

Australian national collaborative teaching of advanced maths via AG

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Advanced courses in mathematical sciences often have small classes. Honours courses (fourth year) typically run with a handful of students and have sometimes been offered as “reading courses”. Australian universities have recently been killing off small courses (on grounds of “not economically viable”). Small usually means less than 20 students in a class. Honours courses are special: in science, they provide a transition from three year bachelor degrees and post graduate courses (masters and PhD) ... as a result they have been exempted (so far) from the “economically viable” drive.

However the lack of topic choice and flexibility for students is concerning. To address these problems and to ensure that Honours and postgraduate students are actively part of a wider community of practice, two programs were initiated by The International Centre of Excellence for Education in Mathematics (ICE-EM) and the Australian Mathematical Sciences Institute (AMSI). The ICE-EM was established in 2004 by AMSI (with a grant from the Australian government) with a broad brief for education in mathematics across the school and university sectors. The Access Grid Room project addresses the advanced part of this brief – with a special focus on Honours courses, Masters by coursework and seminars.

The Summer Schools program: ... face-to-face. AMSI runs Honours/Postgraduate Summer Schools. Pure and applied mathematics and statistics course are offered: some may not be normally available in students’ home institutions. A Summer School is from mid January to mid February, and courses are 14 or 28 hours. With the approval of their home university, students can take courses for credit toward their Honours degree.

Postgraduate students (including research degree students) from cognate areas, including Engineering, Biomedical Science, and Commerce (Finance, Risk Management and other quantitative areas), also participate.

Summer schools have been held at the University of Melbourne (2003), University of New South Wales (2004), Australian National University (2005), RMIT University (2006), University of Sydney (2007) and Monash University (2008).

Student and Lecturer accommodation and travel are sponsored! For example, the program in 2006 was delivered by 11 lecturers from Melbourne, Sydney, Perth, Adelaide and Auckland and was attended by 94 students (including 6 international students). Feedback (separate student and lecturer questionnaires) indicated a high level of satisfaction both with the courses and the event overall.

For the students, social activities are important and the opportunity for Honours and postgraduate students to actively be part of a wider community of practice is valued. It’s pleasing to receive a report of remote AGR Honours students having previously met at the preceding Summer School.

The AGRs program. Access Grid Rooms have been well established and widely used for collaborative research. ICE-EM is coordinating and has partially funding the introduction of a national network of AGRs located in departments of mathematics at AMSI member universities.

By late 2007, there were 10 AGRs operating in mathematics precincts at the following AMSI member universities: La Trobe University, RMIT University, the University of South Australia, the University of Wollongong, Victoria University, Monash University, the University of Southern Queensland, the University of Sydney, the University of Newcastle, Macquarie University in conjunction with the CMIS Division of CSIRO. Two more AMSI AGRs have been financially supported and will be active very soon. Additionally there are over 30 AG nodes in Australia, some of which could be used by mathematical sciences departments. Most of the 38 universities in Australia have access to an AGR. In December 2007, an AMSI special one-day seminar was hosted in the RMIT AGR with 16 remote AGRs participating.

The first three mathematical sciences departments with AGRs ran a pilot program in semester two of 2006: collaboratively teaching Honours mathematics and statistics courses. During 2008, all of the AMSI AGRs are engaged with this national collaborative teaching program that's coordinated by the ICE-EM. Currently 16 Honours maths and stats courses are scheduled (see the ICE-EM web site). As with the summer schools, students (with the approval of their home university) take courses for credit toward their Honours degree.

As with the summer schools, each lecturer must be highly organized with prepared teaching and assessment materials and needs to be aware of variable student backgrounds. For AGR courses there are additional requirements for the use of electronic materials and access to these by the students ... and pastoral care of the remote students.

AGR issues for mathematicians. There are many variations to how AGRs are constructed and how they operate. Mathematicians are often highly computer literate, but are not computer scientists. It's desirable for standard connections to operate in a "turnkey" mode. All AMSI AGRs provide a Windows environment for applications.

We have provided AGR teaching guidelines and presentation guidelines (soon to be revised). These include a requirement for the lecturer to have training in AGR use. Training programs are under development: at RMIT the IT Training group, with advice from me, has developed and delivered "lessons" interactively in small groups. These lessons are not immediately transferable to other institutions for two reasons: the AGRs are different (RMIT is the only one to have linked multiple Smart Boards) and RMIT usage of the mathematical software Maple is atypical.

We wish to provide advice and support for effective use of the local AGR and remote AGRs. We want lecturers to be able to choose from a wide range of pedagogical styles and software. Typically, lecture notes are prepared as pdf files. The lecturer also uses some mathematical software for demonstrations and/or digital ink. Students submit work done by hand and/or software. Files are exchanged by email or web course management packages such as BlackBoard – security is required (IP for the lecturer and privacy of student work).

We are currently preparing advice on digital ink and annotations – for asides and highlighting during the lecture (laser pointers are not effective) and for marking student work (as a pdf file and marked using a TabletPC and pdfAnnotate, say).