network for excellence in mathematics and statistics support

NEWSLETTER

Issue 19: Spring 2020

Editor's Note

It is with pleasure that I present the Spring Edition of the **sigma** Newsletter 2020. Many thanks to Hansa Bissoondeeal for the smooth handover and for her diligent work as editor over the past few years. I hope to continue this work and do it justice.

Being a spring edition, it seems only right to include the Christmassy article by Ann Smith who has merged the season's festivities with maths to get her students to explore Geometry. Peter Mitchell provides a good example of teaching and advising students to fulfil their analysis requirements *and* live up to supervisors' requests.

We have several articles here that demonstrate **sigma** Network's supportive community of practice. There are reports on well attended events focused on aiding transition to Higher Education by Liam Naughton and taking a closer look at maths and statistics anxiety with the intention of alleviating it by Nick Goddard. If you are interested in hosting a **sigma** Network event at your institute the guidelines recently developed will be useful, a more information can be found in our resources pages.

There are also fresh eyes on the effectiveness of maths and statistics provision from Farhana Lunat; a new PhD student reviewing the practice. Plus, a timely reminder and endorsement of the value of our mailing list from the Chair David Bowers to keep conversations going.

We are often under pressure to make our lessons/lectures/presentations 'fun', my attempt at this can be found in the beer joke – feel free to enjoy, use or heckle ...

Thank you, of course, to all authors for their contributions to this edition. The deadline for contributions for the next edition (Autumn 2020) is **28th August 2020**. We welcome contributions on any topic that may be of interest to practitioners and academics supporting higher education students in their learning of mathematics and statistics.

To submit an item, see http://www.sigma-network.ac.uk/sigma-newsletters/.

Finally, as usual: the views expressed do not necessarily constitute recommendations from the **sigma** Steering Group or any associated parties.

Happy Reading!

– Chetna Patel

The Chair's piece: Communicating nationally and internationally

David Bowers
Chair | sigma Network
chair@sigma.network.ac.uk

It was back in the long hot summer of 2012 that the decision was made to start a *JISCMail* email list for the **sigma** Network. As I announced at the time, *JISCMail* is a system whereby one email sent to a "list address" (in our case sigma-network@jiscmail.ac.uk) is automatically forwarded to everyone who has "subscribed" to that list. So if you wish to announce something or seek advice from a group of likeminded people, a single email will suffice.

Given that is was – and largely remains – the case that people working in maths support often do so in relative "isolation", often as an institution's sole maths support tutor or part of a very small team, the opportunity to reach out and communicate with peers elsewhere has been important to encourage the "community of professional practice" around mathematics and statistics support today.
Currently, as of 14 February 2020, the sigma-network *JISCMail* list has:

- 411 individual subscribers;
- Subscribers representing 92 UK higher education institutions, including all but one of the 24 Russell Group universities;
- Subscribers from 11 countries outside the UK.

It is sometimes said that email lists (or Listservs as they are sometimes known) are yesterday's technology, superseded by the glossy allure of other social media outlets. But for professionals working in academic settings, email is an "always on" channel that does not confuse work with personal life. This means that email list communications tend to be to the point and not encumbered by superficial or vacuous comments (LOL 😊).

It is also sometimes claimed that if you subscribe to a mailing list, you will be inundated by irrelevant messages swamping your inbox. I must say that this has rarely been the case with the sigma-network list. (And if things get out of hand, I have the power as list owner to intervene, so be warned!) Messages tend to fall into the categories:

- Announcements of events, conferences etc relevant to maths and statistics support;
- Sharing of links to useful resources, or seeking examples of resources;
- Asking for ideas on running a maths support service;
- Posting of job vacancies for maths support tutors;
- Invitations to collaborate on projects or bid for funding.

So do please use this opportunity to join the conversation around mathematics and statistics support and communicate with like-minded folk at universities across the UK and further afield. It's free!

To subscribe to the sigma-network *JISCMail* list, go to http://www.jiscmail.ac.uk/sigma-network and click on "Subscribe or Unsubscribe".

Origami and geometry postulates: A practical session with a Christmassy feel

Dr Ann Smith
Senior Lecturer in Mathematics, School of Mathematics & Computer Science | University of Huddersfield
a.smith@hud.ac.uk

With the academic term stretching late into December and responsibility for teaching on the final Friday I sought an activity with the perfect combination of intellectual and frivolous elements. What better mix than origami and geometry?

Existing mathematical concepts in geometry, calculus and abstract algebra can be explained through origami whilst new models are routinely developed by modelling enthusiasts and mathematical practitioners alike.

Thanks to the article 'Mathematics and Origami: The Ancient Arts Unite', (Krier 2007) based on Alperin's postulates (2000) I had a readymade plan of action. A rainbow coloured stack of origami paper purchased, and the stage was set, an exploration of the links between the ancient arts of Euclidean geometry and Origami began.

Ideal for a practical session of one to two hours, Krier's exercises could equally be condensed to suit a shorter stint. After a brief introduction, and some deliberation re colour choice of paper, the students were directed to the set of origami postulates as a warm-up exercise. Clearly stated postulates link directly to those of Euclidean geometry (I left it to the student's discretion whether or not the latter were investigated). Interleaved questions promote query, also investigation was aided visually by the figures.

Figure 1 – Origami paper ready

Folding was found to be more immediate than the theoretical geometry, unsurprisingly. Interesting divergences included both decorative items (doilies to dodecorations!) and further geometrical concepts such as the six point snow flake (not 'snow fake'). Doubtless I was far more excited at doubling the cube and the resulting geometric analysis, illustrated, than the group but whoever said widening participation shouldn't include the lecturers?

Overall, a particularly entertaining session I would recommend and a fitting finale for the close of a hard term. Re geometric proofs: I strongly recommend preparatory investigation if your geometry is as rusty as mine. Perhaps this explains my greater elation having battled it out, retrieval practice style?

References:

R. Alperin, A mathematical theory of origami constructions and numbers, New York Journal of Mathematics 6 (2000), 119–133 pp.
J. L. Krier, Mathematics and Origami: The Ancient Arts Unite, Semanticscholar.org (2007). https://pdfs.semanticscholar.org/1c1a/397eb31a69dfd2671cb61326491115b779d0.pdf

"My supervisor says that I need a statistical test"

Peter Mitchell

Part-time tutor, Mathematics and Statistics Help | University of Sheffield

P.L.Mitchell@Sheffield.ac.uk

This conundrum turned up at Mathematics and Statistics Help (MASH) in the University of Sheffield as a query from a medical scientist. The activity of an enzyme had been measured in two types of an organism, three preparations (replicates) in each. One type had zero activity, the other type had three similar results (Figure 1). The student said that her supervisor was insistent that a statistical test was required, and since the data were not Normal, this would be the Mann-Whitney U-test. And when carried out, it was not significant at P=0.10. How could this be, asked the student, when there is such an obvious difference?

My response was that any test would struggle with only six observations, and three of them the same. But why test? There is a qualitative difference between type A that has no detectable enzyme activity and type B that has measurable activity. Moreover, for type B we can calculate a mean and 95% confidence interval, which will not include zero unless the three observations are exceptionally variable. (Afterwards, I calculated that any coefficient of variation for the observations up to 40% would provide a 95% confidence interval not including zero. This from (1) Student's t × standard error = 4.303 × standard deviation/$\sqrt{3}$, and (2) coefficient of variation = standard deviation/mean, and a bit of algebra.) When there is such a clear result, statistical testing of the difference between two treatments may not be helpful and a more common-sense approach is required. I left the student either to accept a non-significant finding from the U-test or to take the other approach and explain this to her supervisor with the reasoning that MASH had provided.

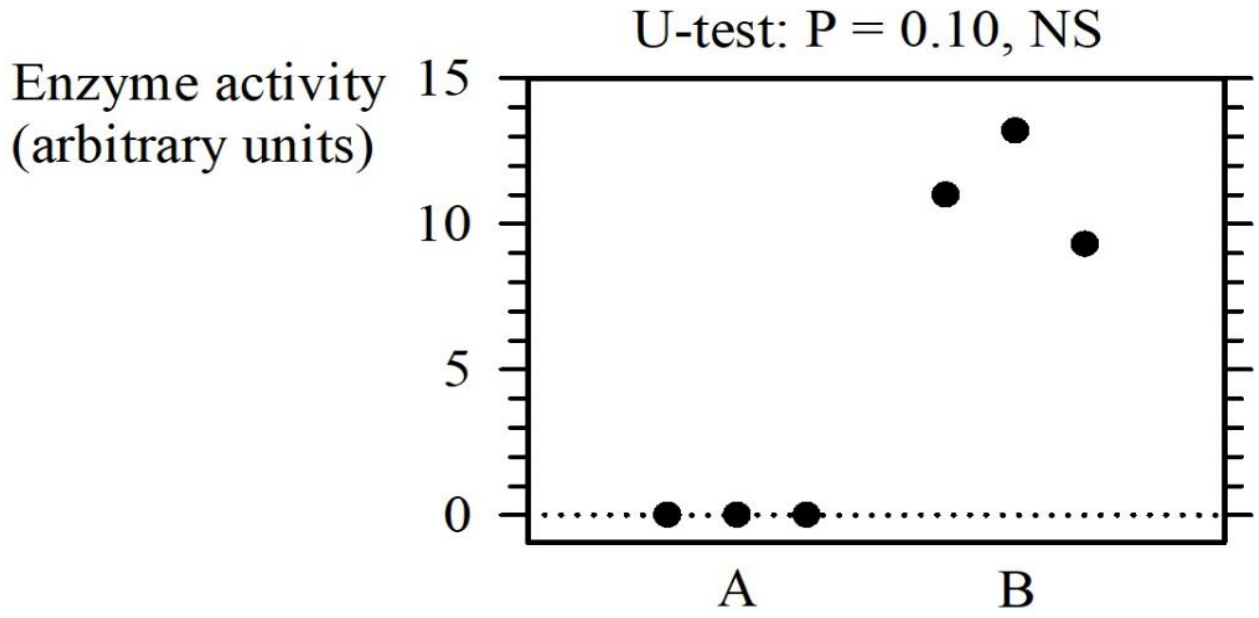

Figure 1. Dot plot of observations from an experiment comparing enzyme activity in two types of organism.

Engagement with Mathematics and Statistics Support

Farhana Lunat
PhD student, sigma Mathematics and Statistics Support | Coventry University
lunatf@uni.coventry.ac.uk

It is well-known that many students who would probably benefit from receiving maths and stats support do not engage with the services provided. My PhD study will seek to understand this non-engagement better by analysing attendance data from sigma at Coventry University. My aim is to investigate demographic variability in the data and then develop an intervention to increase engagement of a target demographic group.

Those who do engage with the support were identified through analysing sigma attendance data (2018/19).

From Figure 1, it is clear that BSc Mathematics was the most popular course of attending students by number of visits, but not by number of different students – indicating many return visits. Although Figure 1 does not indicate cohort sizes, it raises questions about the difference, by course, of the rate of return visits. Thus, further data analysis is required to understand better the relation between students' course of study and their number of visits.

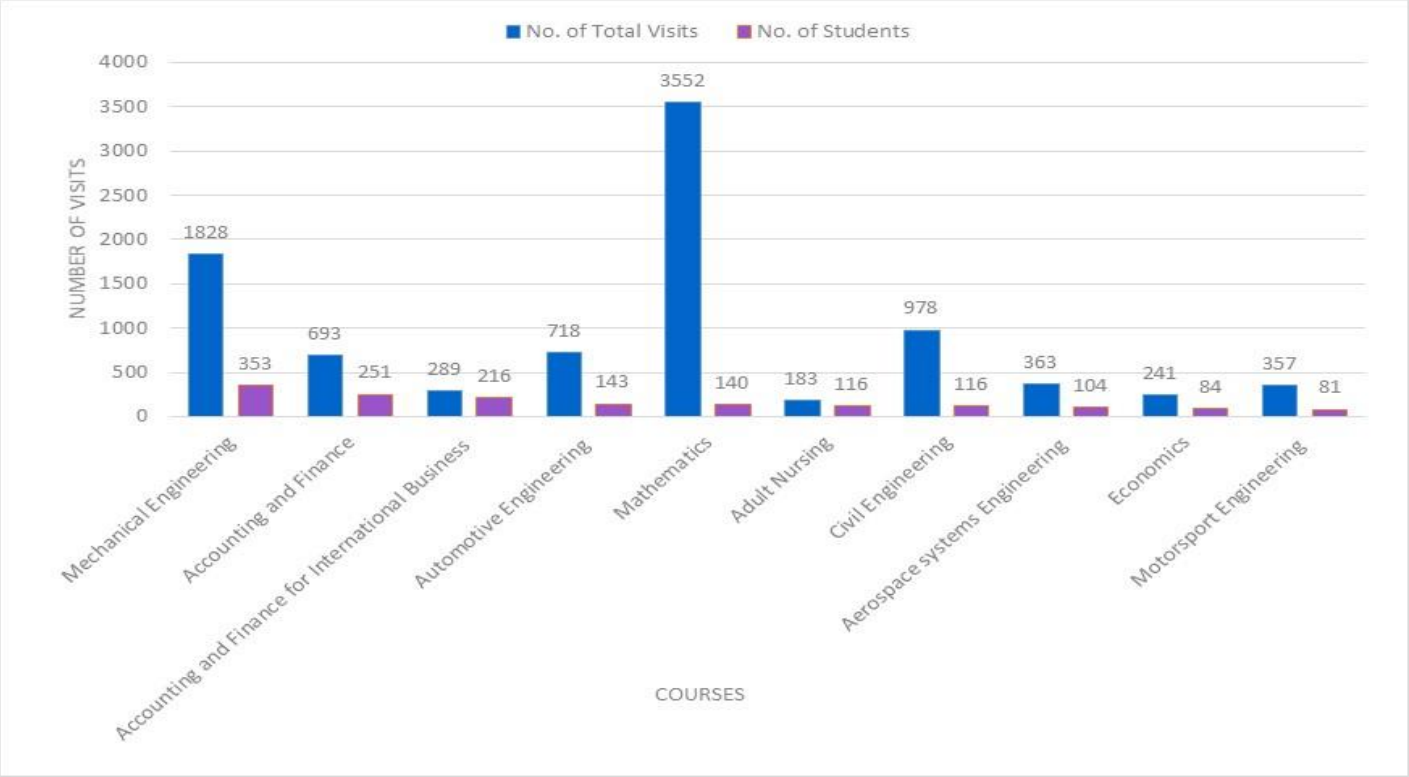

Figure 1 – Student visits and numbers by Courses

The data has been broken down by year of study (excluding year groups with fewer than 10 different visitors) as shown in Figure 2. As expected, first-year students utilise the centre most, with almost exactly 50% of the total of 15677. More surprising is that, although the number of second-year visitors is much lower, the number of visits per second-year is much higher.

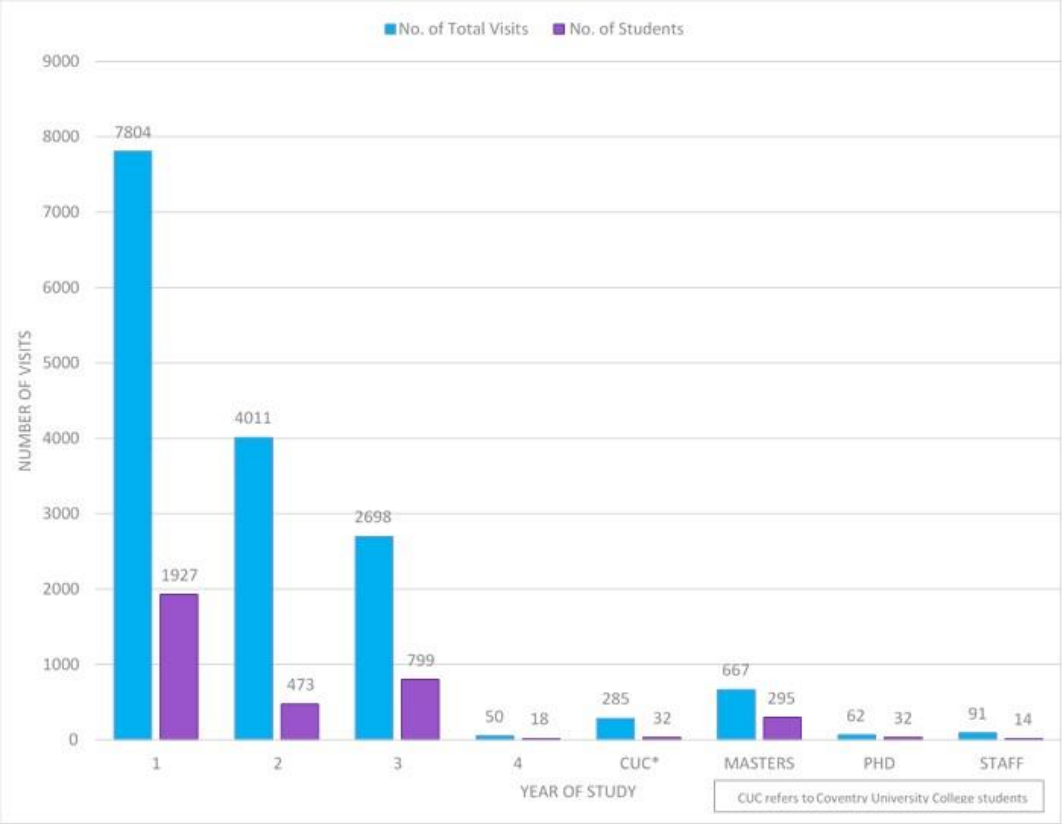

Figure 2 – Student visits and numbers by Level of Study

Figure 3 shows the number of visitors from groups of cognate courses (excluding groups with fewer than 10 different visitors and colour-coded by faculty). It can be seen from Figure 3 that more nursing students visit sigma than students from the maths degree. sigma has put in considerable effort over the last couple of years to encourage engagement from nursing students. Nurses tend to engage with sigma for a short period of time in their first year and therefore do not make as many return visits as students from other courses.

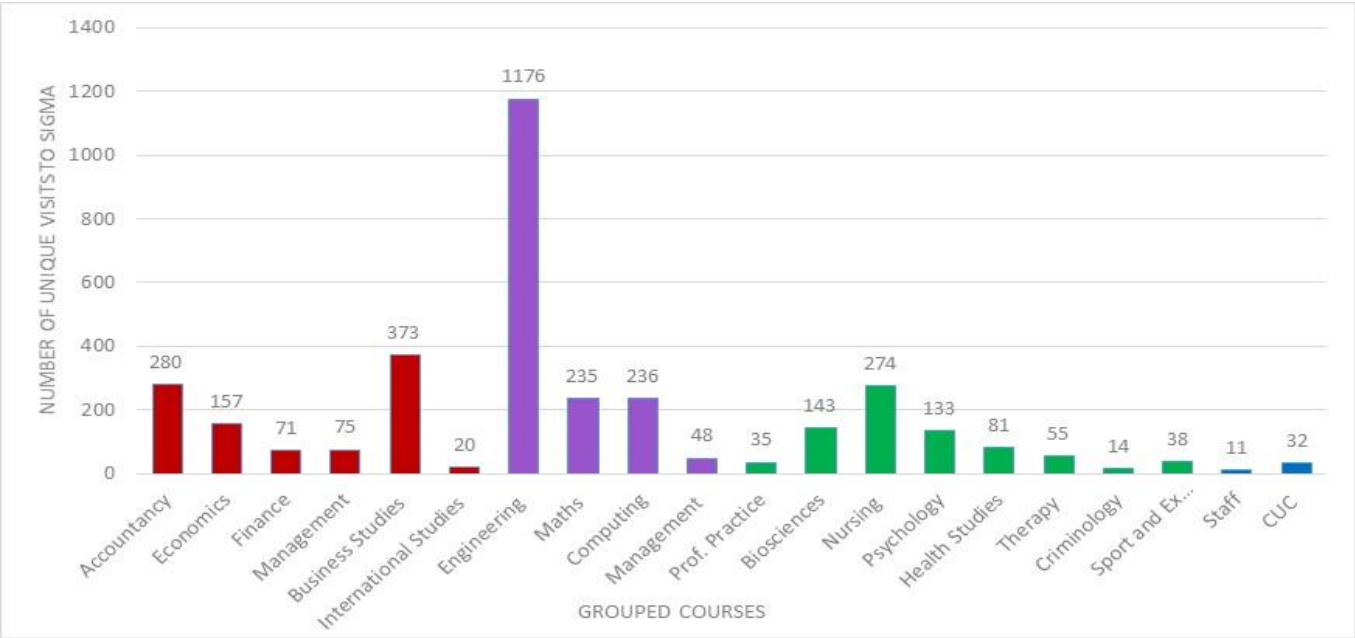

Figure 3 – Student visits by Cognate Courses

Further analysis on sigma attendance data surrounding student demographic data such as gender, age, and ethnicity, will provide more insight into which groups will benefit most from a targeted intervention.

Could you host an event for the sigma Network?

David Bowers
Chair | sigma Network
chair@sigma.network.ac.uk

When HEFCE funding came to an end in the summer of 2016, the sigma Network "re-invented" itself as a voluntary professional association to continue to champion the cause of mathematics and statistics support in higher education, and to provide professional development and networking opportunities to those working in this field. We rely on the good will and generosity of institutions to host our events and cover the cost of doing so, in order that these events can be made available free of charge to the maths support community.

Over the past three and a half years, we have been able to organize around 40 such events, which have attracted more than 600 attendances from people representing over 80 institutions. These events were hosted at various universities across the country, from Lancaster and Leeds in the north, through Coventry and Loughborough in the midlands, to Greenwich and Bournemouth in the south, and stretching from Essex in the east to Bath and Cardiff in the west. And many more institutions besides. For a more complete overview, scroll down the impressive list on the Events page on our website: http://www.sigma-network.ac.uk/events/

Offering to host a sigma Network event brings you several benefits. Your own staff will not incur any travel costs to attend it, and you will have a say in the content and structure of the day. You will be seen as actively contributing to the work of a national professional network, and the experience of hosting such an event can provide evidence of engagement at a national level. Your institution can present itself to attendees from other places and raise your national profile. And not least, by hosting an event you are helping to ensure the sustainability of the sigma Network.

Figure 1 – Deep in discussions over refreshments

The cost of hosting an event is not great. The only direct cost would be the provision of refreshments (coffee, a light lunch). Indirect costs include the staff time to plan and promote the event, deal with registrations and generally organize the day, plus making available a suitable room.

If you are new to hosting a professional development event or networking meeting, you will be supported by an experienced member of the sigma Network's Steering Group. Plus we have recently published some helpful guidelines and a checklist on our website: http://www.sigma-network.ac.uk/wp-content/uploads/2020/02/sigma-Network-hosting-guidelines-2020.pdf .

So if you have an idea for an event that you think would be of interest to the maths support community and would be interested in hosting it, take a look at the above document to get an idea of what would be involved, and get in touch for a no obligation chat. Email chair@sigma-network.ac.uk. The sigma Network relies on the willingness of individual institutions to contribute to the development of our growing programme of activities. Thank you in advance!

How many pints of beer?

Chetna Patel
Academic Team Manager, The Maths Learning Centre | De Montfort University
chetnaptl@googlemail.com

This video is the result of a joke my niece shared with me at Christmas; she said, 'At least you'll get it'. Being an Arts graduate, the maths held no interest to her, so I thought I'd provoke her interest with this. I wish I could say her interest was piqued, but I hope you will find it amusing and maybe even find uses for it as an introduction to series. How many pints of beer, click (https://www.youtube.com/watch?v=j1LJUVQZbeE) and enjoy!

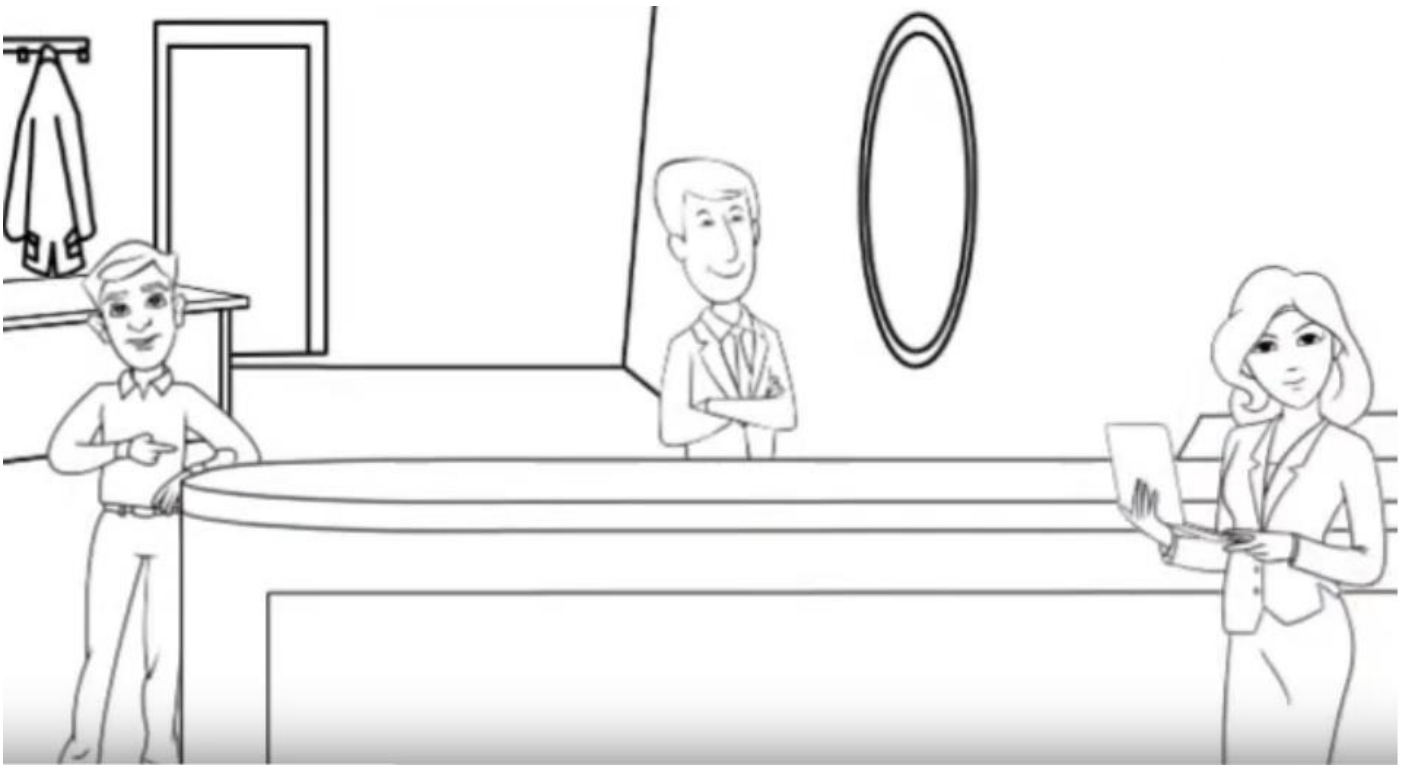

Figure 1 – How many pints of beer? Animation

Job vacancies for Mathematics and Statistics Support

This is a quick reminder that HE institutions with job vacancies relevant to the mathematics and statistics support community are increasingly circulating these via the sigma-network *JISCMail* list. Recent job adverts have been posted by De Montfort University, Heriot-Watt University, Middlesex University and others.

So if you have not already done so, this is another good reason to subscribe (free) to the sigma-network *JISCMail* list and keep abreast with what is going on in maths support across the country and beyond. Simply visit http://www.jiscmail.ac.uk/sigma-network and click on "Subscribe".

Mathematics Learning Activities Conference – Transaction to HE

Liam Naughton
Senior Lecturer in Mathematics, School of Mathematics & Computer Science | University of Wolverhampton
L.Naughton@wlv.ac.uk

On 29th November 2019 the University of Wolverhampton hosted the one-day conference "Mathematics Learning Activities Conference – Transition to HE". The day focused on exploring learning activities in mathematics for students at the transition to HE.

The conference, a joint initiative between the University of Wolverhampton and the **sigma** Network for Excellence in Mathematics Support, took place in the Alan Turing Building. Twenty-eight delegates representing 10 institutions attended.

There were keynote presentations from Dr. Kirsten Pfeiffer from the National University of Ireland, Galway, and Dr. Jorge Luis Bruno from the University of Winchester. Wolverhampton's own Abigail Parkes delivered an interactive workshop on Team Based Learning in Mathematics.

Dr Kirsten Pfeiffer presented recent work on the use of 'Proof evaluation as a learning activity'. Dr Jorge Luis Bruno focused on 'Inclusive practise in mathematics learning activities'. A strong theme in both keynotes was the importance of teaching for understanding.

There was also a sharing practise session where delegates were given the opportunity to share insights and experiences from their own practice. This session provided a rich source of ideas for future collaboration.

Figure 2 – Event Delegates

The day concluded with a complimentary wine & cheese evening at Alice's Tea Room in Queen Square, Wolverhampton.

The conference was organised by Dr. Liam Naughton and Abigail Parkes from the School of Mathematics & Computer Science and is the first in a planned series of regular events focused on mathematics education and support. We look forward to welcoming **sigma** Network members at our future meetings!

Maths/Statistics Anxiety Workshop

Nick Goddard
Maths Skills Adviser | University of Chester
n.goddard@chester.ac.uk

The University of Chester was pleased to welcome 26 delegates from 15 institutions. After a welcome from Senior Pro-Vice Chancellor Chris Haslam, Ellen Marshall (Sheffield Hallam) gave an interactive introduction to maths/stats anxiety. She described physical and emotional responses in students, talked us through the neuroscience and described how maths and stats anxiety are different. Ellen then discussed her experience of students with maths/stats anxiety and provided some suggestions as to how we could support students.

Figure 1 – Ellen Marshall

Our keynote speaker, Sue Johnston-Wilder (Warwick) then gave a passionate and spell-binding talk on raising awareness and addressing statistical anxiety. She talked delegates through the prevalence of stats anxiety, what it is and how we can address it with students. Sue incorporated the growth zone and ladder models, as well as giving suggestions for how we can change how we interact with students. Following Sue, Ellen Marshall (Sheffield Hallam) and Anna Riach (York) talked through some of their research on this topic and the new workshops they are trialling as a result

After a networking lunch, in the first set of lightning talks, Jenny Freeman (Sheffield) spoke about Xerte, a maths anxiety resource, and Paul Wilson (Wolverhampton) spoke on separating learning the stats from learning how to use statistical software. Delegate discussion followed.

Chetna Patel (De Montfort University) then presented student reflections on Maths Anxiety and gave delegates tips on how students can deal with anxiety in the moment. Then, In the final set of lightning talks, Jason Roberts (Chester), discussed how our expectations of students may not match the reality and Mark Mc Auley (Chester) discussed where his interest in maths/stats anxiety came from, how to spot it in engineering students and how to help students deal with it. Delegate discussion followed. Verbal feedback from delegates was positive and the event was oversubscribed.

Figure 2 – Sue Johnston-Wilder