



University of Wollongong



Symposium
ALTC Leadership 2010: Sharing Mathematics
and Statistics Resources

*“Building leadership capacity for the
development and sharing of mathematics
learning resources across disciplines and
universities”*

An ALTC Leadership for
Excellence in Teaching and Learning grant.

Project Leader: Associate Professor Anne Porter
School of Mathematics & Applied Statistics
University of Wollongong



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The Project

The symposium held this year follows one held in 2008 which looked at mathematics learning at higher education institutions. An unofficial launch of the Summertime Maths disk (www.math.uow.edu.au/subject/summer/index.html) was shown which included some samples of mathematics resources which have been made by the UoW, School of Mathematics and Applied Statistics. This has now grown into a 2 disk DVD and will be extended each year with new resources. Following the 2008 Symposium, an ALTC grant application was submitted, and granted, in the area of Leadership for Excellence in Teaching and Learning which has led to this symposium.

In 2009 a symposium was held which focussed on the sharing of mathematics resources and the use of tablet technology in the creation of video resources. Technical sessions were held to train in the use of tablets and discussions surrounding what resources were needed was held across the two days. The project continues to create resources and find a suitable solution to house these resources so that sharing between institutions is possible. Building leadership capacity remains the main focus for this project in the creation of video resources during the last phase of the project.

Project Rationale

The project addresses the need to build leadership capacity in teaching and learning, specifically in the area of learning resource development, acquisition and sharing. It builds upon the UOW led Carrick project, *Developing the Faculty scholars model*, (Lefoe, LE69, 2006) in recognising the value of cross-faculty networks to encourage the dissemination of knowledge and ideas. This project expands upon the Lefoe approach in that it seeks to grow the model from involving the sharing of creative ideas to the sharing of technology-based resources. It retains the cascade dissemination model, whereby, at an appropriate point in time, new collaborative partners are invited to participate in the project. In turn, they will mentor the next institution. Leaders of the initial implementation will invite a new institution to participate. The building of capacity sector wide involves the initial university participants in later stages, mentoring another university and/or discipline.

The project is premised on the belief that within it there is a knowledge base for leaders on how to develop leadership. Marshall (2006) refers to the eight principal knowledge domains associated with leading teaching and learning. Many programs have been created to develop certain attributes such as

- continuous self-evaluation,
- effective networks to accomplish goals,
- solutions to complex problems,
- the encouragement and mentoring of others, and
- communicating and listening more effectively (see for example, HIIH program, 1999).

These types of programs are thought to be adequate to develop leaders that can influence and engage others to effect change (Kotter, 1990) or complete a task. However, without a specific focus on helping leaders to develop leaders, the leadership created may end in the creation of a successful team, not the development of leadership capacity or an increased pool of leaders. This project is in agreement with the notion that *leadership inspires leadership actions and aspirations in others* (SACLE, 2007). There is, however, a need to examine how leadership can be developed when it arises in the context of staff coming together to undertake a task rather than signing up for a leadership program.

Aims of the project:

- To develop and trial a leadership capacity building framework for developing leaders who will in turn develop leaders in the process of completing an authentic resource;
- To document the knowledge components that are crucial for leadership in the development, acquisition and sharing of learning resources;
- To explore issues that arise in the implementation of the leadership model as circumstances of universities, loci of the project and associated leadership skills vary;
- To further develop cross-institutional networks to increase the capacity of the sector to enhance learning support in mathematics and statistics;
- To document processes and outcomes so as to assist other institutions that are seeking to increase their capacity to provide mathematics and statistics learning support of students.
- To gain an appreciation of how to mix technological resources and human resources in the provision of mathematics learning support.

Sharing Resources

The sharing of resources is a major focus of the project. The team has sourced a repository which is currently being built and trialed with the University of Wollongong's infrastructure. A sample of the system will be shown at the symposium. It is anticipated that the system will be available for use prior to the end of 2010. In the meantime, some resources are readily available on the Summertime website. Further updated information regarding the symposium can be found at the project's website at:

<http://www.uow.edu.au/informatics/math/research/mathresources/index.htm>

Meet our current team:

Project Leader

Associate Professor Anne Porter

Project Co-Ordinator

Ms Sue Denny

Project Team Leaders:

Associate Professor Mohan Chinnappan

Dr Mark Nelson

Dr Glennys O'Brien

Dr Caz Sandison

Associate Professor Graham Williams

Project Faculty and Discipline Team Leaders

Dr Roy Brown, Health and Behavioural Science

Dr Grant Cox, School of Mathematics & Applied Statistics

Mr Thomas Goldfinch, Civil/Mining/Environmental Engineering Education

Professor David Griffiths, School of Mathematics & Applied Statistics

Dr Josip Horvat, Engineering Physics
Dr Buyung Kosasih, Mechanical, Materials and Mechatronic Engineering
Dr Martin O'Brien, Commerce
Associate Professor Jacqui Ramagge, School of Mathematics & Applied Statistics
Dr Ian Piper, School of Computer Science and Software Engineering
Associate Professor Nelson Perera, Graduate School of Business
Ms Reetu Verma, Commerce

Specialist Team Members:

Dr Chris Brown
Ms Wendy Meyers
Ms Emily Purser

Added Links to the Project:

Dr Geraldine Lefoe - ALTC Project:
Distributive Leadership for Learning and Teaching: Developing the Faculty Scholar Model

Professor Timothy McCarthy - ALTC Project:
A pro-active approach to addressing student learning diversity in engineering mechanics

Student contribution:

Norhayati Baharun, School of Mathematics & Applied Statistics, Doctoral Candidate
Thomas Goldfinch, Faculty of Engineering, Doctoral Candidate

Our Collaborative Partner is University of Central Queensland

Mr Antony Dekkers, Project Team Leader
Mrs Nadine Adams
Mr Philip Budgeon
Mr Peter Cherry
Mr Clinton Hayes
Mr Steven Millan

External Evaluator:

Dr Leigh Wood, Macquarie University

The Symposium

This aims of the Symposium are to address the sharing and creation of resources across institutions and across disciplines. Members from the higher education academic community have been invited to participate in the discussions during the three days of the symposium.

Building leadership capacity in the development and creation of mathematic and statistics resources is a main focus for this symposium. There will be discussions regarding the required resources for disciplines together with the learning design requirements in order to produce quality, peer reviewed, evaluated resources. It is the intention of this project that the resources remain accessible to further support student learning and aid in the teaching for the academic community.

This symposium's aims are:

- To provide the delegates an opportunity for discussion regarding required resources.
- To involve a wide cross-section of the higher education academic community in a discussion about learning design in order to help to create quality resources which can then be shared among institutions.
- To engage participants in the project to share resources.
- To network with the community and share expertise and experiences in leadership.

Day One

Day 1 introduces the first of our discipline talks featuring Education and Engineering. These talks focus on the creation of resources specific to these disciplines with a variety of technical packages.

A Round table discussion session is being held in the afternoon and you are welcome to attend either of these sessions. Suggestions for topics are welcome and a noticeboard has been provided near the registration desk for suggestions during the morning tea and lunch time sessions. These sessions will be facilitated by Anne Porter and Lorraine Denny to discuss identified issues. The specific topics for discussion will be placed at the doors of each room during afternoon tea break. Following the round table discussions, an overall discussion of topics will be held in room 20.2 where an overview and possible further discussions for Day 3 will be decided.

Day Two

Day 2 features our Science discipline talks, video sessions and learning designs in addition to general contributed sessions.

Discipline break out sessions have been organized in the afternoon session. These sessions provide an opportunity for discipline specific resources to be discussed and shared. A facilitator for these sessions will ensure that discussion centres around the discipline theme.

For those attending the symposium dinner:

The dinner will be held at the The Harbour Front Restaurant, 2 Endeavour Drive, Wollongong. Please make your way there for 6.00pm for a 6.30pm meal. There is no

pre-arranged transport. The Green Bus route has a stop in a short walking distance from the restaurant. Please try to arrange lifts for those without transport.

Day Three

Day 3 has the final of our general contributed talks.

This day also focuses on the collaboration opportunities and issues for sharing resources. It will also focus on discussion of issues that arise in Day 1 Round Table discussions and Discipline specific sessions.

On behalf of the project team, we hope that you have an informative, productive and collaborative time.

Thank you to the Keynote, overseas and speakers from around Australia who have made this symposium an interesting and collaborative opportunity for the participants.

Symposium Organising Committee: Associate Professor Anne Porter, Associate Professor Graham Williams, Dr Mark Nelson, Ms Lorraine Denny and Ms Sue Denny and the Symposium Program Committee: Ms Emily Purser, Dr Mark Nelson and Ms Sue Denny.

Program

Day One: Monday 15th February, 2010

8.45 - 9.30	Registrations [Foyer Building 20]	
9.30 - 9.45	Opening Address: Deputy Vice-Chancellor (Academic) Rob Castle [Room 20.2]	
9.45-10.00	Welcome Address, Anne Porter [Room 20.2]	
10.00-11.00	Keynote Speaker: Bill Blyth, AMSI/University of Melbourne <i>Title: Technology and Collaboration in Learning and Assessment of Mathematics</i>	
11.00-11.30	Morning Tea [Foyer Building 20]	
	Education Session [20.2] Chair: Mohan Chinnappan	Engineering Session [20.3] Chair: Mark Nelson
11.30-12.00	Jacqui Ramagge, UoW <i>Mathematics for Primary Educators</i>	Mary Coupland, UTS <i>Who needs help in first year engineering mathematics and how do we do it at UTS?</i>
12.00-12.30	Ginny Keen, University of Daytona <i>Meaningful Mathematics Teaching through Content- Video Creation.</i>	Antony Dekkers, CQU <i>Learning from change - How the Tablet PC changes my teaching in the Field of Engineering Education.</i>
12.30-1.30	Lunch [Foyer Building 20]	
1.30-2.00	Leigh Wood, Macquarie University <i>Continuing professional development and evaluation of practice</i>	
	Chair: Andrew Kepert	Chair: Antony Dekkers
2.00-2.30	Mohan Chinnappan, UoW <i>Use of Camtasia to model and assess understanding in Mathematics</i>	D'Arcy Mullamphy, JCU <i>Screencasting in Mathematics: How much more flexibility do we need?</i>
2.30-3.00	Stephen Sugden, Bond University <i>Spreadsheets in Mathematics Education</i>	Adrian Koerber, Uni of Adelaide <i>Computer aided assessment in large mathematics</i>
3.00-3.30	Afternoon Tea [Foyer Building 20]	
3.30-4.30	Round Table Discussion #1 Topics* <i>Facilitator: Anne Porter</i>	Round Table Discussion #1 Topics* <i>Facilitator: Lorraine Denny</i>
4.30-5.00	Overall Discussion in [20.2]	

Day Two: Tuesday 16th February 2010

9.30-10.30	Keynote Speaker: Paul Abbott, University of Western Australia <i>Mathematica Learning Resources for Mathematics</i>	
10.30-11.00	Morning Tea	
	Video Session [20.2] Chair: Graham Williams	Learning Design Session [20.3] Chair: Glennys O'Brien
11.00-11.30	Chris Tisdell, UNSW <i>Digital Learning Resources in Mathematics: OpenCourseWare and YouTube EDU</i>	Norhayati Baharun, UoW <i>The Impact of Video Resources in Teaching Statistics: Comparison of Undergraduate and Postgraduate students</i>
11.30 - 12.00	Sherie Elliott, CQU <i>Increasing the Engagement and Understanding of External Students with the Aid of the Tablet PC</i>	Cheryl Howard - Monash <i>Creating a "Biofeedback" Classroom Environment</i>
12.00-1.00	Lunch	
	DISCIPLINE BREAK OUT SESSIONS	
1.00-1.45	Engineering/Mathematics <i>Facilitator: Tim McCarthy, UoW</i>	Education <i>Facilitator: Ginny Keen, University of Daytona</i>
1.45- 2.30	Statistics/Commerce <i>Facilitator: Reetu Verma, UoW</i>	Science/Chemistry/Agriculture <i>Facilitator: Madan Gupta, UQ</i>
	Science Sessions Chair: David Griffiths	General Contributed Sessions Chair: Bill Blyth
2.30-3.00	Glennys O'Brien, UoW <i>Developing Mathematics Resources for Students in the Science Faculty.</i>	Caz Sandison, UoW <i>Accidental resources: Using untapped talent</i>
3.00-3.30	Shaun Belward, JCU <i>Screencasting at JCU and its Role in the BSc.</i>	Mark Nelson, UoW <i>What can you do with Mathematics?</i>
3.30-4.00	Afternoon Tea	
	General Contributed Sessions Chair: Caz Sandison	Chair: Graham Williams
4.00-4.30	Girijasankar Malik , UWS <i>The effect of High School Mathematics on student performance in University: A quantile regression approach.</i>	Sharon Persinger, Bronx Community College. <i>Animations of Linked List Operations</i>
4.30-5.00	Jackie Yong, Newcastle University <i>Multiple Methods: How to help students succeed in Quantitative Methods for Business Unit</i>	Madan Gupta, UQ <i>Enhancing Student Engagement in Agricultural Mathematics with Clicker Technology</i>
6pm	Dinner at Harbour Front Restaurant, 2 Endeavour Restaurant, Wollongong	

Day Two: Tuesday 16th February 2010

9.00-9.30	Anne Porter, Project Leader, UoW <i>Title: Setting the stage for future collaboration</i>
	General Contributed Papers [20.2] Chair: Anne Porter
9.30 - 10.00	Wendy Meyers, UoW <i>Supporting a teaching team in the documentation and refinement of a subject using VLDS</i>
10.00-10.30	Mary Coupland, UTS <i>Helping Mathematicians talk with Engineers to improve subjects for first year students</i>
10.30-11.00	Morning Tea
11.00-12.00	Final Discussion Session - The Way forward.
12.00-1.00	Lunch
1pm	Close

DAY ONE

(In alphabetical order)

Keynote Speakers

Associate Professor Bill Blyth, AMSI/University of Melbourne

Talk Title *Technology and Collaboration in Learning and Assessment of Mathematics*

Biography

Bill Blyth recently retired as an Associate Professor of computational mathematics at RMIT University. He is currently AGR Academic Administrator at AMSI and chair of the Engineering Mathematics Group of Australia.

His PhD was in theoretical physics at Imperial College, London. He has an unusually broad range of research interests in mathematics education (in technology rich classrooms) and the numerical solution of differential and integral equations.

Abstract

Several topics with recurring themes of various forms of technology and collaboration will be discussed and demonstrated with a TabletPC. These include:

- The Australian Mathematical Sciences Institute, AMSI, program of collaborative eTeaching of advanced mathematics (Honours level) to small classes at multiple remote sites via Access Grid Rooms, AGRs.
- Some of the pedagogical issues with eTeaching in AGRs and demonstrate some software (pdf slideshow; annotations in pdf, Word, Power Point, Maple) within the context of both AGR and standard e-presentations.
- Video analysis to evaluate teaching and learning in a CAS immersed mode in a computer laboratory.
- Computer Aided Assessment, CAA, using generally available CAS enabled CAA packages (the commercial MapleTA and the open source STACK) and the more powerful CAS immersed CAA using Maple to mark individualized assignments (with plots and comments) at RMIT University and Oxford University; Plans to develop CAS immersed CAA with Mathematica (an Australian team using AGRs) and a project with Oxford University to develop CAS immersed CAA using MuPAD (which is part of MATLAB).
- Usage of Computer Aided Assessment, CAA, for large classes will surely increase. The development of quality materials is resource intensive: collaborative development (via AGRs ?) would be valuable.

Dr Leigh Wood, Macquarie University

Talk Title *Continuing professional development and evaluation of practice*

Biography

Leigh Wood is Associate Dean Learning and Teaching in the Faculty of Business and Economics at Macquarie University. She is Chair of the Education committee of the Australian Mathematical Society and leader of an ALTC grant entitled A national discipline-specific professional development programme for lecturers and tutors in the mathematical sciences.

Abstract

This presentation outlines a criteria-based professional development framework for teaching in higher education based upon performance outcomes at different levels of pedagogical operation – teaching classes, coordinating units, and leading programs. Core Knowledge and Core Values underpin Areas of Activity, aligning with other professional development models that base practice upon understanding and belief systems. The model is based upon The Higher Education Academy's UK Professional Standards Framework. By incorporating areas of scholarship and reflective practice in all three dimensions, the model emphasises a research-based approach to teaching. I will show how initiatives such as the Sharing Mathematics and Statistics Resources project fit into the framework.

Speakers

Assoc Prof Mohan Chinnappan, University of Wollongong

Talk Title *Use of Camtasia to model and assess understanding in Mathematics*

Biography

A/Prof Mohan Chinnappan is a mathematics teacher educator at the Faculty of Education at the University of Wollongong. For the past 20 years his teaching and research endeavours have focussed on mathematical knowledge and the development of innovative strategies to foster deep mathematical understanding among K-12 students and teachers. He is a consultant on numeracy projects for a number of national and international agencies including DET, CEO, Ministry of Education (Indonesia) and Regional Centre for Mathematics and Science Education (Malaysia). His current research project examines the use of ICT in the rapid assessment and promotion of algebra schemas among students in the Illawarra region.

Abstract

In this presentation, a model of understanding that can be used to assess mathematics knowledge acquisition and representation will be discussed. Following this, I will share our work in the ALTC project that involved the production of an e-learning resource. The resource was constructed within Camtasia and driven by Cognitive Load Theory (Sweller, 2009). Pedagogical implications for use in primary/secondary classroom practices and innovations for curriculum leadership will be examined.

Dr Mary Coupland, University of Technology Sydney

Talk Title *Who needs help in first year engineering mathematics and how do we do it at UTS?*

Biography

Mary Coupland is a Senior Lecturer in the Department of Mathematical Sciences at UTS. She teaches first year Engineering students and is the director of the Mathematics Study Support Centre. Mary has been at UTS since 1990, following ten years of Secondary School teaching in mathematics and two years in teacher education. She is currently President of the Mathematical Association of NSW, (MANSW), the professional association for teachers of mathematics at all levels in New South Wales. In recent years Mary has been a consultant for the NSW Board of Studies concerning HSC examinations and syllabuses. Mary's PhD was awarded by the University of Wollongong in 2004 for a thesis titled "Learning with new tools", concerning the learning and teaching of mathematics with Computer Algebra Systems.

Abstract

The problem of the wide range of student knowledge and skills in mathematics on entering first year is often addressed by holding a diagnostic test. The results of this test may be used for various purposes, including directing students to study support centres, streaming of classes, and diversion to preliminary studies. At the university where we work, a diagnostic test is given to all commencing students in engineering courses as part of their enrolment process. As a result, many students are required to complete a preliminary subject (Foundation Mathematics) before the usual set of mathematics subjects. In our first year subjects, the department runs Support Tutorials in addition to regular tutorials, and Peer-Assisted Study Skills sessions are also offered by Student Services. In this presentation we will describe the diagnostic test, the progression from Foundation Mathematics to regular mathematics subjects, the kinds of tutorials that are run, and student responses to this support.

Mr Antony Dekkers, Central Queensland University

Talk Title *Learning from change – How the Tablet PC changes my teaching in the Field of Mathematics Education.*

Biography

Antony Dekkers is currently Senior Lecture in Faculty of Science, Engineering & Health and currently develops and delivers courses in the Engineering Program. He also has had fifteen years experience in delivering bridging tertiary mathematics and is part of team developing bridging mathematics material used within the Mathematics Learning Centre. Current research interests include the development and delivery of online or CD based resources for teaching bridging tertiary mathematics and Engineering courses.

Abstract

The teaching of mathematics today focuses on providing more meaning for students, encouraging them to think logically, developing their number sense and cultivating a true mathematical understanding. This presentation seeks to explore the complex interaction among three bodies of knowledge: Content, Pedagogy, and Technology and the issues inherent in the delivery courses with mathematical content using a Tablet PC to aid students' understanding course content.

Dr Ginny Keen, University of Daytona

Talk Title *Meaningful Mathematics Teaching through Content – Video Creation*

Biography

Ginny is an Assistant Professor at the University of Daytona. Ginny works as an outreach mathematician in the Department of Mathematics. Ginny's research is currently focusing on using student-created video products to enhance the mathematical content knowledge of early childhood and intervention teachers.

Abstract

As part of my goal to more actively engage students with the content of our mathematics for early childhood and intervention specialist education majors, I assign students the task of preparing video presentations/explanations of concepts included in the course curriculum. The videos (2 – 5 minutes in length) are put on the course website for students to view. These videos hold promise as devices for expanding the resources available to students for strengthening their understanding of the content through both the creation and examination of the video

presentations. With the increased availability of digital video recording equipment on campuses, more faculties will be able to take advantage of this type of assignment. There are some not-insignificant issues to be worked through in order to ensure a satisfactory outcome in terms of completed videos, quality control, and other aspects of content and presentation.

The session includes a discussion of five questions related to the project: Why video? What is the design of the project? What are the desired results? What logistical and technical concerns need to be addressed? and What actually results? We will also have a larger discussion of questions and suggestions for improving this design as well as for alternative uses of streaming video in the classroom and on the web.

Dr Adrian Koerber, University of Adelaide

Talk Title *Australian Network in Learning Support in Mathematics and Statistics (ANiLSiMS)*

Biography

B.Sc.(Hons) from the University of Adelaide, Ph.D. on free surface fluid dynamics from The University of Queensland, Post Doc at The University of Nottingham in mathematical biology/medicine, Lecturer in the School of Mathematical Sciences at the University of Adelaide since 2005. Responsible for coordinating and part of the teaching for large level 2 mathematics courses for engineering students. Interested in effective and efficient teaching, including the use of online resources, and in particular in the development of both formative and summative computer aided assessment tasks.

Abstract

The School of Mathematical Sciences at the University of Adelaide has been using computer aided assessment (via Maple T.A.) for both summative and formative assessment for the past four years. The significant advantages provided by computer aided assessment (CAA) in terms of consistency, reusability and instantaneous feedback for students make it a valuable addition to the teaching strategy for large mathematics courses.

We will present a discussion of our experiences with the use of CAA in large first and second year mathematics service courses. A combination of student feedback, our own assessment and relevant literature, has been used to develop guidelines for good practice in this area, and has also allowed us to document some common difficulties and downsides of large scale CAA.

The primary threshold that prevents CAA's ready adoption is the considerable amount of initial time and effort that must be spent in creating banks of suitable questions (and to a lesser degree in structuring particular assessment tasks). In an attempt to help lower this threshold, and to increase the efficacy of mathematicians' work in this area, we are interested in creating a cross-institutional repository of resources for CAA (including exemplars, documentation, and guides for good practice), as well as a general forum in which common problems and possible resolutions can be discussed. Our vision here is twofold: certainly we aim to lower each institution's individual burden in using computer aided assessment, but equally important to us is encouraging the development of more ambitious, cross institutional CAA projects.

Dr D'Arcy Mullamphy, James Cook University

Talk Title *Screencasting in Mathematics: , How much more flexibility do we need?*

Biography

D'Arcy is a senior lecturer in mathematics at JCU who has been involved with the teaching of first year mathematics for over twenty five years. He has recently moved his research interests from physics to mathematics education and has a particular interest in students who have a fear of mathematics. D'Arcy has also begun researching into the perceived drop in the standard of students entering first year mathematics, and more recently has become interested in "screencasting" as a tool to enhance learning in mathematics.

Abstract

As the type of student entering Australian universities changes, we are obliged as educators to adapt our teaching styles to suit the new demographic. A large proportion of our students find it increasingly more difficult to attend classes, and demand more flexibility in the way lectures and support materials are delivered. The modern student is techno-savvy with the vast majority having access to the internet. These students also are comfortable with using computers and the internet for their own study. To allow for this new demographic, staff at JCU have increased the flexibility in their courses by creating screencasts as both a lecture replacement and supplement. This increased flexibility allows students to view materials from a computer, Ipod touch or phone and can be viewed multiple times in their own time and at their own pace. The main stream first year class at JCU were given access to screencasts for their course and were surveyed to determine the usefulness of these screencasts. These survey results will guide us in our future use of screencasting and technology in general.

Associate Professor Jacqui Ramagge, University of Wollongong

Talk title *Mathematics for Primary Educators*

Biography

Jacqui Ramagge was appointed Associate Professor at UOW in 2007. She has served on the Australian Mathematics Trust Primary Competitions Committee since 2003 and is on the Educational Advisory Committee of the Australian Mathematical Sciences Institute. She has taught into the Vermont Mathematics Initiative (a PD program for middle school teachers in the USA) and is on a writing team preparing modules to support the National Curriculum as part of a \$2m Australian Mathematical Sciences Institute project funded by DEEWR. She is a member of Council of the Australian Mathematical Society and is currently a member of the Engineering, Mathematics and Informatics panel on the Australian Research Council College of Experts.

Abstract

We will discuss two subjects aimed at prospective primary teachers developed and delivered at UOW in 2009. Each subject had approx 100 students enrolled over 5 campuses; lectures were videoconferenced and tutorials were run locally. A large number of resources were developed and will be discussed, including

- Complete set of lecture notes in beamer style of latex
- Exercises and solutions
- Various eLearning navigational tools
- Learning design analysis
- Videos

We will give a description of the development process and demonstrate the main highlights. All resources will be available for sharing, including lecture notes.

Professor Stephen Sugden, Bond University

Talk Title *Spreadsheets in Mathematics Education*

Biography

Professor Sugden's present research interests at Bond University centre on the use of technology in mathematics education, especially the use of modern spreadsheet programs such as Microsoft's Excel. In 2002, he established the electronic journal *Spreadsheets in Education*, hosted at Bond. This journal publishes fully peer-reviewed articles plus classroom resources for teachers.

In recent years, he has been very active in consulting work and was responsible for the mathematical models presently employed by Jupiter's KENO in Queensland.

Abstract

The common electronic spreadsheet may conjure up visions of accounting or auditing applications, however, it is a vastly underrated tool when it comes to illustration and modelling of mathematical fundamentals. In 2002, the speaker established the electronic journal *Spreadsheets in Education* <http://epublications.bond.edu.au/ejsie/>. It was set up to provide a focus for researchers and teachers to share their ideas and experiences of using the modern electronic spreadsheet as a teaching tool. The journal is devoted to the publication of peer-reviewed articles which provide a focus for advances in our understanding of the role that spreadsheets can play in education. The journal is fully open access and the third number of volume three was published in January 2010. The presentation will give a brief overview of major insights gleaned by researchers of roles played by the ubiquitous spreadsheet over the past 25 years in educational contexts. Following this, some examples will be given where Microsoft Excel is used to illustrate and model mathematical concepts, including applications to elementary financial and discrete mathematics.

DAY TWO

(In alphabetical order)

Keynote Speaker

Dr Paul Abbott, University of Western Australia

Talk Title *Mathematica Learning Resources for Mathematics*

Biography

Paul Abbott is a computational physicist in the School of Physics at the University of Western Australia. He worked for Wolfram Research Inc. (WRI) — the makers of the Mathematica computer algebra system (CAS)— from 1989-1992 in their Applications Department, and is presently a WRI consultant. Abbott was the founding technical editor of *The Mathematica Journal* in 1990 and continues his involvement with the journal as a columnist.

Abbott makes extensive use of CAS in his research and teaching. His computational physics course(http://www.physics.uwa.edu.au/information_for/current/third_year/computational_physics)

s) won an Undergraduate Computational Science Education Award in 1995. In 2002 Abbott was a winner of the SIAM 100-Dollar, 100-Digit Challenge (<http://mathworld.wolfram.com/news/2002-05-25/challenge/>). In 2007, with A/Prof Grant Keady, he developed a new introductory applied mathematics course (MATH2200), taught via immersive use of *Mathematica*.

Abstract

Today, there is a wide range of technology with application to teaching mathematics, including graphics calculators, geometry packages, and general purpose computer algebra software (CAS) such as Maple and Mathematica. This talk will demonstrate how to produce quality learning resources by integrating CAS technology into mathematics courses in a non-trivial way.

Speakers

Ms Norhayati Baharun, University of Wollongong

Talk Title *The Impact of Video Resources in Teaching Statistics: Comparison of Undergraduate and Postgraduate students*

Biography

Norhayati is a doctoral student from the School of Mathematics and Applied Statistics, University of Wollongong. She is a senior lecturer at the University of Technology MARA (UiTM) Malaysia in the area of applied statistics. Her study/research project is on Statistics Education with a topic “Improving the learning of Statistics: An Impact of Mathematics Learning Support on Student Outcomes”.

Abstract

In this presentation, I will discuss the impact of video resources in teaching statistics. This presentation compares two cohorts of students, eighty-six postgraduate and eighty-nine undergraduate students who enrolled in an introductory statistics subject at the University of Wollongong. The comparison is based on the impact of learning resources in particular video resources towards student learning outcomes i.e. student understanding of topics, confidence, and anxiety in statistics subject. At the end of session, the students asked to participate in an online survey via the e-learning site. The results showed significant differences in the impact of video resources between postgraduate and undergraduate students. Postgraduate students significantly more confident and less anxious compared to undergraduate students after completing this subject.

Dr Shaun Belward, James Cook University

Talk Title *Screencasting at JCU and its role in the BSc*

Biography

Today, there is a wide range of technology with application to teaching mathematics, including graphics calculators, geometry packages, and general purpose computer algebra software (CAS) such as Maple and Mathematica. This talk will demonstrate how to produce quality learning resources by integrating CAS technology into mathematics courses in a non-trivial way.

Abstract

James Cook University has recently been through a process of curriculum renewal, a process which is being repeated around the country. Curriculum renewal provides a unique opportunity to examine the way quantitative skills are delivered to science students. In the sciences, the need to have students with greater quantitative skills is essential and the current situation of students entering university with weakness in this area presents great challenges. Students must be able to apply mathematical and statistical thinking and reasoning in the context of science.

A typical approach to dealing with students who have a weak background in mathematics is to offer a one-semester catch up of the secondary school mathematics pre-requisite for the BSc. At JCU this means these students receive 13 weeks of tuition, as opposed to students who take the appropriate mathematics subject at secondary school, who receive 80 weeks of tuition. The opportunity for deep learning in the tertiary catch up subject is very much reduced.

In the past, beyond the one catch up subject, there has been little coordinated attempt to deliver quantitative skills. Disciplines look after their own needs, often in an ad-hoc fashion with individuals determining how they are going to handle quantitative skills in their subject, without consulting other academics.

In this talk I will discuss how a coordinated approach to the development of resources can facilitate the targeting of quantitative skills throughout the BSc. This should allow opportunity for students to engage in the development of these skills throughout the entire degree, therefore providing the student with a deeper learning experience than is currently delivered.

Ms Sherrie Elliot, University of Central Queensland

Talk Title *Increasing the Engagement and Understanding of External Students with the Aid of the Tablet PC*

Biography

Sherie Elliott is an Associate Lecturer at CQUniversity's Gladstone Campus, teaching Mathematics in the STEPS program and running the Mathematics Learning Centre. She is the Course Coordinator of Transition Mathematics + (TM+ - an external bridging program) and Tertiary Preparation Skills Extended.

Sherie has a Bachelor of Science (Hons Psychology), a Graduate Diploma of Teaching (Secondary), a Certificate of Gifted Education and is currently completing a Master of Education. She has seven years experience teaching Secondary Mathematics, Science and Psychology in Victoria, the Northern Territory and Queensland and was the Student Counsellor and Equity Officer at the University before her current role.

Sherie is a strong proponent of Tablet Technology, utilising it for classroom teaching, external marking and course development. Sherie has recently been using Tablet Technology to develop a series of videos to accompany the TM+ textbook.

Abstract

Transition Mathematics + (TM+) is a 12 week bridging course offered by CQUniversity. The course is designed to follow on from Transition Mathematics 1 (TM1), a course containing introductory mathematical concepts and leads into Transition Mathematics 2 (TM2), the equivalent prerequisite for Undergraduate engineering. TM+ was developed to give students introductory knowledge of various mathematical topics including statistics, standard deviation, probability, absolute values, inequalities, simultaneous equations, quadratic equations, functions,

logarithms, trigonometry, geometry, variation, ratio, proportion, financial mathematics, annuities, series and sequences.

Prior to 2010 the course was delivered externally with the use of a textbook providing an explanation of the concepts, worked examples and exercises for the students to complete. Students were able to contact the course coordinator for assistance via phone or email or visit one of the Mathematics Learning Centres (MLC) on a CQUniversity campus. Unfortunately as many students completing TM+ have a very basic understanding of mathematics they often struggle trying to learn the concepts on their own and many drop out as a result.

MLC staff have used tablet technology to develop instructional videos to support the textbook. This enables students to hear the concepts being explained and see and hear the problems being worked through, just like they would in a lecture or tutorial. We envisage many benefits of incorporating this approach, including catering for different learning styles, enhancing the understanding of how the problem may be solved and increasing the engagement of external students.

This presentation will show the development of the teaching and learning resources using the Tablet PC, including the utilization of Camtasia Studio, PDF Annotator and Flash software.

Dr Madan Gupta, University of Queensland

Talk Title *Enhancing Student Engagement in Agricultural Mathematics with Clicker Technology*

Biography

Madan Gupta is a Senior Lecturer in Agricultural Engineering at the University of Queensland where he has been teaching since 1992. His teaching practices are a reflection of his educational philosophy based on the principles of 3 Ps – **P**assion, **P**articipation and **P**atience. Madan completed the Graduate Certificate in Higher Education in 2002 following which he successfully introduced innovative cooperative learning techniques and a peer and self-assessment system to enhance student performance. He was awarded a Carrick Citation for Outstanding Contributions to Student Learning in 2006. He also won the University Award for Excellence in Teaching in 2007.

Abstract

Many undergraduate students at the University of Queensland Gatton Campus join their studies without having studied Grade 12 Mathematics at high school. These students have difficulty in comprehending Biometrics, Chemistry and other applied courses in agriculture that require high knowledge of mathematical concepts. To overcome this problem and help improve mathematical skills of agricultural graduates, students without sound achievement or higher in Maths B (Senior Maths) are now required to undertake the Agricultural Mathematics course as part of their degree requirements.

A number of innovative teaching and learning strategies were incorporated in the past two years to address not only the social isolation common to the experience of many first-year students but also the difficulties posed by the inadequate mathematical background and consequent mathematical phobias that many students bring to their agricultural studies. One of the key innovations introduced in the delivery of Agricultural Mathematics course was the adoption of clicker technology to motivate and engage students in the classroom. This presentation will describe the methods used in implementing clicker technology in the lectures. Student feedback on the benefits of clickers for interactive teaching and learning will also be presented.

Ms Cheryl Howard, Monash University

Talk Title *Creating a “Biofeedback” Classroom Environment*

Biography

Cheryl Howard is a Lecturer at Monash University for the Berwick School of Information Technology. She has worked in the field of Education for over 30 years in primary, secondary and tertiary institutions, before joining Monash University in 2004. Her research interests include games-based learning and developing more effective technologies to enhance students' study and review processes. She has also been active in the development of educational software since 1984 for primary and secondary students and since 2004 for tertiary students, particularly in the field of games-based learning. Currently she is researching issues related to enhancing both teaching and learning experiences using appropriate technology. Her current challenge is finding a simple tool to assist teachers achieve their goals that will also support both different learning styles and varying degrees of skill in note taking, study and review techniques of students. Towards this end, she has been the principle educational consultant during the development of a software solution Omina™ and will be exploring its potential to meet these needs to determine whether this software can be successfully implemented in varying contexts, which will be presented in her Doctoral Thesis.

Abstract

The catalyst for this research is the simple premise that you cannot review what you do not capture. It focuses on two critical aspects of the teaching and learning experience. This paper discusses some specific issues of and proposes an integrated practical solution for a) enhancing current teaching methodologies with minimal impact on preparation and presentation and b) enhancing comprehension, retention, study and review options for all students. For teachers, principle concerns with presentation include maintaining student engagement, adopting new technologies and improving the quality of teaching. For students, principle concerns with learning include understanding the content while simultaneously identifying and applying appropriate techniques to minimise “information overload”. The challenge is finding a simple tool to assist teachers achieve their goals that will also support both different learning styles and varying degrees of skill in note taking, study and review techniques of students.

Using Personal Response Systems (clickers) within lectures has provided limited interaction by and feedback to students present. While these systems are simple to implement, and quite cost effective, their limitations do not necessarily provide teachers/students with useful feedback. This research proposes to broaden the current boundaries of “clicker” technology through a specifically developed software application Omina™ through iPods or mobile phones. Omina captures content from any presentation format and also manages multiple input modes from students (comprehension, opinion, and assessment). Comprehension mode provides immediate feedback (teacher only during presentations) on student understanding so that presentations can be modified “on the fly”, while saving student input data in pre-defined colour-coded blocks for later review. The opinion and assessment modes provide graphic feedback for questions posed to everyone. When students review captured lessons via Omina Viewer, supplementary notes and their personal input data are displayed. The coloured playback bar helps students quickly identify what they need to study, customised playlists and other options are also available.

Dr Girijasankar Mallik, University of Western Sydney

Talk Title *The effect of High School Mathematics on student performance in University: A quantile regression approach*

Biography

After working for several years in governmental organisations and in the private sector I have been working full time as an academic since 1995. My current position is that of Senior Lecturer and Honours coordinator in the School of Economics and Finance at UWS.

Abstract

This paper investigates the relative importance of a wide range of variables that may impact on student performance in different Colleges in the University. Using multi-year data set covering 14528 students, we have found that, higher level of Mathematics and English (e. g. extension one and extension two) subjects are significantly positively correlated with the University Admission Index (UAI) in HSC. In contrast General Mathematics and Standard English are significantly negatively affecting the UAI. Using OLS and quantile regression we found that Mathematics (former two unit mathematics) plays a positive and significant role in achieving higher Grade Point Average (GPA) in the Arts, Business and Health Science subjects in the University. However General Mathematics and Standard English have significantly negative effect on GPA across different Colleges in the University.

Dr Mark Nelson, University of Wollongong

Talk Title *We've got the resources, now what do we do? Two uses of mathematical videos to engage students*

Biography

Dr Mark Nelson is an applied mathematician from the University of Wollongong. His area of research interest is the applications of mathematics to problems from physical chemistry, combustion science and reactor engineering. At Wollongong he taught first-year engineering students mathematics for six years and is in his third year of teaching science students who stopped their mathematics education in year ten the mathematics they need for their degrees. (This involves teaching the 'best' parts of year 11 and year 12 mathematics in 13 weeks). He has been involved in a number of teaching initiatives to develop learning resources for both students taking mathematics as a service course and mathematics majors.

Abstract

Not available at time of printing.

Dr Glennys O'Brien, University of Wollongong

Talk Title *Developing Mathematics Resources for Students in the Science Faculty*

Biography

Glennys O'Brien is the Director of First Year Studies in the School of Chemistry and 2009 Faculty of Science Teaching and Learning Scholar. Glennys has a background in environmental and analytical chemistry. She has been involved with teaching chemistry at various levels in the tertiary sector for a decade, and has been in her current role for four years. The first year student cohort covers a wide range of disciplines and varies greatly in terms of skills brought to their chemistry studies. Glennys is involved in two linked projects relating to teaching, this project developing mathematics resources and the Mapping Science Subjects and Courses project which is linked to provide background mapping of needs for the mathematics project.

Abstract

This contribution reports our experience over the past twelve months and covers three areas for comment: (i) our now refined methods of design and production are briefly summarized with aspects of technical detail as well as experiences worth sharing; (ii) embedding and linking resources and (iii) slowly building connections with staff in the rest of the faculty to provide resources.

We now see the process for design and production of the video clip resources as having several steps which are important for ensuring the embedding of the resource in the original unit of study and for easily using it elsewhere. We also report informal student comment on specifically how they use the videos, which has important implications for design.

Embedding and linking the resources to other materials is useful both for the teaching staff and for students. Where the individual teacher can make direct links to other related resources, they do not have to provide an example of every last variation of a concept and the students see more than one way of setting out and solving calculation problems.

Dr Sharon Persinger, Bronx Community College

Talk Title *Animations of Linked List Operations*

Biography

Sharon Persinger received a Ph.D. in mathematics from the Graduate School of the City University of New York, working in combinatorial group theory with Gilbert Baumslag. After teaching mathematics in several colleges, she realized that her true interests were in the areas of algorithms and computational thinking, and began to move to teaching computer science. She has just completed a master's degree in computer science at City College of New York. She teaches in the Department of Mathematics and Computer Science at Bronx Community College, where she coordinates the computer science curriculum.

Abstract

A linked list is a data structure consisting of a sequence of nodes, each node containing some data and a link or reference to the next node in the list. The linked list is one of the first data structures that a computer science student will study and implement.

To explain the linked list structure and its basic operations of inserting and removing nodes at specific places, computer science instructors and textbooks use standard diagrams to represent the list as stored in computer memory and the processes of accessing, changing, and inserting nodes. When presented in class, the diagrams are drawn in a sequence, with modifications from one diagram to the next to show the changes in the structure as the steps of an operation are performed on the list. But the diagrams become a static representation of the process when students copy them into their notes.

My project is a collection of animated versions of the usual diagrams showing linked list operations. The animations allow students to see the effect of each individual step in a process with several steps, not just the final result of the entire process. Because of the animation, this representation retains the dynamic nature of the list operations, and so models the actual processes better than a sequence of static images. This collection of animations is a work in progress.

Dr Caz Sandison, University of Wollongong

Talk Title *Accidental resources: Using untapped talent*

Biography

Dr Caz Sandison has almost 20 years of lecturing experience. She has a passion for mathematics and a desire to help students understand and appreciate maths. Caz spent ten years involved in the coordination of first year Maths at UoW, including four years as the leading coordinator. While mostly allocated those difficult, large first year Calculus classes, Caz has also lectured in second, third and fourth year Pure Maths, even managing to inspire a number of students to pursue a career in that field. Caz is dynamic and enthusiastic, always on the look-out for ways to improve her teaching and new ways to motivate students. Caz has been involved in the development of a CD-Rom to assist in the training of new tutors. She was also instrumental in the development of the Summertime Maths DVD providing resources to help struggling students revise their fundamentals. Caz was foundation chair of the School's Education committee, chaired the recent working party to review first year Calculus offerings at UoW, and she has been recognised at both University and national level for her excellence in teaching.

Abstract

It is not always necessary to spend a lot of time and effort to develop resources to aid in teaching. Many students have the talent to produce engaging resources that can be useful. When setting an assignment for first year engineering maths students, I accidentally ended up with a number of resources that help contextualise maths for engineering students.

Dr Chris Tisdell, University of New South Wales

Talk Title *Digital Learning Resources in Mathematics: OpenCourseWare and YouTube
EDU*

Biography:

Dr Chris Tisdell is Senior Lecturer in Applied Mathematics at UNSW, Sydney and is passionate about free and openly accessible education materials, known as OpenCourseWare (OCW). He has been an early Australian contributor to YouTube EDU, which is the educational arm of the world's most popular online video community, allowing millions of learners to discover, watch and share originally-created videos. His research is currently supported by several industry partners, such as ELMO Co. Ltd and Pearson Publishing Inc. Chris' research interests include differential equations and dynamical systems. These equations are used in the modeling of phenomena that change over time and provide a deeper understanding of their behaviour. He is the author of over 50 research articles in the field and serves by invitation on 3 editorial boards of international mathematics journals. His research is supported by the ARC; Aust. Acad. Sci. and DEST.

Abstract

OpenCourseWare (OCW) is a movement that is dedicated to free and openly accessible education materials. Recent technological advancements in document camera, video and internet technologies have created exciting opportunities for educators to significantly advance teaching and learning resources in the OCW environment. For example, the world's largest online video website, YouTube, has formed "YouTube EDU" where universities can upload OCW materials, such as video lectures.

I will discuss my experience over the last 12 months in forming OCW materials in mathematics for YouTube EDU. This research is supported by: UNSW; ELMO Co. Ltd; and Pearson Publishing Inc.

Ms Jackie Yong, Newcastle University

Talk Title *Multiple Methods: How to help students succeed in Quantitative Methods for Business Unit*

Biography

Jackie is a Lecturer in Accounting at the Newcastle University's Business School located in Sydney.

Abstract

Helping students succeed in a quantitative analysis courses is often difficult especially when students have little or no prior mathematical training. Without denying the significance of traditional lectures and tutorials in undergraduate education, an increasing number of academics are recognising the value of practical sessions, informal small-group learning and *Blackboard*. By recognising that each person processes information differently, by reducing student's anxiety towards the unit and by making teaching accessible to students of multiple learning styles, the lecturer can give all students a better chance of successfully completing the unit. This paper looks at the links between the multiple learning activities adapted in Quantitative Methods for Business unit to the students' academic performance and their attitude towards the unit.

DAY THREE

(In alphabetical order)

Speakers

Dr Mary Coupland, University of Technology Sydney

Talk Title: *Helping Mathematicians talk with Engineers to improve subjects for first year students*

Biography – See Day One

Abstract

In 2008 a Cross-Faculty Curriculum Renewal Project was initiated at UTS. Titled "Teaching and Learning of Mathematics and Science in Engineering programs: Curriculum renewal for graduate capability enhancement in a practice-based engineering course", the project was jointly managed by staff from both faculties (Science and Engineering). An important part of the project was to interview lecturers of Engineering subjects for which mathematics is regarded as pre-requisite knowledge. The outcomes of this collaboration will be described in this presentation, and a benchmarking of the new arrangements against the recommendations of the Carrick funded report by AMSI: 'Mathematics Education for 21st Century Engineering Students' will be discussed.

Ms Wendy Meyers, University of Wollongong

Talk Title *Supporting a teaching team in the documentation and refinement of a subject using VLDS*

Biography

Wendy is committed to excellence in teaching and learning. Her particular interests are eTeaching, developing online resources, designing and developing eLearning activities, online collaboration and communication and emerging technologies. She has a background in education, the visual arts and graphic design. These areas combine to enable her to bring an understanding of the design process and visual literacy alongside her knowledge of current teaching pedagogies to create effective dynamic learning environments.

Abstract

The Visual Learning Design Sequence (VLDS) emerged from a national project documenting exemplar practice in Higher Education (<http://www.learningdesigns.uow.edu.au/>). It aimed to extract generic learning designs from leaders in the field enabling academics to re-use the ideas within their own teaching context. The tool facilitates the identification of the tasks, resources and supports needed within a blended learning environment. Since completion of the project the VLDS tool has been used beyond it's original context. Teachers are using the VLDS as a tool to document, communicate and reflect on their teaching practice. In 2009 as part of the ALTC Maths Leadership Project, the VLDS was used to support a teaching team to reflect on current practice, document, refine and communicate a subjects learning design.

How to become involved...

If you are interested in becoming involved in this project please contact the Project Leader or Project Co-ordinator. You may be interested in participating in all or selected aspects such as literature review, peer review of resources, leading a team to create resources for Indigenous students, or for maths in Agriculture... or you may simply wish to use resources and gather and share student evaluation. We aim to facilitate your role as a member of the team and in particular to work with you develop and explore your leadership potential.

The final year of our project sees the completion of the repository which will be setup for access for users from institutions other than the University of Wollongong. This system will enable users to view and download video resources that may be used in their own teaching and learning spaces using their own learning designs.

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