

Undergraduates Speak Out! Undergraduate Mathematics Conference: Tomorrow's Mathematicians Today

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In February 2010, the University of Greenwich hosted the UK's first Undergraduate Mathematics Conference with support from the Institute of Mathematics and its Applications (IMA). The conference was of great value to all who took part and has received much positive feedback. This is the account of how and why it came about, and the factors that contributed to its success.

Ideology

The idea for a mathematics conference for undergraduates presented itself after the author took a group of Greenwich students to the IMA's Younger Members' conference in November 2008. Although they had enjoyed a wonderful day and were made to feel most welcome, it was obvious, talking to students afterwards, that many of them found that the gulf between the early stages of the undergraduate curriculum and cutting-edge applications of mathematics tersely presented meant that, understandably, the material was not easily assimilated. Consequently the undergraduates had difficulty identifying their future selves with the presenters.

After much reflection it seemed that a possible way forward would be to provide an undergraduate conference where maths undergraduates could present any mathematical topic of their choice; something they were interested in or were researching, to an audience, made up primarily, of their peers. This would inspire those present to investigate these or similar topics further during their degrees or afterwards in their research. The various benefits for mathematics students seemed enormous: those going into research would gain experience of the process of conference submission, while those going into the workplace would gain valuable experience to enhance their CVs and career prospects. All delegates would gain insights into a wide range of mathematics of potential value in their future careers and would feel the benefits of being a part of the wider maths community.

Research and inquiry-based learning at undergraduate level is important. Mick Healey and Alan Jenkins' paper (2009) states that "all undergraduate students in all higher education institutions should experience learning through, and about, research and inquiry". The Boyer Commission (1998) argues that "dissemination of results is an essential and integral part of the research process". Many of the so-called soft skills such as confidence building, time management, etc. are increased by presenting research.

These skills, valued highly by employers and many others, are enumerated by Angela Brew (2007).

The 2002 QAA Benchmark Statement for Mathematics, Statistics and Operational Research (MSOR) suggests that MSOR graduates are generally “able to transfer knowledge from one context to another, to assess problems logically, and to approach them analytically. They have highly developed skills of numeracy, including being thoroughly comfortable with numerate concepts and arguments in all stages of work”. However, there are other, highly desirable, skills that do not come quite so naturally to mathematicians. Challis *et al* (2002) found that “mathematics graduates tended to lack presentation and communication skills (including report writing and presentation to a non-technical audience)”. The opportunity of presenting at an undergraduate conference such as Tomorrow’s Mathematicians Today (TMT) would address this.

Similar events

From research into the viability of this idea, it transpired that the Mathematical Association of America (MAA) promotes a number of such events based in regional centres around the US, and that they are a great success and well thought of by students and academics alike. The reasons they give for promoting the idea resonated soundly: “The goal of the Undergraduate Mathematical Conferences program (sic) is to provide opportunities for students in the mathematical sciences to make presentations in a supportive and non-threatening atmosphere” (MAA, 2011). They also recognise the importance to those attending the conference: “Students in the mathematical sciences who attend but do not present papers also benefit by seeing that undergraduates can successfully pursue independent study in mathematics” (MAA, 2011). Of course, undergraduate studies in the US are structured differently from the UK, with much less specialisation and perhaps less sense of identity for undergraduate mathematicians as a result. Interestingly the first conference in British Undergraduate Research (April 2011), organised by the University of Lancashire, built on Boyer with participation from Healey and Jenkins.

Methodology

Having set a date, obtained initial support from IMA and obtained the agreement of our keynote speaker, Professor Ian Stewart (Warwick), a prolific writer and broadcaster with a wide following amongst mathematics students, the task was to put out a call for abstracts from undergraduates. Initial concerns as to whether suitable undergraduates would offer to speak and whether others would see the relevance and benefit of attending were quickly dissipated by the response obtained. At the outset, the plan was to limit participation to those at London universities but when some academics further afield expressed interest, on behalf of their students, we thought it necessary to send the information and the call for abstracts to all UK university mathematics departments.

We were delighted with the response. We received over 30 abstracts from 11 universities and by the end of January had a total of 130 delegates registered from 22 different institutions from as far afield as Aberdeen and Exeter and from institutions as diverse as Oxford and Brunel. It was wonderful to hear that this was being talked about in maths department common rooms up and down the country and that staff were actively seeking out would-be presenters. It was mentioned on Facebook and Twitter and Peter Rowlett, the then university liaison officer for the IMA, discussed it on his blog in the context of “providing graduates with appropriate experiences and evidence of their skills”, (Rowlett, 2009). We were very grateful to receive sponsorship from the publishers Taylor and Francis, and Simon Walker (University of Greenwich) kindly agreed to supply folders for conference packs.

The programme

The day surpassed all expectations. We began with three plenary talks on diverse but generally understandable topics such as the Maths behind the Weakest Link, Paradoxes and Cayley's definition of an Abstract Group. After a short break we had a couple of parallel sessions (one on pure maths and one applied). Following a buffet lunch we separated into five streams on topics such as Group Theory, Applications of Maths, Applied Maths, Statistics and Others before Ian Stewart's closing keynote speech. The streams were named after historical mathematicians connected with Greenwich and the subject of the stream. There was a tremendous buzz throughout the day; students networking with those from other universities, maths being spoken in corners and corridors and the university liaison officer from the IMA talking to students about working in industry and the benefits of IMA membership. There was also a live Twitter stream which provided a number of useful comments for us to reflect on afterwards. Full details of the abstracts and programme can be found on the conference website (Tomorrow's Mathematicians Today, 2009).

Conclusions and feedback

Although there are a few minor details we would change based on feedback received from delegates, the overall response has been extremely positive. Initial feedback gathered straight after the event included comments such as:

"Thank you for hosting such a successful event for our students. I have received very positive feedback and we are pleased as a department that so many of our students took an active interest."

"Thanks again for organising the conference – everyone I spoke to got a great deal out of it and is eager for something similar to happen again."

Two years later

Two years on, the conference is now functioning under the umbrella of the IMA as we felt unable to undertake such a big event every year. We are due to be hosting it again in February 2013, something that we are looking forward to immensely. Greenwich students benefitted enormously and some of those who presented, and are now in their final year, had this to say about their experience:

"Speaking at TMT was undoubtedly the highlight of my mathematical career thus far."

"My presentation has led me into a project for my dissertation – my TMT research when coupled with my third-year studies has enabled me to come up with an excellent dissertation idea."

"My confidence and skills in public speaking were enhanced incredibly and this has been a prime experience to use when applying for graduate jobs. Employers are especially impressed at the amount of motivation and passion required to voluntarily research a topic and present your findings to such a large audience."

"I was also able to gain excellent feedback from students at other universities, allowing me to look at my research in new ways."

"Not only did I speak at TMT but I was able to attend a number of fascinating talks. It was inspiring to see so many maths students presenting their research into the areas that excite them the most."

“TMT was really great, you got to show people what you enjoy most in maths and see what others enjoyed. It was fun and enjoyable.”

“It felt amazing afterwards to know that I'd done it and I hope to do more talks like it in the future.”

In the Department of Mathematical Sciences at Greenwich, we have a focus on enquiry-based learning. As part of this, students are required to complete a final year research project, similar to a dissertation in other disciplines. As one of the final year project co-ordinators at Greenwich, it is very apparent to me that those second year students who participated in TMT began their final year with more confidence, determination to succeed and clarity of thought than others of similar ability in their year. They were more focussed when choosing a topic for their project, presented their work with greater confidence and had a far greater appreciation of the breadth and diversity of their subject. They had a better understanding of research and how to structure research for their learning. Having this conference on their CV, and being able to talk about it at interviews, certainly gives them an edge over other, similarly qualified candidates. Feedback from staff and students based at other institutions suggests that everybody derived similar benefits.

The success of this conference has caused me and other, initially sceptical academics to think that this is something that undergraduates really want and need. While mathematics is an unusual discipline, in that ideas are often difficult to communicate in a brief presentation and require time to comprehend, TMT has shown that this is not an obstacle to the sharing of enthusiasm and new ideas. Students emerged from the conference excited and stimulated. We believe that it is worth investigating whether teaching and learning in other disciplines could be similarly enhanced by events which bring together undergraduates from different institutions whose courses may have different foci.

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