting students with SpLD, presented some tips and techniques she has developed.

This event opened up real possibilities for improving engagement with SpLD students by giving tutors more confidence and increased awareness.



Chetna Patel



Vijay Teeluck

#### **Breaking Down Silos**

The North East and Yorkshire Hub's second event was a networking event held on 24 June 2015 at the University of York. This event provided an opportunity for delegates to consider their individual needs for service development and get ideas from the experiences of the group. It also involved discussions on developing ways of making mathematics and statistics support provision more inclusive. It was attended by 11 participants from 6 different institutions.

## North West & North Wales Hub

The North West and North Wales Hub was co-ordinated by Leslie Fletcher, Liverpool John Moores University. Leslie retired from LJMU at the end of May 2015 and from July 2015, this hub has been co-ordinated by Ian Jarman, also from Liverpool John Moores University.

## Meeting the mathematics needs of pharmacy students

This event was held at Liverpool John Moores University on 19 November 2014 and attracted 31 participants from 16 institutions, with a good representation of both maths support practitioners and pharmacy teachers. Tony Croft opened proceedings with a presentation on the issues with numerical and mathematical reasoning which plague all HEIs and all disciplines. He also outlined the contribution which maths support centres make to overcoming them.

Next Emma Bolton, Educational Development Officer of the British Pharmaceutical Students' Association, presented the results of a social media poll of pre-registration pharmacists (those in their first year of practice after graduation) asking about their experiences with mathematics in their undergraduate courses. She also asked about their preparedness for the calculation part of the qualifying examination which all graduate pharmacists have to pass, with quite high marks, in order to become fully registered pharmacists.

The final invited presentation in the morning was given by Lisa Smith, Question Writing Coordinator from the General Pharmaceutical Council who manages the setting, marking and moderation of the calculation part of the qualifying examination, nicely complementing Emma's presentation. In the afternoon there were contributed presentations on an interesting range of approaches to creating capability with and confidence about the calculations which pharmacy students encounter.

#### **Mathematics and Statistics Support Networking Event**

A regional networking event was held at Liverpool John Moores University on 25 June 2015. This event was aimed at those who would like to network with other Mathematics and Statistics support practitioners, share good practice and discuss common issues. The meeting included a talk from Tony Croft (Loughborough University) on the impact and





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importance of the **sigma** Network; Alun Owen (University of Worcester) discussed the issues and challenges associated with offering statistical support services to students across a wide range of university discipline areas.

Mathematics and statistics support services are used by learners from a variety of backgrounds and disciplinary areas. Collecting data and evidence on usage and impact can be used to greatly enhance the overall effectiveness of these services and their visibility across an institution. Michael Grove (University of Birmingham) gave a talk that reviewed the types of data that might usefully be collected and highlighted tools, techniques and strategies for doing so. He also discussed how those working in mathematics and statistics support might embed a scholarly element to their practice through the collection and dissemination of findings arising from their work. Finally, Mark Taylor (LJMU) gave a talk on why mathematics can be difficult to understand for some students. Issues included: describing a mathematical concept using unfamiliar terms; use of unfamiliar mathematical symbols (e.g. Greek symbols); use of unfamiliar mathematical abbreviations (wrt, st, iff, etc.); the use of unfamiliar examples; lack of use of diagrams or pictures; lack of use of simple analogies; and always explaining a mathematical concept in exactly the same way (regardless of whether the students understand the explanation). He suggested a few simple changes to the presentation of mathematical concepts that can make such easier to understand.

The event was well attended, with 18 delegates from 11 different institutions.

### Midlands Hub

The Midlands Hub is co-ordinated by Ruth Fairclough, University of Wolverhampton. Ruth has been assisted by Paul Rice (University of Northampton) for the past two years. Paul has decided to step down from the role of Hub deputy from July. We would like to take this opportunity thank Paul for his help and support for Ruth and the other Hub co-ordinators.

#### Statistics Training Event - two day workshop

Statistics and quantitative data analysis techniques are increasingly used in "non-mathematical" disciplines such as the social sciences and humanities, as well as in the STEM subjects. This places an increasing demand on tutors, lecturers and learning assistants who support students in this area, either through in-course tutorials or through maths support centres or other central academic skills provision. This two day event, held on 2 and 3 December 2014 at the University of Northampton, addressed an emerging need on the part of maths support tutors who might be less confident with statistics than other areas of mathematics and numeracy.

Day One was a Statistics for Mathematicians session, which covered some of the more straightforward statistical methods that are commonly seen in a maths support environment and proffered approaches that could be used to assist students with these methods. Day Two was an SPSS boot camp, which built on the statistical methods covered on Day One. Delegates were shown how to use (and support students to use) the popular statistical software package SPSS. Topics covered included:

- The SPSS interface; defining variables and coding data
- Producing descriptive statistics and graphs
- Correlation; simple significance testing
- Interpreting the SPSS output window

18 delegates from 10 institutions attended this residential workshop.



Ruth Fairclough





## Eastern England Hub

The Eastern England Hub is co-ordinated by Abdel Salhi, University of Essex. Adbel is assisted by Phil Assheton, University of Lincoln.

#### Models for the delivery of maths/stats support

This meeting was held at the University of East London on Tuesday 16 December 2014.

To begin, two hours were allocated for strictly timed 10 min talks, one from every institution represented. A timer with a loud buzzer was set at 10 minutes, starting at the beginning of each presentation and no comments or questions were allowed during this two hour period. This approach was to ensure that every institution was able to present their model of delivery. The afternoon group work was in snowball style: first in pairs who had to decide what was interesting/good about their partner's model; then pairs into groups of four or three; each of these three groups nominated a spokesperson to feedback to the whole group. Finally, a plenary talk rounded the event up.

Feedback received after the event from attendees included:

- It's very useful to hear about practice in other institutions – as the only person with this role in my institution, I find any feedback from those in similar roles particularly helpful.
- The (strictly!) timed talks and the structured discussions meant that we all got to hear from each other.
- I personally learned a lot about the various ways of providing math support.

There were 14 delegates from 10 institutions in attendance.



Abdel Salhi

#### An introduction to GeoGebra for Maths Support

A one day hands-on workshop to introduce maths support practitioners to the software package GeoGebra was held at the University of Essex on 15 May 2015.

Led by Tom Button, an experienced GeoGebra user from MEI, the event gave participants the chance to try out the various features of GeoGebra and consider ways this software could be used to explain and illustrate concepts in geometry and algebra in an engaging way. Tom could provide hints and tips on features such as the use of dynamic text boxes and controlling parameters by embedding sliders. There is a substantial library of GeoGebra resources at www.geogebra.org.

17 people took part in the workshop, giving positive feedback on the day. "As a complete beginner, I found this extremely useful and inspiring". Interest was expressed in a longer workshop to explore more advanced features in depth.

### South East Hub

The South East hub is co-ordinated by Noel-Ann Bradshaw, University of Greenwich, assisted by Allison Smale, Buckinghamshire New University.

#### Using online resources and the virtual learning environment to promote and enhance maths support

On 28 November 2014, the South East hub organised a one day workshop on using online resources and the virtual learning environment to promote and enhance maths support. The event was hosted by one of the newest **sigma** funded centres, Central St. Martins, University of the Arts London. This must be the first time that a meeting about maths support has taken place in an art studio!

There were seven speakers who presented on a variety of connected topics:

- The Evolution of a Support Centre: MathsAid online (Nigel Atkins, Kingston University),
- Flipping classrooms using online resources with Excel and VLE to enhance Maths support (Allison Smale, Bucks New University),
- HowCloud: a new teaching and learning tool for mathematics (Joe Ros, HowCloud),
- Use of diagnostic testing to improve access to maths support (Chetna Patel, Sheffield University),
- Providing maths support and improving transition into university life through VLE at Brunel (Inna Namestnikova, Brunel University London),
- Use of VLE in statistics and SPSS support at Brunel University (Christine Pereira, Brunel University London),
- Problems and solutions navigating to maths support resources (Leslie Fletcher, Liverpool John Moores University).

During the lunch break delegates were given the opportunity to try out HowCloud and a couple of tablets for creating screencasts. The meeting was well attended with 19 delegates from 16 institutions.



Noel-Ann Bradshaw

## Meeting the mathematical needs of pharmacy students

On 15 June 2015, a one day workshop on meeting the mathematical needs of pharmacy students was held. This was, in part, a rerun of the very successful event organised by the North West and North Wales hub in November 2014, in order to make it available to HEIs in other parts of the UK. The following talks formed the agenda for the day:

- Emma Bolton, British Pharmaceutical Students' Association Educational Development Officer – The Pharmacy Students' Perspective;
- Lisa Smith, Question Writing Coordinator, General Pharmaceutical Council – The Pharmacy Regulator's Insight;
- Sion Coulman, Cardiff University A contextualised diagnostic numeracy test: What? When? Why? and How?;
- Matthew Copping, University of Kent -Providing additional numeracy support for Stage I MPharm students.

After this there were two shorter presentation from Martin Greenhow (Brunel) and Jerome Durodie (Greenwich) followed by a short time for discussion and questions.

The event was hosted by one of the newer **sigma** funded centres, Kings College, London, and attracted 16 delegates from 14 institutions.

### South West and South Wales Hub

The South West and South Wales Hub is co-ordinated by Emma Cliffe, University of Bath, assisted by Rob Wilson, Cardiff University.

#### Embedding and sustaining mathematics support

A meeting on embedding and sustaining mathematics support was held on 23 January 2015 at the University of Bath. It was attended by 11 delegates from 7 institutions. Abdel Salhi (University of Essex) started the day with a view on sustainable maths and stats support in universities. He described the drivers for and development of the Maths Support Centre at Essex and highlighted the importance of considering direct income, indirect income, expertise, space, time and tools in ensuring the sustainability of a centre. Of particular interest was that the Centre is open to any member of the local community. This raises the local profile of the University and in turn the standing of the Centre. Direct income also results as queries from businesses lead to consultancy work.

Jon Gillard of Cardiff University spoke about the path from pilot to promoted service with a focus on meeting the challenge of securing ongoing funding and resources even for a very well-used service. Jane White related her experience at the University of Bath, comparing it to that at Cardiff. She showed how funding and staffing evolved over time and highlighted the importance of developing key collaborations and unique selling points.

In the afternoon, attendees discussed delivery at their own centres and considered how they might develop their centre in a sustainable way. Finally, attendees shared their thoughts on sustaining communication, networking and sharing of ideas within the South West Hub going forwards.





#### Statistics for non-statisticians

The statistics for non-statisticians event was held on 7 July 2015. Those with a strong quantitative background are often approached to give advice on statistical problems, even though they may have no formal training in statistics. This workshop aimed to provide non-statisticians with a guide to commonly encountered statistical concepts and their applications.

The day was led by Chris Hallsworth, Statistics Advisory Service Co-ordinator, and Cheryl Voake-Jones, Mathematics Resource Centre Co-ordinator, both of the University of Bath. Cheryl started the day with a short session of hints and tips which can be applied to the majority of statistical queries. Chris followed this with the start of an overview of statistical concepts which underlie common statistical techniques.

After lunch Jon Gillard and Rob Wilson of Cardiff University provided some statistical 'light relief' with their presentation on "What students really evaluate when they fill out questionnaires: A Cardiff case study and the NSS". This talk also helped highlight how statistical approaches work. Refreshed by discussion, we returned to Chris' overview of statistical concepts which finished with an example of the ideas in practice.

In the final session, Cheryl returned to highlight and lead discussion on common issues and challenges encountered when dealing with statistical gueries including the thorniest of queries which start with "But my supervisor said..."!

The workshop was well-received by the 19 delegates (from 10 institutions) who gave feedback including "Terrific review of stats stuff [...] really informative and very enjoyable", "Great audience and talks", "Dealing with statistical queries - good advice", "Made me like statistics better", "Useful discussion of common problems".

## Supporting students

The need to provide mathematics and statistics support for undergraduate and postgraduate students in higher education in England is now well-established. One of the key focuses of the current HEFCE funding is to enable increased levels of mathematics support for students studying at HEIs in England, regardless of the course they are undertaking. In addition, we are keen to support the wider skills development of students undertaking work within the mathematics support arena.

### The funding of new and enhanced support provision

In the first year of this programme, sigma organised two funding calls for distributing funding to set up new mathematics and statistics support in institutions with little or no existing provision. This has enabled us to provide funding to 9 HE institutions and 2 FE colleges with HE provision over the lifetime of the project:

#### 2013/14 - 2014/15

- Bournemouth University
- Halesowen College (HE in FE)
- King's College London
- University of Leicester

#### 2014/15 - 2015/16

- University of the Arts London
- University of East London
- University of Greenwich
- Lancaster University
- Royal Holloway, University of London
- Vision West Nottinghamshire College (HE in FE)
- Nottingham Trent University (enhanced provision)



"Overall I have found this experience worthwhile as it has allowed me to develop skills which will be useful in my future career such as: communication skills and calculation skills. I also feel that it has been an invaluable experience to have been able to work together with professionals from a variety of different fields to produce these resources" Student Intern, LJMU

> One of the institutions currently receiving funding to develop provision has now taken the strategic decision to increase its size and scope. sigma is providing help and support to the team tasked with this expansion. At another institution, sigma was able to provide contacts between staff in different departments looking to provide similar support, thus enabling a more joined up provision across that institution. We are now looking into developing case studies based on some of the funded provisions, covering issues like multi-campus provision, HE in FE provision and support for non-traditional disciplines, such as Fine Art.

Sally Dodsley and Vandana Sharma, co-ordinators of maths support at West Nottinghamshire College

### Student internships

**sigma** is continuing to support the direct involvement of students in projects that benefit the discipline of mathematics and statistics support through its student internship programme. Each student internship project receives a £2,000 grant, with the main purpose of providing the student interns with experience of working on a time limited project.

As part of the conditions of funding, the universities receiving funding have to provide match funding in the form of a second student intern project. The outputs of the projects are shared with the wider community. In addition, the students have been offered the opportunity to present their projects as part of one of the keynote sessions at the CETL-MSOR conference.

In 2013/14, **sigma** funded 6 undergraduate student summer internship projects. Here are some examples of the ongoing impact of those projects:

#### **University of Bath**

Developing resources to overcome specific language barriers in HE Mathematics and Statistics

**www.bath.ac.uk/study/mash/lang/** This link takes you to the project page which outlines the project and provides a link to the MASH Crowdsourced Bilingual Mathematics Dictionaries and non-English terminology list. The resources were developed by and for students who face language barriers in mathematics, and thus the project team believes that students will find them appropriate and relevant. With high numbers of international students at English HE institutions, this project can have a substantial and far-reaching impact. One of the student interns was subsequently employed by MASH for other purposes.

#### **University of Brighton**

Developing resources for mathematics and statistics on the University of Brighton Academic Study Kit (ASK).

The resources produced as a result of the **sigma** internship continue to be developed, funded by the institution. An additional outcome from this project included raising awareness of the model of internships to the university's careers and HR departments, and there are plans to create other specialist internships across the institution. Furthermore, the student who undertook the intern role was subsequently employed as a part time 'maths and stats student ambassador', alongside his final year studies.

#### University of Liverpool

Creating online maths questions to enhance student learning in maths in a chemistry context.

The aim of this project was to create online maths multiple choice questions with increasing complexity, quality formative feedback and grading to enhance student learning in maths in a chemistry context. Resulting from this project, all the workshops in the first year chemistry mathematics module (at the University of Liverpool) are covered with compulsory online assessments for both lower and higher level maths. The aim of the assessments is to evaluate students' knowledge on various topics practised in the workshops. Students who do not perform well on these assessments have the opportunity to take the optional online tests with increasing complexity in order to improve their maths skills. The project was presented at the Royal Society of Chemistry (RSC) Teaching Fellow Meeting in September 2014. The RSC has shown interest in using the online maths questions, answers and feedback on their website.



Student keynote session at CETL-MSOR 2014



#### Liverpool John Moores University

Designing a collection of practice questions to improve the numeracy, capabilities and confidence of pharmacy students.

This project focussed on the development of formative assessment and similar learning materials specifically geared to the mathematical needs of pharmacy students. The outcomes of this project played a significant role in the development and delivery of the November 2014 hub event "Meeting the mathematics needs of pharmacy students" – this event was also run in the South East Hub in June 2015. The project has significantly strengthened the collaboration between the School of Pharmacy and the Maths Resource and Support Centre at LJMU.

#### London Metropolitan University

Data collection and analysis relating to usage of the maths support provision at London Met.

This project's intended objective was to examine the effectiveness of the LMU's Maths Clinic in providing adequate support to users. The recommendation of opening the Maths Clinic for more hours as supported by the results from the project has been accepted by School of Computing which has agreed to finance the additional 12-hours and have employed two-mentors to give support in the Maths Clinic.

#### **Sheffield Hallam University**

Investigating ways to promote engagement with students from subject areas which are under-represented as users of Maths Support.

The aim of this project was to promote engagement with students from subject areas which are under-represented as users of Maths Support at SHU, and generally boost the participation rate of the existing Maths Support Service. The project outcomes have informed plans to reshape the Maths Help service at SHU, both in terms of its location and its delivery. Students from 5 of the projects will be presenting at the CETL-MSOR conference at the University of Greenwich in September 2015. In 2015/16, we will be funding in-year, rather than summer, intern projects to enable projects to complete and report back prior to the end of this funded programme in July 2016.

#### 2014/2015 intern projects

After receiving more than double the applications compared with last year, the following 6 student intern projects are being funded during the summer of 2015:

#### • Brunel University London

To enhance the maths e.g. computer-aided assessment engine to cover more basic mathematics and statistics

#### University of Bath

To investigate and identify promotional activities for the Mathematics Resources Centre (MASH) at the University of Bath

#### • University of Leeds

To develop e-assessment activities, including integral calculus and financial mathematics

#### • University of Central Lancashire

To assist with the development of a three day outdoor course for mathematicians using experiential games.

#### **Newcastle University**

To develop further material for the mathematics and statistics on-line support wiki found at http:// mathsupport.mas.ncl.ac.uk/wiki/Main\_Page

#### • University of Nottingham

To produce engaging support, training and promotional materials for the School of Mathematics' new PASS scheme

## Supporting practitioners

In addition to providing access to local and central events and support through the hub network, **sigma** supports a variety of activities to support mathematics and statistics support practitioners across the country.

#### **CETL-MSOR Conference**

The annual CETL-MSOR conference is now well-established as the principal national (and indeed, international) event for dissemination and sharing of good practice in mathematics and statistics support as well as wider mathematics and statistics education discussions. The current HEFCE funding has provided support for the conference for 2014, 2015 and 2016.

In 2014, the conference *Mathematics and Statistics Teaching, Learning and Support: Real, Virtual, Mobile* was hosted by Cardiff University on 8th and 9th September. A total of 105 delegates attended the conference this year, representing 44 different institutions. This compares with 90 delegates in 2013. The programme included 4 Keynote sessions, 43 30-minute sessions and 1 1-hour workshop. As with previous years, one of the most successful sessions was the student keynote session, where students undertaking **sigma** funded intern projects presented on their work.



Keynote speaker Colin Jones, University of Tasmania

16

This year's conference *Sustaining Excellence* is being hosted by the University of Greenwich on 8th and 9th September 2015. There was an increase in the number of received and accepted abstracts.

#### sigma Prizes

The **sigma** prizes, which are awarded at the conference, have been important in promoting research and scholarly activity alongside hands-on practice in mathematics and statistics support.

The winners of the **sigma** prizes in 2014 were:

Innovation of the Year: Shazia Ahmed and Sarah Honeychurch (University of Glasgow)

The Innovation of the Year prize was awarded to a project that has made a significant and demonstrable difference to mathematics/statistics support at its home institution. In addition, the initiative has the potential to be replicated or developed at other institutions. In the case of the winning innovation, Shazia Ahmed and Sarah Honeychurch have developed, moderated and evaluated an innovative form of Virtual Peer Assisted Learning (VPAL) using Facebook for students at the University of Glasgow. By providing a place for students to talk and interact, and having minimal but supportive tutor presence, students were encouraged to organise their own study groups and access Student Learning Service support; once established, the groups became virtually self-supporting.



Student of the Year: George Hudson (Coventry University)

The Student of the Year prize was awarded to a student involved in mathematics and statistics support at their home institution, who could demonstrate a positive impact on the support experience through, for instance, direct contact with students or resource development. In the case of the winning student, it was clear to the Panel that George Hudson more than met this requirement. With an increasing number of students from disciplines other than STEM students patronising the Maths Support Centre (MSC) at Coventry University, George was its first student proctor from outside the Faculty of Engineering and Computing. As a student from the Business, Environment and Society (BES) Faculty, as well as the Bloomberg BAT Campus Ambassador and Treasurer of the Investment Society, George has established an excellent relationship with those departments in the BES Faculty with mathematics in their degree courses. He was able to successfully promote MSC services to fellow BES students and he identified free slots in their timetables, co-ordinating his hours of tutoring duty in the MSC to be on hand when they attended.

The awards were presented at the CETL-MSOR 2014 conference dinner on 8th September 2014.

This year's winners will be announced at the conference in Greenwich on the 8th September 2015.

All sig who the stea thro fou will Man tho





All 11 provisions funded by the current HEFCE funded **sigma** Network project have been provided with a mentor who has been available to share their experiences, helping the new provisions to avoid "re-inventing the wheel" and to steer clear of common pitfalls. In addition, provisions funded through the previous HE STEM Programme funded **sigma** projects have also been offered continued mentoring. The four provisions whose funding comes to an end this summer will be offered continued mentoring should they want it.

#### Support tutor training

Many mathematics support centres, including the majority of those established during the National HE STEM Programme, make extensive use of post-graduate students to act as tutors. Providing mathematics support is not the same as the routine tutorial support that many post-graduate students undertake. To prepare mathematics support tutors, **sigma** has developed a one day training workshop (with supporting materials) that was delivered six times during 2014/15. 88 delegates from 20 institutions received training at these workshops. It was noted that delegates included staff as well as postgraduate students.

It is our intention to run this workshop again in each of the hub regions in 2015/16.

"The network has helped us develop our provision by drawing on the experiences of other practitioners, which has been a more efficient way of spending our limited resources." 2015 survey respondent

# Resources, resources, resources

Another avenue for **sigma** support is the development and provision of resources and information for both students and staff. We continue to use a number of approaches to achieve this.

### Resource development activities

In the past year, a number of resources, funded through the **sigma** programme, have been made available to the community, either via **math**centre or **stats**tutor. These have included:

Scenario-based statistics support training resources
 Alun Owen (University of Worcester), Ellen Marshall
 and Scott Smith (both University of Sheffield) produced
 a pack of "scenario-based" training resources that can
 be used for developing statistics advisory skills. The
 resources include four scenario-based training videos
 with transcripts, a statistics support tutor training
 workshop slide set, an SPSS workbook and the Statistics
 Tutor's Quick Guide to Commonly Used Statistical Tests.

 SPSS video tutorials
 In addition to resources submitted via the statstutor Community Project (see below), Christine Pereira

(Brunel University London) also produced 27 SPSS video tutorials, covering topics such as Initial analysis and descriptive statistics, Charts and graphs, Correlations and T-tests.

• *Binary Number System and Boolean Logic videos* Eva Szatmari and Catherine Griffiths (Birkbeck College, University of London) developed 20 video based resources to support Computing Science students, focusing on binary numbers and Boolean logic.

*Pharmacy calculations - at a glance* Matthew Copping (University of Kent) produced 17 self-study guides specifically to support pharmacy students. Collectively, the study guides provide a comprehensive resource to support pharmacy numeracy development at university and plug a current gap in the availability of self-help resources. Matthew is planning to add more resources to this collection over the summer.

- Statistics e-Assessments with supporting materials The resource produced by a team at the University of the West of England is a suite of five statistics e-Assessment modules that relate to the statistical activities involved in choosing and carrying out an appropriate one sample test for location (mean or median) on a randomly generated data set. The modules can be accessed independently or can be taken sequentially which will mimic the flow of a full statistical analysis where the appropriate location test for a particular data set needs to be identified. In addition to this student-focused material, the team produced an instruction manual detailing how the e-Assessments were created. This enables fellow academics to make alterations to the e-Assessments, for example to contextualise the problem for a different discipline and/ or to produce their own statistics e-Assessments.
- "Getting started with...." screencasts and help guide Emma Cliffe (University of Bath) has developed a set of 4 "getting started with..." guides covering effective entry of equations in Word, LaTeX, data manipulation in Microsoft Excel and data handling in SPSS.
- Euclidean geometry for the Arts
   Andrew McGettigan and Rich Cochrane (Central St Martins, University of the Arts London) have developed a set resources for Arts and Humanities students, covering some key themes and ideas in geometry while emphasising practical skills, mathematical thinking and points of cultural and historical interest.



### **math**centre

**math**centre (www.mathcentre.ac.uk) is the online open access website established in 2003 with mathematics resources for both students and staff. Usage data indicates that the site continues to be well used, attracting approximately 155,000 users over the past year. New users have increased to 70% (66% in the same period last year). The majority of use originates in the UK (54%) and increasingly users are utilising **math**centre on mobile devices – desktop 77% (83% in 13/14), mobile 14% (9% in 13/14) and tablet 8% (8% in 13/14). This has prompted us to investigate ways of making the resources more accessible on such devices.

Staff resources include key reports relating to mathematics support. These are archived on **math**centre so that they are easily accessible to practitioners and other interested parties.

The mathematics support community has continued to enhance **math**centre through contributions to the **math**centre Community Project. Examples of resources contributed this year include:

Welsh language version of 'More Facts and Formulae'
 leaflet

A fourth Welsh language version of the mathcentre Fact & Formulae leaflets, More Facts and Formulae, has been translated and made available to **math**centre by Dr Tudur Davies, a Coleg Cymraeg Cenedlaethol Lecturer of Mathematics, at the Institute of Mathematics, Physics & Computer Science, Aberystwyth University. Funding from the Coleg Cymraeg Cenedlaethol is gratefully acknowledged.

- Resources for pharmacy and health science students
   Two new resources for pharmacy and health science
   students on Solid trituration and Isotonicity have been
   contributed by Abigail Francis from Liverpool John
   Moores University.
- 'Mathematical Tools for Physical Sciences and Systems Biology' Facts & Formulae leaflet

A Facts & Formulae leaflet containing Mathematical Tools for Physical Sciences and Systems Biology has been contributed by Morgiane Richard, University of Aberdeen and reviewed by Mamen Romano and Ian Stansfield, University of Aberdeen.

#### • Quick Reference leaflets

Two quick reference leaflets on Numerical quadrature and Equations of Motion have been contributed by Josh Simpson and reveiwed by Leslie Fletcher, Liverpool John Moores University

#### Numbas

Over 60 sets of additional Numbas resources covering a range of mathematical and statistical topics have been made available under a Creative Commons licence to the **math**centre and **stats**tutor Community Projects by Bill Foster and Christian Perfect, School of Mathematics and Statistics at Newcastle University. These contain randomised questions with feedback for formative assessment.

#### Maths e.g.

Maths e.g. has been made available to **math**centre by Martin Greenhow and Abdulrahman Kamavi from Brunel University. The resource continues to expand and now contains over 3000 mathematics and statistics questions with randomised parameters and feedback. A teachers' interface has been developed that allows tests to be created from the question bank.

#### • Just the Maths

"Just the Maths" authored by the late Tony Hobson, former Senior Lecturer in Mathematics in the School of Mathematical and Information Sciences at Coventry University, is now hosted on **math**centre. It is a collection of separate mathematics units, in chronological topic-order, intended for foundation level and first year degree level in higher education where mathematics is a service discipline e.g. engineering.

### **stats**tutor

The online open access website **stats**tutor (www. statstutor.ac.uk) was launched in 2012 with case studies and resources for students in higher education studying statistics. Usage statistics show that **stats**tutor was accessed by approximately 19,000 users (13,000 in 13/14) for over 24,000 sessions (16,000 in 13/14). 78% of visitors are new users.

The **stats**tutor Community Project enables the resource bank to expand by facilitating high quality peer reviewed resources developed by academics and support practitioners to be made available to a wider community. This year, these have included:

• Getting started with SPSS video tutorials A series of 16 bite-sized 'Getting started with SPSS' video tutorials have been contributed to the statstutor Community Project by Christine Pereira, Brunel University and reviewed by Kate Richards, MEI, and Vikki O'Neill, Queen's University Belfast.

### Mobile Apps

As part of our resource development work, we are producing applications for use on mobile devices, such as iPads and other tablets as well as smart phones.

#### mathcentre Percentages

Many in the maths support community are familiar with the mathtutor resources consisting of video tutorials and interactive exercises. Mo Rehman and Pete Chapman at Newman University have completed a pilot project to create a mobile phone app from one of the mathtutor videos. The app, called '**math**centre percentages', is available from the Apple App Store and via Google Play. It contains a re-versioned section of the **math**tutor percentages video and randomly generated guestions so that the user can self-assess their progress. This development was part of a concept project and was showcased at the 2014 CETL-MSOR conference.

#### Bemazed

sigma and Mathematics in Education and Industry (MEI) have collaborated on a game for mobile devices in which the player solves sets of small problems of increasing difficulty, starting with the four operations of arithmetic and

[mathcentre]... is a wonderful resource that I recommend frequently to students – our Maths Learning Centre could hardly function without it...

introducing inequalities, powers, logarithms and elementary number theory. The game will be available for general access and use from September 2015.

#### **Pocket Guide**

When it comes to seeking help for teaching and learning mathematics, the internet offers an embarrassment of riches: video tutorials, animations, mobile apps, interactive web pages, all sorts of assessment software, entertainments, powerful programs to explore, investigate and compute, books, wikis, forums, and probably more digital documents than there are trees for the paper to print them on. The sheer proliferation of informative and alluring material can be overwhelming. There is a need for a compact and reliable guide to all this material that will make it easy for maths support tutors to direct their students to the reliable resources they need, as well as to get help for themselves. Work has begun on the development of two guides: one covering mathematics support and one covering statistics support. The guides will offer a simple evaluation of each resource included and a description of what it offers. These guides will be available in 2016.

## Facts and Formulae leaflets

sigma provided over 15,000 Facts and Formulae leaflets to 25 institutions over the past academic year.

These leaflets include:

- Facts & Formulae
- More Facts & Formulae
- Facts & Formulae for Economics
- Probability & Statistics
- Mechanics
- Maths for Chemistry
- Maths for Computer Science
- mathcentre
- statstutor

Electronic version of all Facts and Formulae leaflets can be found at www.mathcentre.ac.uk. Please contact m.g.petrie@lboro.ac.uk if you require any of these leaflets for your students (available free of charge while stocks last).

## What does the future hold?

Prof Duncan Lawson, sigma Director, Newman University

What will happen in the future? The flippant answer is that if I knew that, then I would select the winning numbers in the lottery and retire. The more serious answer is that of course we don't know.



Duncan Lawson

Who would have thought, this time last year, that there would now be a Conservative Government with an overall majority and a minister for universities and science determined to introduce a Teaching Excellence Framework (TEF) within a matter of months.

One thing that is certain is that 2015/16 is the third and final year of the current HEFCE mathematics and statistics support programme. The letter from HEFCE, commissioning **sigma** to undertake this programme highlights that **sigma** was expected to "continue its work in co-ordinating national maths support activities in England, to establish new maths

support centres in England and to continue to develop maths support resources to be used by the English HE sector". It is clear from the information presented in this annual report (and in last year's) that sigma has delivered successfully on these goals.

However, although not explicitly mentioned in HEFCE's letter, the proposal sigma put to HEFCE included a higher level goal - the establishment of a sustainable community of mathematics and statistics support practitioners. Considerable progress has been made towards this goal too but, of course, only time will tell as to how effective this has been.

We are working towards establishing the **sigma** Network as a formally constituted organisation, with elected officers responsible for the continuation of the community of practice. David Bowers, the Network Chair, has prepared a draft constitution, which has been reviewed by the current Advisory Board. This will be discussed further at the forthcoming CETL-MSOR conference in Greenwich.

Collaboration has always been a fundamental principle within the mathematics and statistics support community and this has continued despite the 'marketisation' of higher education and increased competition amongst institutions. Mathematics and statistics support has prospered over the last decade because of the commitment of enthusiastic individuals who have given their time and energy for the good of students throughout the country (and indeed the world), not just at their own institution. Through this commitment and co-operation, the total has been considerably greater than the sum of the individual parts.

We hope and believe that this will continue – that there will be individuals who, as good 'academic citizens', will

be willing to take on roles, such as Network officers and Hub co-ordinators, to enable the Network to continue to flourish. Such roles are not entirely altruistic - they will provide opportunities for professional development and reputation building, particularly for those who hope to develop their careers with a learning and teaching focus.

The regional Hubs will be integral to the on-going operation of the community and their activities will continue to provide the backbone of the Network's programme. The annual CETL-MSOR conference will remain the showpiece event of the year bringing the whole community together as it does currently, but with an additional purpose: the Network officers would report to the conference and be elected there.

Sharing of good practice and resources has been instrumental to the spread of mathematics and statistics support throughout the sector. Measures already taken have provided the framework for this to continue in the future. The revival of MSOR Connections as an academic magazine 'by practitioners, for practitioners' will provide one vehicle whereby the community will be able to publish and disseminate new developments. The **math**centre and statstutor websites are now firmly established and the 'community projects' on these websites provide forums for sharing of new resources.

Alongside the goodwill and commitment of individuals and the established mechanisms for sharing good practices, there will be a need for some financial resource. Events like the annual conference will need to fully cover their costs in the future and possibly even make a small profit. Other avenues of funding, such as charitable grants, support from professional bodies and learned societies and institutional subscriptions will be explored. The time may be ripe for this.

The recently published high-level sector needs report Senior Management Perspectives on Mathematics and Statistics Support in Higher Education by Professor Harry Tolley and Dr Helen Mackenzie shows that there is a good level of

understanding, amongst PVCs and other senior managers, of both the need for mathematics and statistics support and the role that **sigma** has been playing. There is also a clear understanding that, even in the increasingly competitive HE world, co-operation amongst institutions in this area will provide real benefits.

Whilst there is still considerable uncertainty about how the impending TEF will operate, it does provide further opportunities to underline the value of mathematics and statistics support. In his speech of 1 July, Jo Johnson MP, Minister of State for Universities and Science, set out four aims for the TEF - these included:

- to ensure all students receive an excellent teaching experience that encourages original thinking, drives up engagement and prepares them for the world of work;
- to recognise those institutions that do the most to ٠ welcome students from a range of backgrounds and support their retention and progression to further study or a graduate job.

Mathematics and statistics support can surely make significant contributions in both of these areas - something the Tolley and Mackenzie report shows PVCs are well aware of. Several institutions already mention their mathematics and statistics support provision in their OFFA access agreements. The Director of OFFA is giving a keynote address at this year's CETL-MSOR conference which will underline the role that mathematics and statistics support can play in delivering fair access. The TEF, whatever our reservations about the indecent haste with which it is being introduced, might further concentrate senior managers' minds and provide some levers for accessing further support from institutions.

We believe that the current **sigma** programme has been "low cost and high impact" at a national level. There is a strong case that the same is true of mathematics and statistics support at an institutional level. The future is uncertain but by no means bleak.

## Find out more

We are working hard to ensure that we spread the word about what we are doing as extensively as we can. Here are some of the ways to find out about what we are doina:

#### sigma Network website

The sigma Network website www.sigma-network.ac.uk is one of the primary communication tools used by the project. We have continued to work hard to ensure that all relevant news from the mathematics and statistics support sector, funding calls and all **sigma** and **sigma** Hub events are publicised on the site. Details and materials, such as presentations and hand-outs, are archived following the event so that those not able to attend can also benefit. Information on individual mathematics and statistics support provision across institutions has been collated and the hub pages on the website have been updated to include links to relevant support provision webpages.

The **sigma** Network website contains resources and key reports that will be of use to mathematics and statistics support staff. This includes all **sigma** publications and publicity leaflets as well as high level sector publications. All abstracts and presentations from CETL-MSOR 2013 and 2014 have been archived on the site and it is the intention to make materials from CETL-MSOR 2015 available. In addition, we have published the programme for the CETL-MSOR 2015 conference, along with links to the abstracts for each session, prior to the conference itself.

Other website improvements include easier access to event information via a monthly calendar format. This year, the number of views to www.sigma-network.ac.uk exceeded 16,000.

#### sigma Network newsletter

We are keen to ensure that as much news and information as possible is available. To this end, a guarterly **sigma** Network e-newsletter has been published, with the first edition in December 2013. Newsletters contain articles of interest to the mathematics and statistics support community, event publicity and reports and highlights resources and research publications. Newsletters are archived on the **sigma** Network website. We are grateful for the contributions received. The newsletter is sent to all members of the sigma Network JISC mailing list.

the remainder of the project to ensure the widest reach possible. Follow us on Twitter at @sigmahubs. sigma Network mailing list The sigma Network mailing list is hosted by JISCMAIL (sigma-network@JISCMAIL.ac.uk). It is used by sigma to communicate events and funding calls to the mathematics and statistics support community. It is increasingly being used by the community to advertise positions in mathematics and statistics support and to request relevant information. Membership of the list now stands at 216 subscribers (up



We will continue to develop our online presence over

from 166 last year). In addition, the number of posts to the mailing list has increased from 127 last year to 185 this year.

Do encourage your mathematics and statistics support colleagues to sign up.



# Get involved with the **sigma** Network

## People involved with cross-university mathematics and statistics support come from a broad range of backgrounds.

The sigma Network includes:

- specialist mathematics and statistics lecturers
- study skills tutors
- learning developers
- student peer learning leaders
- departmental managers
- educational researchers
- learning technologists
- and many others with a general interest in the teaching and learning of mathematics and statistics

There are several ways you can become involved in the **sigma** Network:

 Visit our website at www.sigma-network.ac.uk. The website contains news and updates of events relevant to mathematics support practitioners, and also includes links to resources and key documents dealing with the theory and practice of mathematics and statistics support. Please don't just browse the website, let us know of content that you would like to see included.

- (2) Subscribe to our free email discussion list at www.jiscmail.ac.uk/sigma-network. This will put you in touch with a growing number of professionals with an interest in cross-university mathematics and statistics support.
- (3) Get in touch with the co-ordinator of your local sigma hub (contact details on the website). The regional hubs are always keen to hear from new people working in mathematics and statistics support, especially if you have ideas for local or national meetings and events and could help to organise them.

**mathcentre** (www.mathcentre.ac.uk) and **stats**tutor (www.statstutor.ac.uk) provide online open access mathematics and statistics resources to support students in all disciplines in their study of mathematics and statistics. The sites are also repositories for resources such as guides and research papers for mathematics and statistics academics and support practitioners working with students.

Developed in 2003 by a group from the Universities of Loughborough, Leeds and Coventry, the Maths, Stats and OR Network and the Educational Broadcasting Services Trust and upgraded in 2009 with funding from JISC, **math**centre is highly regarded by the sector, and used as a repository for high-quality formative assessment resources, such as Numbas (Newcastle University) and Maths e.g. (Brunel University).





The sigma Network website



### mathcentre

students and staff free online mathematics resources to support the transition from school to university in a range of disciplines

igma 5

## statstutor

atstutor offers free line statistics support aterials to students, cturers and everyone oking for post-16 tatistics help in a range

sigma 2

www.**math**centre.ac.uk

**statstutor** was developed by staff from Loughborough and Coventry Universities and also the **sigma** Network, with contributions from the Royal Statistical Society's Centre for Statistical Education as well as a number of other colleagues from other HE institutions in the UK.

The Communities area of both **math**centre and **stats**tutor facilitate the contribution of high quality peer reviewed resources developed elsewhere so that these resources may be made available to the wider mathematics and statistics support community.







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