



**BSRLM Day Conference
University of Leeds, London, 11 June 2011**

A. Janet Duffin Memorial Lecture

Cathy Smith will give the Janet Duffin Memorial lecture at 12:00.

"Not knowing and not being too safe": happiness, work and further mathematics

B. Conference Sessions

Georgiou, Ioanna

University of Warwick

I.Georgiou@warwick.ac.uk

Connections between motivational patterns and the social/cultural/historical approach to teaching mathematics

Dweck (1986) defined two motivational patterns, by considering the dichotomy between learning and performance goals. She found that some students are driven by the desire to learn and improve, while others are driven by the desire to perform well, regardless of the depth of their understanding. In fact, students identified with learning goals enjoy challenges, while students identified with performance goals avoid effort. From a different area of mathematics education, authors, including D'Ambrosio (1991), Bishop (1988), and Skovsmose (1994), argued that bringing social/cultural/historical elements into mathematics teaching may increase students' interest, understanding, and allow them relate to mathematics. The present survey, attempts to investigate connections between students' motivational patterns and mathematical beliefs. 100 questionnaires were distributed to upper secondary school (lyceum) students in Cyprus, with questions regarding their beliefs about mathematics, and their attitudes towards mathematical skill, versus improvement with effort. In more detail, questions like: "Is mathematics related to everyday life?", and "Do you believe that you should be learning about the history of mathematics?" will be juxtaposed with questions like: "Do you believe that studying helps you improve in mathematics, or is it a natural skill?", or "Are you more interested in understanding the lesson, or performing well at a test?". This type of juxtaposition may reveal connections between students' motivational patterns and mathematical beliefs. Students' answers are examined in a quantitative sense, as well as having some of their actual words discussed (the students' answers will be translated from Greek).

Goulding, Maria

University of York

mgoulding@hotmail.co.uk

Secondary mathematics teacher education: how does research feature in feedback on observed lessons?

Since 1994 governments in England and Wales have put schools in the driving seat in preparing and assessing teachers. Despite this, the higher education (HE) sector has so far maintained its role as a major provider of teacher training in partnership with schools. HE tutors, who teach and visit students in schools over the course of training, may be expected to provide a research based perspective complementing the more situated perspective of school based mentors.

This session focuses on how research emerges when students receive feedback on their lessons from a HE tutor, who has the opportunity to point up examples of classroom interactions which embody research informed insights. Student teachers may be unaware of these insights because they have not encountered the research or because they have not made the link between their own practice and experience in the classroom and learning done outside the classroom. The observer may foreground or suppress discussion of these insights according to the perceived needs of the student teacher and the constraints of working within national and school frameworks.

Participants will work on data drawn from twenty observed lessons of students on the one year Post Graduate Certificate of Education course in an English University. The data consists of one tutor's informal notes and her formal post lesson feedback written up with the students. These texts will be analysed with the following questions in mind:

Can any research informed insights be identified in either set of data?

What are the differences between what is noted in the informal notes and the formal written feedback?

Which readings could be used to follow up the feedback?

Do the observer's written comments help student teachers to pursue their own enquiries?

How could this feedback be improved?

Hall, Graham

University of Wales, Newport

graham.hall@llandrillo.ac.uk

The use of conversation analysis in identifying creative approaches to mathematical problem solving

Assessment of written answers to mathematical questions can often give limited insight into the thought processes of students. Where solutions are incorrect, this might variously be a result of: misinterpretation of the problem, lack of knowledge and understanding of solution methods, or inaccuracy in applying formulae and algorithms.

Questioning of students in a classroom situation to investigate approaches to problem solving can be difficult. There is a tendency for the teacher to intervene too quickly when a response is not forthcoming, allowing insufficient time for learners to think through the problem and develop their own, perhaps unique, solutions.

Techniques of conversation analysis have been used in an effort to better understand the thought processes of vocational students and adults engaged in a range of mathematical tasks. Participants are asked to provide a commentary during problem solving, in a non-judgemental environment with minimum intervention from the researcher.

Interesting outcomes from the work are: indications of lack of specialised mathematical vocabulary, misuse of standard algorithms which have been learned in a superficial manner without full understanding, and a preference for justification by concrete example rather than through abstract reasoning. Distinct differences in approach to problem solving are observed between participants with *visual or verbal preferred learning styles*.

Hernandez-Martinez, Paul, Williams, Julian, Farnsworth, Valerie

Loughborough University, University of Manchester, University of Leeds

P.A.Hernandez-Martinez@lboro.ac.uk; Julian.Williams@manchester.ac.uk;

V.L.Farnsworth@leeds.ac.uk

Transition to university mathematics: learning, identity and educational practices

In this session we will present some findings of our "Transmaths" project which aimed to understand how 6th form and Further Education students can acquire a mathematical disposition and identity that supports their engagement with mathematics at University.

Williams will draw on case study work with university engineering courses to exemplify how the concepts of boundary crossing, brokering and third spaces can help in understanding the transition to University mathematics.

Hernandez-Martinez will use students' biographical interviews to define the concept of "resilience" from a socio-cultural perspective, and to explain how "resilient" students seem to be able to negotiate successfully their educational capital during transition, allowing them to persist with mathematics.

Farnsworth will report on a case study of a university medicine course based on a Problem-based model of learning. The comparative case highlights practices and aspects of the course that supported students' change of habits, perceptions and beliefs about learning. Implications for school/university practices in relation to mathematics and for the development of learners' mathematical identities will be discussed.

Hosein, Anesa, Harle, Jamie
Liverpool Hope University
hoseina@hope.ac.uk

Students' prior mathematical attainment and confidence in evaluating their performance

This research looks at eighty first year students' ability to evaluate their performance following a mathematics test. The students were from Health Sciences. The research investigates whether three variables: mathematics confidence, GCSE mathematics grade and highest level of prior mathematical attainment (e.g. A level, undergraduate,...) can help predict how students evaluate their performance. Students followed a one semester pre-undergraduate mathematics course before completing the test. Following the test, students were asked to estimate their score as well as evaluate their confidence on several mathematical topics. Students' estimate of their test performance was associated with students' highest level of prior mathematical attainment and their overall mathematics confidence. It was also observed that students with GCSE grades A and C were better at estimating their test score than students with GCSE grade B. These results have implications for how teaching strategies could be optimised for student cohorts with varied mathematics entry qualifications.

Huntley, Ray
University of Gloucestershire
rhuntley@glos.ac.uk

Researching primary trainees' choice of examples - the findings

Trainee teachers' mathematical subject knowledge and subsequent choice of mathematical examples remain a key area for consideration, in the light of the Williams' Review and the Rose review. In this session I will briefly report on the findings of my doctoral research project, based on lesson plans and case study interviews from two successive cohorts of B.Ed. final year students. The data collected and analysed gives some indications of the factors that drive trainees' choices of examples, and these results will be presented in relation to theory already established in this area. Critical discussion and comments are invited from session participants' own expertise in this key aspect of primary teacher education.

Ingram, Jenni
University of Warwick
Jenni.Ingram@warwick.ac.uk

The discursive construction of mathematics

The nature of mathematics, nature of beliefs about mathematics and what it means to be a mathematician has long been a discussion point in mathematics education (Thompson 1984; Boaler, Wiliam & Zevenbergen 2000). My research focuses exclusively on what is said in the classroom during whole class teaching. Using transcripts of whole class teaching from three secondary mathematics teachers, I examine how different types of mathematics are discursively constructed by the teacher and his/her pupils. This ethnomethodological approach uses only the content of the interaction to describe the nature of mathematical activity in that interaction. We cannot directly access the beliefs of teachers and pupils, but an examination of how they talk about mathematics can reveal how mathematics is jointly constructed by a teacher and his/her class.

Jones, Ian
Loughborough University
I.Jones@lboro.ac.uk

Using paired comparisons to assess mathematical ability

Mathematics is seen as easy to assess reliably because exams typically comprise lots of short items that can be marked right or wrong. This has a fragmentary effect on teaching and learning in mathematics classrooms. I present results in which an alternative method to traditional marking, called *paired comparisons*, was used to assess Key Stage 4 mathematics. The paired comparisons method is based on holistic expert judgements of candidates' mathematical abilities, and is therefore potentially better suited than mark schemes to assess open-ended problem-based tasks. The rank orders of scripts generated by paired comparisons had high reliability coefficients and correlated strongly with rank orders generated by traditional marking. These findings suggest paired comparisons offer promise for improving the quality of school mathematics exams and so reducing the negative backwash effect of the current summative assessment system.

Joubert, Marie

University of Bristol

marie.joubert@bristol.ac.uk

Developing a research agenda: mathematics and ICT

There is now a wide research literature concerning the use of technology in the teaching and learning of mathematics. General text books, guidance for teachers, national curricula and other teacher materials almost always include advice and guidance related to the use of technology (ICT) and practitioner journals frequently include accounts of how technology has been used in a particular setting. Both research and practice have commonly framed their understanding of the landscape of 'what is going on out there' in terms of the software or hardware used (e.g. dynamic geometry or handheld technologies) or in terms of the mathematical area addressed (e.g. graphs and functions, geometrical transformations.) This presentation takes a different approach, borrowing the three Grand Challenge themes from the European Network of Excellence, STELLAR, to frame our understanding of the research and practice reported in recent BSRLM informal proceedings and the forthcoming ICTMT10 conference. The three Grand Challenge themes are 1) connecting learners, which is concerned with the issues and questions that arise from the increased connectedness of learners through the use of, for example, the Internet 2) orchestrating learning, which aims to understand the opportunities and challenges for teachers when technology is introduced into their classrooms and 3) contextualizing learning, which focuses on how the use of technology provides new and different learning contexts for teaching and learning. I argue that the use of this Grand Challenge framing will provide a new and different understanding of the current landscape and future challenges for research and practice in the use of technology in mathematics teaching, and the presentation will conclude by considering what a mid-term research agenda might look like for our community.

Lagrange, Jean-baptiste

Reims University

jean-baptiste.lagrange@univ-reims.fr

How do context and theoretical frameworks influence research about classroom use of technology?

How do we appreciate the potential of digital artefacts created by educational research for mathematics teaching/learning? This is certainly a difficult question because, if their potential was clear, these artefacts would disseminate more easily than they actually do. A hypothesis is that, like other research outcomes in our field, their appreciation depends on the context in which these artefacts were designed and experimented, on the theoretical background underpinning their conception and, also that which we are not really able to elucidate, this dependency.

Designing and experimenting digital artefacts, researchers do not necessarily work for direct application into everyday teaching. But it is of importance, both for sharing outcomes within research and for communicating with outside communities, that they progress towards a better understanding of how their theoretical background and the context they are working in, influence their production.

This talk will draw from ReMath, a research project bringing together research teams working in dissimilar contexts and inspired by different theoretical backgrounds. My research team designed and cross-experimented together with an Italian team a DDA, Casyopée and cross-experimented with

another, Cruislet, designed by a Greek team. From this experience, I will show the steps forwards we made towards a better vision of the potential of these artefacts.

Marks, Rachel
King's College London
rachel.marks@kcl.ac.uk

Ability ideology and its consequential practices in primary

This presentation, based on my Ph.D. study, focuses on the *mathematics* unintended and often unnoticed impacts of *ability* on pupils in primary mathematics.

This mixed-methods study explored *ability* in two schools: one where pupils were set from Year 2 for mathematics and one employing mixed-ability teaching except in Year 6. 284 pupils (of which 24 were focal pupils) and 8 teachers in Year 4 (ages 8 - 9) and Year 6 (ages 10 - 11) were followed for a full academic year, exploring the understandings, practices and implications of *ability* in primary mathematics.

The data suggests that *ability* has impacts across the school beyond explicit practices such as setting. In particular, 'bottom-set' pupils are faced with challenging, inappropriate learning environments which potentially inhibit learning. The teaching these pupils receive often draws on kinaesthetic approaches, but these may be unhelpful and reduce access to the mathematics required to increase attainment. Further, the process of between-class *ability*-grouping reduces the teachers' focus to mathematics rather than the whole-child. Overall I argue that the primary school environment is not suited to the *ability* practices of secondary mathematics.

Mendick, Heather
Goldsmiths, University of London
heathermendick@yahoo.co.uk

Error! Not a valid bookmark self-reference.

In this session I want to raise questions about the role of progress within mathematics education. I will look at how progress defines a linear and teleological relationship between the past, present and future. This idea then sets the parameters in which researchers, policymakers and practitioners work in mathematics education, constraining the questions that we ask, the answers that we give and the actions that we take in the present. I will suggest some alternatives to the progressive narrative of past-present-future as perhaps the only way not to answer 'yes' to the question: does mathematics/education make things better?

Osment, Kelly
Swansea Metropolitan University
k.osment@strichardgwyn.co.uk

An assessment of the impact of games on the teaching and learning of mathematics.

This study aimed to examine the impact of games on the teaching and learning of mathematics. It was carried out in a secondary school in South Wales in 2008. Two Year 7 classes were used, the intervention class was taught using games in addition to timetabled classroom resources for twelve weeks whilst the control class was taught using the same resources, but did not use the games. The research adopted an action research case study design which allowed for two cycles of intervention. A pre-intervention analysis of MidYis scores was used as a baseline measurement and a departmental end of topic test was used post-intervention to assess the impact of the games on learning. Analysis of the results showed no significant difference between the classes post-intervention, therefore indicating that, in this case, games did not improve the learning of mathematics. However, the results also suggest that the games were not detrimental to learning either, and thus, as a teaching tool, provide the same quality of learning as more traditional exercises and worksheets. Qualitative data was collected in the form of lesson observations, a teacher diary, questionnaires and interviews with intervention class pupils. Analysis of qualitative data showed that the design of the games and pupils' understanding of how to

access learning opportunities impacted considerably on the success of the game. It also showed that the use of games had a positive effect on the motivation and attitude of some pupils towards their learning in mathematics lessons.

Osmon, Peter
King's College London
peter.osmon@kcl.ac.uk

Paperless classrooms: a networked Tablet PC in front of every child

Paperless classrooms, with networked Tablet PCs in front of every child, could be a reality within a couple of years: iPad clones will be cheap, reliable, easy to use, portable, and perhaps as popular with the children as phone technology. An analysis of costs and reliability shows significant advantages over conventional PC labs. Reports from the United States of interactive student workbooks designed for use in networked classrooms, and combining the roles of Textbook, Exercise-book, Exam-paper, and detailed Progress-record, that render the classrooms paperless, are reviewed. An interactive maths workbook graphical user interface for an iPad-style Tablet is described. These workbook pages look like the squared paper pages of a conventional mathematics exercise book. Two projects at KCL aimed at demonstrating a little of the enhanced learning potential of the interactive workbook compared with traditional pencil and paper are briefly described. The interactive property of the workbook is the basis for potentially enhanced individual learning. Networking all the workbooks for the class under the control of the teacher has the potential to enhance her contribution: automatic recording of the progress of each child eases her administrative burden and leaves more class time for teaching; and from her own workbook she can monitor the work of individuals in her class in real time and see where her help may be needed. Automatic recording of the interactive work of a whole class will produce a flood of data. If researchers will rise to the challenge of formulating good questions, and develop the necessary observation and analysis techniques, there is great potential to improve our understanding of mathematics learning. Successful networked Tablet-workbook equipped mathematics classrooms will not happen overnight. The first requirement may be a prototype to demonstrate and explore the way forward. The development of such a prototype is discussed.

Pope, Sue
Liverpool Hope University
popes@hope.ac.uk

The English assessment regime: how consistency and standards stifle innovation and improved validity for the assessment of mathematics

This paper describes the national assessment regime for mathematics in England for 5 to 16 year olds which is the basis of school accountability. Most of these assessments comprise timed written tests or exams that are designed to assess the statutory national curriculum programmes of study. For pre-16 learners the assessments are developed nationally and teacher assessment is reported alongside test outcomes. There is considerable evidence that teachers are over-reliant on the tests and adjust their assessment to match that of test outcomes. Despite recent changes to the testing regime, many schools still choose to use optional tests at the end of each school year. At age 16 independent commercial organisations (awarding organisations) develop public examinations (GCSEs) in a regulated market place. There is fierce competition between awarding organisations to gain market share. The regulatory system for the development of tests and exams and maintenance of standards is rigorous but restricts innovation and improvements in validity.

Trenholm, Sven
Loughborough University
s.trenholm@lboro.ac.uk

Mathematics Lecturing in the Digital Age

In this study we consider the transformation of tertiary mathematics lecture practice. We undertake a focused examination of the related research with two goals in mind. First, we document this research,

reviewing the findings of key studies and noting that reflective pieces on individual practice as well as surveys are more prevalent than empirical studies. Second, we investigate issues related to the transformation of lecture practice by the emergence of e-lectures. We discuss the latter in terms of claims about the efficiencies offered by new technologies and contrast these with possible disadvantages in terms of student engagement in a community of practice.

The search yielded a total of 43 articles of which 33 were reflective papers and surveys and 10 were empirical studies. The presentation will detail the nature of methodological approaches employed in the current empirical research and present the major themes that emerge. Overall, while student and lecturer satisfaction is clearly documented, the limited empirical evidence shows a negative correlation between e-lecture use and achievement. Findings are discussed in relation to communities of practice in mathematics (Wenger, 2000) and transactional distance (Moore, 1997).

Wilson, Paul

UCP Marjon, Plymouth
pjwilson@marjon.ac.uk

Disposition to mathematical engagement

Successive governments have recognised the importance of promoting a mathematically-engaged society. As a consequence, raising mathematical attainment in schools has been a key target for our educational system for many years. Of course, well-developed mathematical understanding, knowledge and skills are pre-requisites for a numerate society. However, life-long mathematical engagement is not a necessary consequence of mathematical attainment at school. Rather surprisingly perhaps, there is limited evidence of a correlation between mathematical facility and a positive attitude to mathematics. I am interested in exploring how our approaches to teaching mathematics can contribute to a student's life-long disposition to mathematical engagement, with the intention of developing a construct for describing this disposition. Attitude to mathematics is clearly an important factor in this construct and has been a focus for researchers for many years. I will review how engagement in mathematics can be affected by other factors such as needs, beliefs, identities and values. Within this session I hope to tease out the factors which contribute to this construct, drawing on participants' experience and insights.

C. Workshop

Turner, Fay

University of Cambridge
fat21@cam.ac.uk

A workshop on data analysis: coding

This is intended as an interactive workshop. The proposer does not claim any particular expertise in the coding of qualitative data but aims to draw on her experience (and data) to promote dialogue about this process. Transcripts of interviews with teachers and written reflective accounts of teaching will provide data for the workshop. This data came from a completed PhD study of beginning primary school teachers which investigated developments in their mathematical content knowledge. Data analysis carried out in this study made use of the NVivo qualitative data analysis software package. A brief explanation of how this was used will be given in the introduction to the session. Participants will work in small groups to code extracts of this data 'manually' using codes which emerged from the study. This activity will be the stimulus for discussion about issues involved in the coding of qualitative data. The discussion will arise from concerns of participants but may include for example; different coding strategies/ procedures; issues of reliability and validity; the origin of codes (emergent or based on theoretical frameworks) and/or the advantages of qualitative data analysis software packages.

D. Working Groups

Rogers, Leo

University of Oxford
Leo.Rogers@education.ox.ac.uk

History in the mathematics curriculum

The Working Group aims to select, share, trial, evaluate and modify appropriate material in the light of teachers' experience so that together we may discover sensible ways of introducing the "rich historical and cultural roots of mathematics" to our pupils.

This session continues the earlier meetings of the group and will review the outcomes and material from the meeting of the History and Pedagogy of Mathematics group held in Vienna in July, update on recent activities, and introduce plans for a new website about materials aimed at secondary pupils, teachers, and teacher trainers.

Wake, Geoff, Williams, Julian

University of Nottingham, University of Manchester

geoffrey.wake@nottingham.ac.uk; Julian.Williams@manchester.ac.uk

From research to practice: making an impact?

This working group aims to explore ways in which our research might make an impact by informing practice at classroom, institutional and/or systemic level. The organisers are currently grappling with this issue as part of an ESRC funded follow-on project that aims to synthesise the results of three studies that have researched transitions of students through phases of education. It is the intention to critique a number of means of dissemination drawing on concrete examples being used by the working group organisers, but also hopefully from the working group participants who are invited to come ready to share ideas and examples of their own.

Part of the workshop will be devoted to more general discussion of how as a research community we might be strategic in ensuring that our evidence base informs both policy and practice. BSRLM itself plays a central role in our own community, but can it, or other key organisations, assist us in making an impact?

These issues are of timely importance given (i) the performativity demands made of us as researchers at this time, and (ii) policy-making that currently seems to be informed more by anecdote than systematic and rigorous research.