

MSSTL10 SPEAKERS AND CORRESPONDING ABSTRACTS:

1. **Michael Brennan (Cork IT)**

Title: Exploring Mathematics using Mathematical Treats

The teaching of Mathematics regularly comes under both the media and academic spotlight [1,2]. A recent report from Engineers Ireland [3] gives particular attention to the teaching of mathematics at second level. One of the issues that arises is how best to present mathematics to a general audience, so that concepts and topics resonate with the learner. Good resources play a critical role in achieving this. In this talk I hope to present some *mathematical treats* that go some way in attaining this goal.

References

1. John Collins, *Investment in Maths and Science Urged*, The Irish Times, February 12th, 2010
2. NCCA, *Review of Mathematics in Post- Primary Education Report on Consultation*, 2006.
3. Engineers Ireland, *Report of Task Force on Education of Mathematics and Science at Second Level*, February 2010.

2. **Frank Doheny (Athlone IT)**

Title: Moodle quizzes - Much more than Multiple choice

This study is an extension of an earlier project funded by the NDLR. I developed a set of questions designed to test the key skills required by a first year engineering class. Each quiz, composed of a set of randomly chosen questions, is an unsupervised open-book on-line test. The marks awarded by the quizzes become the students' continuous assessment mark.

Once a quiz is completed, the correct answers are revealed and feedback on each question given to the student. Feedback contains information on how to solve that type of question or directions to an appropriate screen-cast demonstrating the solution of a similar problem.

Students are allowed two attempts at each quiz. After the first attempt students are locked out for three days during which time they are encouraged to re-engage with the material using their feedback as a study guide.

My presentation will include a demonstration of some of the question-types available within Moodle.

1. Short answer
2. Numerical
3. Algebra
4. Matching
5. Cloze

The results of the study will be analysed at the end of semester 2. The results of a student survey on students' reaction to this type of assessment will be included.

3. Martin Grehan (NUI Maynooth)

Title: An analysis of at-risk students' lack of engagement with mathematics support.

(Martin Grehan, Ciarán Mac an Bhaird, Ann O'Shea.)

The Mathematics Department at NUI Maynooth uses assessment as one method of identifying at-risk students. In the first week of lectures students take a diagnostic test. Students who fail are automatically registered for an online course that covers basic mathematical topics. Leaving Certificate marks are also used to identify at-risk students. As well as the online course, the Department has other supports in place, including small group tutorials, workshops and it runs a very successful Mathematics Support Centre. Research has shown that students who avail of these services have a greater chance of succeeding on examinations than those who do not. However, a small minority of at-risk students do not take advantage of the support available.

Our aim was to investigate the reasons why those students experiencing difficulties were not seeking help. In October 2009, we identified 39 students who were repeating a 1st year maths module. These students were contacted and invited to participate in our study. 10 students agreed and they were asked to complete a short questionnaire concerning their first year mathematical experiences. 7 of these students agreed to be interviewed. Preliminary analysis highlights issues such as fear and a lack of understanding or awareness of supports and services within the Mathematics Department. Already, this study has led us to implement earlier and more frequent intervention with those at risk students and further refining of this process is taking place as we analyse our data.

4. Ciaran O Sullivan (IT Tallaght)

Title: Promoting active learning in Mathematics - a 'Problems First' approach.

*(Dr. Donal Healy, Dr. Martin Marjoram, Mr. Ciaran O'Sullivan & Dr. Paul Robinson ITT Dublin
(Institute of Technology Tallaght), Tallaght, Dublin 24, Ireland)*

The engagement of students in active learning in mathematics is an ongoing challenge. As a sudden move from a traditional mode of mathematics delivery of a complete module to an enquiry based approach for the module appears daunting, an approach of ongoing incremental change in delivery is under investigation at the ITT Dublin. This paper describes a '*Problems First*' project in which mathematics lecturing staff identify a section or aspect of a Mathematics module which is suitable for modification of approach from a traditional one to one in which the students encounter sets of mathematical problems first. The students do these problems using appropriate materials, aids to reflection and other inputs. This is followed, as needed, by some lecture input to ensure that the necessary learning outcomes have been achieved.

The '*Problems First*' project was implemented on three modules:

- 1) In the first module, a first year Mathematics module on a pharmaceutical science course, the implementation consisted of an unseen problem being given to small groups of students early in the semester. The students were directed to online preliminary notes and library books and were encouraged to discuss the problem with the lecturer at any time.
- 2) In the second module a '*Key Skills Testing in Mathematics*' Moodle based testing approach is used to reinforce key mathematical skills needed for a particular semester of engineering and is implemented as part of a Mathematics module for a 3rd year electronic engineering course. An additional reflection sheet was deployed to help students reflect on, and take action on, key areas highlighted for them by their performance in these '*Keyskills*' tests.
- 3) In the third module, a Mathematics module in the first year of a degree in Mechanical Engineering, for the first 6 weeks of the module problem sheets were given to the students first. These problem sheets were augmented by notes given to the students and by input from the lecturer. As well as the development of the materials to enable this approach to be undertaken, a reflective diary template for the lecturer was developed and maintained for this section of this module.

In this paper the implementation of this '*Problems First*' approach in these 3 modules is outlined. Also presented in this paper is the student feedback relating to the facilitation, documentation and learning outcomes of the project as well as any effects on group dynamic during the project. Finally the effectiveness of this approach is examined by comparing student performance in continuous assessment and end of semester examination in these modules in January 2010 with the performance data for similar students from previous academic years.

5. Fiona Faulkner (Research Student UL)

Title: Predicting failure in service mathematics in the University of Limerick

In this paper an analysis of the likelihood to fail service mathematics in the University of Limerick (UL) in Ireland is carried out. A dataset containing information of 1918 students between the years 2006 and 2008 is used in the analysis. This dataset contains information on students such as gender, degree course of choice, performance in end of semester mathematics examinations, performance in a diagnostic test etc. The aim of the investigation is to determine the most common characteristics possessed by students who have failed semester 1 service mathematics examinations between the years 2006 and 2008. The following characteristics are examined: the year in which the student studied service mathematics in UL, their gender, pre-university mathematics background, whether a student is standard i.e. coming straight from school in Ireland to university, or non-standard i.e. a mature student or a non-national student, degree program being pursued, performance in a diagnostic test carried out in the first mathematics lecture to test basic mathematics skills and finally whether or not students were present in the first mathematics lecture to take the diagnostic test. The analysis highlights whether there are strong correlations between students who fail semester one service mathematics examinations and the previously mentioned characteristics which a student may possess.

6. Tugba Aysel (Research Student NUI Maynooth)

Title: An Exploration of the Effect of High-Stakes Examinations on the Teaching and Learning of Mathematics in Post-primary Education in Turkey and Ireland.

Both Ireland and Turkey have high-stakes examinations at the end of second level schooling that determine entry to third level education. We will explore the effect of such examinations on the teaching & learning of mathematics at second level in both countries. Concern has been expressed in Ireland that teaching (and learning) to the examination is widespread. However, there is less evidence in Turkey of such a 'backwash' effect from the examinations that mark the end of second-level schooling and entry to the third level system. It is hoped that the research undertaken in this project will help to explain why.

Data was collected by means of questionnaires for pupils and teachers in 10 schools in Turkey and in 13 schools in Ireland. More than 600 pupils in each country participated. The process of back-translation was used in preparing the questionnaires for Turkey in order to improve the reliability of the data. A subset of participating teachers was interviewed in both countries using a selection of the open questions from the questionnaire. In this talk, we will give an overview of the project and discuss initial findings.

7. **Fiacre O Cairbre (NUI Maynooth)**

Title: The positive impact of short story telling in Mathematics Education

In this talk I will make a case for how the telling of short stories can make a major contribution to improving the understanding, awareness and appreciation of mathematics in second level, third level and the general public. A rich source for short stories related to mathematics is the history of mathematics and such stories may include famous characters, practical power, motivation, Irish connections, drama, beauty, word origins and much more. Evidence for the case above arises from many years of third level teaching (including a history of mathematics course), giving school talks and Maths Week events and also conducting a diversity of public events including the annual Hamilton walk, radio and TV shows etc. I will also discuss the positive feedback and some surprising consequences of the short story approach.

8. **Padraig Kirwan (Waterford IT)**

Title: How MathXL/Coursecompass changed my assessments.

Abstract: Over the past 2 years I have used online homeworks and tests linked to a textbook to assess my students. In this talk I will outline how it has changed

- my views on assessment,
- my views on learning outcomes,
- the shape of my end-of-semester exams and
- its impact on retention.

I will also discuss associated changes in timetabling and why my colleagues in chemistry, physics and biology have followed my lead.

9. Shane Dowdall & Peter Morris (Dundalk IT)

Title: Student self-assessment and independent learning in a 1st year mathematics module: identifying and responding to needs and challenges through technology

As lecturers we have to maintain standards and meet learning outcomes for our modules. Many students identify mathematics as a problem area. With limited resources, difficulties arise from increasing student numbers and a more diverse cohort. The aim of this study was, through the use of technology, to enable students to learn independently, reduce mathematical anxiety, and improve self-efficacy and competencies in mathematics.

The approach taken was to introduce mathematics software consisting of visual tutorials and assessments. The initiative enabled students to bridge the gap between their expected and actual level of mathematical competency. The advantages include improved accessibility, alternative teaching style, self-paced tutorials, timely automated feedback and self-assessment for learning.

During the semester, weekly supervised technology-led sessions were offered as part of the Mathematics module to all students enrolled on a 1st year Level 7 Computing programme. Students could retake online assessments with their best result recorded as part of the module's continuous assessment.

This initiative has relevance to lecturers delivering mathematics as a service module and for learning support units. For those interested in introducing a similar initiative we highlight problems encountered and suggest solutions. Our research findings show the aims of the initiative were met successfully.

10. Theresa Bradley and Majid Ghanbari (Limerick IT)

Title: Maximising engagement and knowledge transfer in large classes

Since 1995 survey results confirm anecdotal evidence that student life style was changing: students generally attend class as timetabled but very little time was given to study outside class. In recent years diagnostic tests revealed that first year students had a very poor knowledge and understanding of basic mathematics and therefore had difficulty applying basic mathematical methods in related subjects on their course. Various interventions were introduced to motivate and enhance understanding such as practicals, use of software (Calmat, Maple, Excel) etc.

At present research is being carried out in the use of new technologies to engage and maximise the transfer of knowledge within the classroom: these technologies include classroom response systems and interactive whiteboards.

11. Eabhnat Ní Fhloinn (Dublin City University)

Title: A Review of Mathematics Requirements for Incoming Engineering Undergraduates in Ireland

Engineering honours degree programmes accredited by Engineers Ireland have a minimum mathematics requirement for incoming students of a C3 (at least 55%) in Honours Leaving Certificate mathematics. However, in recent years, increasing diversity in the third-level population has led to the development of a wide variety of different practices to allow students who have not obtained the necessary mathematics grade a second chance to enter into such programmes. These practices range from once-off mathematics examinations offered in August by individual colleges, to summer schools or bridging years to allow students an opportunity to improve their mathematical skills.

Previous research undertaken in the Dublin Institute of Technology has shown that the greatest predictor of successful completion of first year for an engineering undergraduate is their incoming mathematics level. Therefore, in this talk, we review the current initiatives with the aim of establishing the minimum level desirable for new entrants into engineering programmes and hope to open a debate into how best to implement “second-chance” assessment mechanisms, with a view to attracting as many students as possible into engineering programmes, while maintaining necessary standards

10. **Michael Carr (Dublin IT)**

Title: Improving Core Mathematical Skills in Engineering Undergraduates

Many undergraduates enter Third Level with deficiencies in their basic mathematics. Every year a diagnostic test is given to incoming first year students in the Dublin Institute of Technology (DIT). This test consistently reveals problems in many core areas of mathematics. It is difficult to motivate many students to seek help in the Maths Learning Centre to address these problems, and they struggle through several years of engineering carrying a serious handicap of poor core mathematical skills. Some initial testing of Final year students show that students carry these problems with them through their entire undergraduate course.

A pilot project set up a “module” in core mathematics. The course material was basic but with very high pass mark of 90%. Students were allowed to repeat this module as often as they liked until they achieve a pass mark. An automated examination for this module has been developed on WebCT and a bank of questions been created. Initially, this project was piloted as part of the third year Ordinary Degree mathematics module in Mechanical Engineering and proved very successful with 88% of the students achieving a mark of more than 90% in this “module”.

Given the success of this module the pilot project was extended to five programmes doing Ordinary level degrees in Engineering in the DIT, across three different years.

The Diagnostic test was also given to a large sample of Fourth year students, confirming that many fourth students still struggle with basic maths.

Full results and analysis of this extended pilot will be presented, including the results of an online reflective survey and in depth interviews with a selection of the students.

The conference is being sponsored by the National Digital Learning Repository (NDLR) and organised under the auspices of IT Carlow's Teaching and Learning Centre, with additional sponsorship from the Irish Mathematical Society (IMS).



Teaching & Learning Centre



5th Annual Conference in Mathematics and Statistics Service Teaching and Learning 2010

May 24th-25th 2010 – Institute of Technology Carlow

MSSTL10 POSTERS AND CORRESPONDING ABSTRACTS:

1. **Eamon Costello (Dublin City University)**

Title: The Changing Face of Educational Video: Explorations of the Role of Screen-casting in Distance Education of Mathematics for Information Technology

The cost of developing video and the expertise required have fallen rapidly in recent years. Screencasting software for example, which is useful for creating educational video, is now inexpensive or free. This has led to a large increase in use of video screencasts in place of live instruction or to supplement it [1][2]. The teacher provision, and the student use, of such video can be temporally asynchronous. This has advantages over live synchronous streaming video in that learners have more flexibility about when to participate and participants can scale further. However immediate interaction is what is lost in asynchronous situations. The problem remains of how students ask questions and receive feedback in this environment. Are educational videos self-study resources, similar to books, or can they be integrated into curricula as interactive media?

Here experiences with systematically developing educational video are evaluated for distance learners of Mathematics, Statistics and Communications Technology in an undergraduate IT degree. A workflow evolved for the systematic and rapid development of educational video screencasts is outlined. Data from student surveys on the use of this video is presented. Finally, provisional results of using the Google Apps for Education platform show how both the video development cycle, and its integration into online curricula are simplified and made more powerful through Web 2.0 technology.

REFERENCES

- [1] W. Hürst, W. Waizenegger: An overview of different approaches for lecture casting. *Proceedings of IADIS International Conference on Mobile Learning 2006*, July 2006.
[2] J. Copley: Audio and video podcasts of lectures for campus-based students: Production and evaluation of student use. *Innovations in Education and Teaching International*, 2007, 44(4), 387-399.

2. **Damien Raftery & Sharon McDonald (IT Carlow)**

Title: Assessing for learning and quantitative literacy on a first year business quantitative techniques module

In a SIF2-funded *Repositioning Assessment for Learning* project, a primary concern was how to address the challenges of teaching business quantitative techniques in a large lecture environment. Also, the learning outcomes of a traditional module are calculations focused, with students focussing on learning the mathematical steps in producing a numerical answer.

Thus, during the academic year 2009-2010:

- We sought to increase the focus on quantitative literacy (the ability to know when and how to work with numbers in particular contexts, as well as to critically evaluate and communicate the results) by broadening the assessment approach to include elements to promote quantitative literacy, in particular by using written assignments.
- We also sought to encourage meaningful engagement in a large lecture setting, including the piloting of clickers.
- Finally, we piloted the use of online activities and support, such as online quizzes and online presentations.

3. **NDLRfest Poster of the Mathematics and Statistics Service Teaching CoP**

4. **Damien Raftery (IT Carlow)**

Title: - We all need to be *numerati*: fostering quantitative literacy in higher education

Stemming from a reflective review of the literature on quantitative literacy (the ability to know when and how to work with numbers in particular contexts, as well as to critically evaluate and communicate the results), the implications for learning, teaching and assessing first year students in higher education are considered.

Coming to good decisions requires everyone to be comfortable with numbers, to be able to both use and challenge quantitatively-based arguments. Quantitative literacy is a crucial means to interpret the world. Important contexts include citizenship, educational, personal finance, personal health, management and work. When teaching for quantitative literacy, due attention must be given to working in different contexts and establishing connections between them. The focus should be on open-ended authentic problems, requiring students to explore unclear situations, use relevant quantitative techniques, and critically interpret and communicate the results. Students need to be engaged and challenged. Motivation should be aided by using examples that are relevant to students' lives, relate to social justice or are counter-intuitive. To alleviate mathematics anxiety and reduce the calculations burden, technology should be harnessed as appropriate. This will go beyond the vocational aspect of higher education's mission to cultivate *numerati*, quantitatively literate citizens who can understand, judge and act in a world full of numbers.

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