MATHS OUTREACH REPORT

BACKGROUND

As part of the HEFCE funded HE STEM programme, the IMA carried out a survey of outreach activities which take place in HE maths departments in England and Wales.

This survey was carried out with the view that it will help build links and enable the sharing of good practice between institutions. It is also hoped that within the programme there might be funds to develop and extend existing good practice, and the IMA wanted to be sure that it is aware of all good practice outreach work as it develops its plans.

CONTRIBUTING INSTITUTIONS

There was a good response from the Maths community and the following institutions contributed a survey response. There are of course many institutions not listed here which are also doing excellent outreach work.

Bristol	Keele	Nottingham	Royal Holloway
Brunel	Kingston	Open University	Sheffield
Cambridge	Leeds	Oxford Brookes	Surrey
Coventry	Leicester	Oxford University	UEA
Essex	Liverpool	Plymouth	UWE
Glamorgan	Loughborough	Portsmouth	Warwick
Goldsmiths	Manchester	Queen Mary	
Hertfordshire	Newcastle	Reading	

ANALYSIS

It comes as no surprise that there is a large volume of outreach work taking place in maths departments around England and Wales. There is great variety both in the range of activities and also in who is delivering or co-ordinating the activities. In some institutions it could be a dedicated member of outreach staff, whereas in others it may be an academic who oversees outreach.

There are some activities which are common to many institutions, whereas there are also a large number of unique or unusual activities which only one or two institutions run. Some of these will be described in the next section.

Most institutions surveyed have a student ambassador scheme, either as part of a module for credit, or as part of the Student Associate scheme, or in another format such as the Cambridge Stimulus programme. Even those institutions which do not have a formal

programme will use students at open days, and to support outreach activities which their department is running. In fact there wasn't a single institution which didn't utilise their students in some way for outreach. Some institutions also used students to devise and run activities, for example in the case of postgraduate students at Queen Mary designing and running a week long summer school for school pupils.

The other most commonly reported activities were masterclasses, enrichment days, and schools lectures, with about two thirds of institutions carrying out this type of outreach. Another popular set of activities, with about one third of institutions participating was work with the general public, revision sessions, sessions for teachers and extended activities over a number of days such as Plymouth University's Junior University.

It became apparent whilst reading the surveys that the Further Maths Support Programme plays an important role in the provision of outreach and enrichment from HEI maths departments. Many FMSP centres organise enrichment days, teacher days and most of the revision sessions run at HEIs are organised by the programme.

UNUSUAL OR UNIQUE ACTIVITY

Many institutions run an excellent programme of outreach consisting of a standard programme of activities such as those activities described in the section above. There are however lots of institutions which are also running schemes unique to just one or two institutions. The attempt has been made below to list out some of these ideas so that other HEIs can gain new inspiration for their own work.

A sample of non-standard outreach activities – i.e. activities currently occurring at only a small number of institutions.
University of Bristol, University of Warwick Support local schools with the study of STEP papers.
Coventry University Run Industrial Placements for Yr 12 students for 4-6 weeks in summer. In 2010 it is for 20 students, but would most likely be increased to 50 students in 2011. Keele University have also recently started a similar programme. *Loughborough University* Nuffield Science bursaries have been used to provide school students just completing year 12 with the opportunity to spend time during the summer working in the Mathematics Education Centre. For example, in 2008 two students worked on a project to design mathematical tasks around Lego robots. They produced worksheets and activities which could be used by school students in order to motivate their study of mathematics.
Sheffield Hallam University, University of Glamorgan, University of Leeds Pop Maths Quiz – pub quiz style activity with maths questions, held not in a pub but in a University.

University of Leicester
Annual G-STEM Conference for Year 12 students – attended by 160 students interested in studying geography, mathematics, and sciences at university, and coordinated by the Maths department. This is a collaborative approach to outreach within the College of Science and Engineering.

University of Liverpool
FunMaths Roadshow (in collaboration with Liverpool Mathematical Society – LivMS).

- Up to 100 pupils at a time, each session lasts for 50-75 minutes. Activities are available for school years from 1 to 13.

University of Liverpool "Maths Club" targeted at Years 9, 10 & 11. It is held monthly on autumn and winter term-time Saturday mornings.

- Approximately 20-30 members, co-ordinated by Dr David Lewis.

Club members, past and current, have contributed to outreach activity through presenting Club sessions or providing input into ongoing Roadshow development.

"Challenge" and "Senior Challenge" annual take-away personal entry competitions for Years 7 & 8 and Years 9 &10 respectively (In association with Mathematical Education on Merseyside). (This activity has been adopted by the University of Leeds for the last few years.)

"Open Challenge" annual take-away personal entry competition targeted at senior secondary pupils but entries from earlier years are welcome.

Loughborough University

- Maths at Work Conferences
- "I am an engineer – this is what I do" conferences
- "I am a scientist – this is what I do" conferences
- Maths and Sport conference
- Practical Mechanics workshops

  "We have made a big effort to involve personnel from Industry and Commerce in some of our events. This has brought a sense of reality to the importance of mathematics and, we believe, has helped to encourage young people to work hard at the subject in schools."

University of Manchester
Sixth Form Colleges Group – group of Sixth Form College Heads of Maths meets three times a year (coordinated by Steven Broom at the University of Manchester)

University of Nottingham
Visual Learning Lab
This is a scheme for 6th formers and mathematics undergraduates to talk and work together using some of the facilities in the School of Education via a video link. This project is just beginning and so far has involved 3 first year undergraduates and one group of sixth formers in Devon. The project was initiated by Steven Watson of the

School of Education, and is run in co-ordination with the School of Mathematical Sciences' Teaching Officer, Sally Barton.

Oxford Brookes University
Science in Your World*:* event to launch Science week in March. Both undergraduates and postgraduates help run a stall of mathematics puzzles for the general public in the centre of Oxford.

Brookes Science Bazaar*:* as above, but located on campus.

Plymouth
Using past graduates to talk to sixth formers:

"The one-day conference Let Maths Take Your Further attracts around 120 year 12 students in Devon and Cornwall studying A level mathematics. The event makes use of student guides and includes past graduates giving talks on careers, academic staff describing a range of applications of mathematics and statistics, and workshops."

Portsmouth
Annual Maths & Art Festival aimed at the general public, schoolchildren (all age groups) and students. Organised by the maths department.

Queen Mary
Collaborative work with NRICH and the London Borough of Tower Hamlets: undergraduates and postgraduates help at enrichment sessions for Year 8 students.

Art of Mathematics -this is a summer school run by Postgraduate students. It takes place during the school holidays and is aimed at post-GCSE students who want to find out more about university mathematics.

Women into STEM conference. This one day conference is aimed at getting more female students into STEM subjects.

Science for Society Courses – sponsored by the Goldsmiths' Company. QMUL runs two residential courses for teachers: one on Astrophysics and a second on Mathematics. The aim is to refresh their knowledge and update them on recent developments.

STEM Spring School -In conjunction with the other STEM departments QMUL run a week-long school for Year 12 pupils based around the theme of energy and the environment. The mathematics session is on networks and their use in gas and electricity distribution. This is co-ordinated by the Widening Participation Office.

Computer Science for Fun - this is the UK's biggest initiative to interest students in computer science, a discipline with close ties to mathematics. Looking at concepts like algorithms and computation, cs4fn magazine is distributed twice a year, free, to over 20,000 teachers, students and subscribers across the UK and worldwide. A successful side project, The Magic of Computer Science, teaches students card tricks that all work because of mathematics.

Royal Holloway, University of London
The Pi Club, a Runnymede Borough initiative for children in Years 2, 3, and 4, who have been identified as gifted in mathematics; RHUL runs sessions at which their students pilot their ideas for extending the skills of these young mathematicians.

RHUL has two rooms of activities for local community as part of annual Science Open Day, reaching about 2,000 people over the day (predominantly families with children aged 5-14), of whom over half visit the maths spaces.

University of the West of England
Bloodhound project (outreach work relating to the attempt to break the world land speed record.)

BME Master classes to raise attainment in GCSE mathematics

Cambridge University
The Millennium Mathematics Project (http://mmp.maths.org) is a joint outreach initiative involving staff in the Faculty of Mathematics and the Faculty of Education. The MMP umbrella covers a number of distinct but complementary projects:

- NRICH (http://nrich.maths.org). The NRICH website publishes free resources – rich mathematical tasks – for KS1 – 5. The website also includes the AskNRICH discussion boards (http://nrich.maths.org/discus/messages/board-topics.html). NRICH staff also work face-to-face with teachers providing CPD, both at events in Cambridge and through visits to schools throughout the UK.

- Plus (http://plus.maths.org) is a free online magazine publishing articles, interviews, news and podcasts on mathematics and its applications. The site includes careers interviews and also teacher packages collating all the Plus material on particular mathematical topics (e.g. graphs and networks, geometry).

- Motivate (http://motivate.maths.org) provides mathematics enrichment sessions via live video-conferences for schools, and (from the Autumn of 2010) online multimedia resource packs facilitating mathematical investigation and collaborative project work

- Enigma Project (http://enigma.maths.org) - visits schools throughout the UK and internationally to run events including a lecture on codes and codebreaking followed by hands-on workshops. Schools visited are given a Teachers' Pack, including ideas for follow-up activities, the codebreaking resources, and a copy of the Code Book CD-ROM.

- Hands-On Maths Roadshow (http://www.mmp.maths.org/roadshow) – visits schools throughout the UK and internationally to run workshops engaging students with hands-on mathematical puzzles, games and activities. Roadshow activities are designed to promote creative approaches to mathematics and strategic thinking and to stimulate mathematical curiosity.

- Hands-On Risk and Probability Show (http://www.mmp.maths.org/risk), developed in collaboration with Professor David Spiegelhalter, visits schools throughout the UK and internationally to run events including a highly interactive presentation on chance, uncertainty and probability, followed by games-show style workshops in which students use hand-held voting technology to participate.