



B•S•R•L•M

**British Society for Research
into Learning Mathematics**



**BSRLM Day Conference
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A. CONFERENCE SESSIONS

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Is my research a research? Looking at mathematics education research methods as a Derrida reader

Since Derrida's philosophy, which could be named as post-structuralism, has challenged the history of Metaphysics, it has challenged the concept of research included in such a tradition. Therefore it is sensible to ask about the possibility of doing research supported by Derrida's philosophy. Through this path I must locate which are the struggles between Derrida's philosophy and research methods. In this paper I attempt to draw on my empirical experience doing research in the mathematics education field.

Bibby, Tamara
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Learning not to be interested in mathematics: the case of one primary school pupil

This paper presents an early analysis of data from the ESRC funded 'Children's learner - identities in mathematics at KS2' project. It considers the case of 'Shanhrul', a child who moved to the UK and joined the school during Y4 and his changing relationships with mathematics throughout Y5 and into Y6. Using Bion's (2004, 1993) ideas about knowledge, thinking and learning, I will offer an analysis that explores Shanhrul's shifting mathematical identities and make some tentative conclusions about the effects of teaching in performative cultures. I will hope to make time for discussion at the end.

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Is the tangent line tangible? Students' intuitive ideas about tangent lines

In this session I will report on a doctoral study nearing completion which focuses on students' intuitive thinking about tangent lines. The study explores the ways in which students who have studied tangents in school in three different contexts: (i) perceive properties that are not generally valid as defining conditions of the concept and (ii) create new, often not-valid, properties out of the fusion of information from across the different contexts. (E.g. in the context of Euclidean and Analytic Geometry the tangent line has only one common point with the curve. In the context of Calculus however this is not the case.) Data were collected through a questionnaire administered to 182 first year mathematics undergraduates in Greece at the very beginning of their studies. In the session I will present examples of several properties students create.

Borthwick, Alison and Micky Harcourt-Heath
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Calculation strategies used by Year 5 children

When working on mathematical questions, children choose from a range of calculation strategies. Although the NNS advises that different methods are taught for each of the four operations, this research shows that children

often find it difficult to choose the most efficient and effective in order to answer the question. In this session we wish to share and discuss the findings from a sample of 995 Year 5 children who were given questions in July 2006 from a QCA paper. This will include looking at a range of strategies used by them.

Brown, Margaret, Peter Brown and Tamara Bibby
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"I would rather die": Attitudes of 16 year-olds towards their future participation in mathematics

This paper discusses how students' attitudes towards mathematics influence their decision whether to continue to AS-level and beyond, and relates both attitudes and inclination to participate with a number of variables, including predicted GCSE grade. The data are from questionnaire responses to open and multiple-choice questions from nearly 2000 GCSE students in 17 varied schools and formed part of the GCSE two-tier pilot evaluation study (Stobart, Bibby & Goldstein, 2005). It supports some results in the recent QCA study (Matthews & Pepper, 2005).

Brown, Roger
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Graphing and graphing calculators in examinations, trends over time

The graphing calculator has been required in several countries' end of secondary school 'high stakes' mathematics examinations. The graphing calculator's greatest impact is likely to have been on questions requiring a student response incorporating graphing. This presentation will provide an overview of the changes in the question design used by question writers for different examination authorities; trends across these authorities will be described.

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Probing pupils' geometrical reasoning: questions arising from the Longitudinal Proof Project

In Küchemann and Hoyles' Longitudinal Proof Project (1999-2004), pupils experienced difficulties with a geometry item, G1. I report on my investigation of Year 9 pupils' responses to the two versions of question G1. I compare responses to the two versions of the question, from written tests and interview transcripts. This raises questions about the identification of particular aspects of mathematical reasoning from types of written response.

Cowley, Richard
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Personal identity in the mathematics classroom

I am in the process of reanalysing transcripts from some previous research and reinterpreting the data in the light of literature relating learning to identity formation. In the original project (1992), 13 and 14 year old girls were using various LOGO-based activities and struggling to understand fundamental relationships between the lengths of sides of shapes composed of straight lines and right-angles only. Originally, I saw pupils' social priorities interacting with but separate from the process of learning. Now I think their social priorities and interaction with mathematics might be seen as a single process of identity formation. My plan is to offer a ten minute presentation aimed at stimulating a 20 minute discussion of theoretical and methodological issues.

Daniels, Karen
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Home school mathematics

My research interest is to try to identify factors that bridge the gap between what Chapman (2003) describes as 'informal' home mathematics and the 'abstract symbolism' of school mathematics. I will be comparing theoretical positions and draw on the work of Bishop (1988), Meira & Lins (2006) and Lave & Wenger (1991) to examine the mathematical conflict that I believe occurs when young children start school. My intention for the presentation is to attempt to clarify consistency between the theoretical framework, methodology and my hypothesis prior to carrying out a pilot study and to invite discussion of these issues.

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Trainees' reflections on Mlevel research experience: genuine reflection or QTS-speak?

In this session, I will present some data from Mlevel assignments, written by Primary PGCE trainees, across two consecutive years. As part of their 6000 word assignment, trainees are expected to write a brief summary about the impact of the experience of undertaking a small-scale classroom-based research project on their personal and professional development as a teacher. The amount of writing about this aspect of their development varies from approximately 500 words to 1500 words. An initial evaluation suggests that the quality of reflection in this writing, whatever the quantity, is indicative of the final grade awarded. Findings from a further analysis, using categories developed from a grounded method of coding, will be presented for discussion. In particular, the question is raised about whether the quality of reflection is necessarily genuine or whether it reflects the trainee's ability to utilise the language associated with the Standards for Qualified Teacher Status.

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A systematic review on the use of ICT in teaching algebra

This session will outline the process and findings of the latest Mathematics Education systematic review conducted by the York review group for the TDA, under the management of the evidence informed policy and practice information service (EPPI) based at the Institute of Education. The review group was looking for evidence of the use of different ICTs in the development of understanding in algebra. It narrowed down its initial question to focus on functions and their representations, giving 15 papers for the in depth analysis. A synthesis of findings will be presented, together with a discussion of implications for the use of electronic whiteboards and more personal technology such as graphics calculators. There will also be some discussion of the EPPI methods and general features of method and its reporting in the included papers.

Hodgen, Jeremy
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Summative assessment by teachers: The particular case of mathematics

There is an increasing interest in the role of teachers in the assessment of mathematics. At the same time, many mathematics teachers distrust and dislike the assessment of coursework at GCSE. In this paper, I will draw on an ongoing research project examining processes of teachers' summative judgements at Year 8. This study involves 6 mathematics teachers and 6 English teachers. By comparing the two subjects, I will examine the particular difficulties faced by mathematics teachers when tackling issues of reliability, validity and comparability of their assessments. I will suggest approaches to increasing teachers' (and other's) trust in their own and other teachers' judgements and to improving the quality of teachers' assessment.

Kanes, Clive
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Intermediate knowledge domains for teaching mathematics: some critical thoughts

This paper offers some thoughts on the difficulty of pinning down the kind of knowledge of mathematics a teacher of mathematics needs in order to teach effectively. Up to about the last 20 years it was assumed by many that knowledge of teaching and learning applied to knowledge of mathematics were (together with other informing curriculum knowledge) the key to effective mathematics teaching. However, for reasons to do with challenges to the status of professionalism of the teacher and uncertainty as to nature of the domain of knowledge which can be said to be the particular province of the expert (mathematics) teacher, new kinds of intermediate knowledge among these elements were drawn. For instance, Shulman's pedagogic content knowledge, Ball's mathematics for teaching, the recent work of Adler and Davis (2005), and so on. These kinds of knowledge offer a potential focus points for the empowerment of the mathematics teacher profession in particular and carve out space for mathematics education community to occupy on its own, internally generated and regulated, terms. This paper offers a critical assessment of these developments and tries to give sense around the conceptual and paradigmatic issues continuing work of this kind may need to address. The format for session will be a presentation of some minutes followed by interaction among those present.

Küchemann, Dietmar
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Which came first, ‘angle at the centre’ or the ‘alternate segment’ theorem?

In this session I will look at the responses of a group of four Year 10 students as they attempt to solve a GCSE question involving circle theorems. Their lack of familiarity with the theorems and lack of experience of tackling such tasks throw light on the complexity of the system of circle theorems, and on the demands of constructing proof arguments and of working in a group.

Little, Chris and Keith Jones
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Contexts for pure mathematics: an analysis of A-level mathematics papers

While there has been some research into the use of context in mathematics assessments pre-16, little work exists on the role of context in post-16 mathematics. In the specifications for A- and AS-level mathematics, assessment schemes are required to include questions that test candidates’ abilities to apply mathematical models to real-life contexts, and to translate real-life contexts into mathematics. For some components of A-level mathematics, such as statistics, mechanics and decision mathematics, contextualised questions could be said to occur ‘naturally’. This paper explores the use of context in pure mathematics questions and, through this, suggests a framework for analysis that encompasses issues such as authenticity, accessibility and fitness for purpose.

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Coding strategic behaviour in Mathematical Problem Solving

The crucial role that strategic behaviour plays in achieving mathematical problem-solving success has been well documented by research into learning mathematics. This session will deal with transcripts of clinical interviews with pupils of Year 4, 5, and 6 while working on mathematical word problems and with issues of identifying and coding the various strategies pupils employ. A coding scheme that consists of cognitive, self-regulatory, resource management and task strategies allocated at each stage of mathematical problem solving will be presented as a tool for interview analysis. Participants will be invited to use this scheme to work on transcripts of clinical interviews and issues of inter-rater reliability will be raised. The session will close with a brief demonstration of how to import the transcripts in N-Vivo and the potentials of the software in coding and ultimately delineating students’ strategic behaviour.

Mendick ,Heather¹, Marie-Pierre Moreau¹ and Debbie Epstein²
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Looking for mathematics

In this session we will explore the question: ‘What is maths?’. This question bubbled up in our research on mathematics and popular culture. We started with a survey of Year 10 students and second year undergraduates. An innocent looking question on this survey asked people to list a couple of examples of where they could remember seeing maths or mathematicians in popular culture. However, as well as some perhaps predictable references to things like A Beautiful Mind and The Curious Incident of the Dog in the Night-Time, there were many more surprising or controversial entries, including game shows like Deal or No Deal and even action movies like Mission Impossible. We then carried out group interviews with some of these same students once they reached Year 11 of school or the third year of their degree, in which we could follow up some of these issues. We provoked them to talk about what maths is by showing them clips from television programmes and movies and also by showing them examples of Sudoku puzzles. In this presentation we look at their answers. In particular, we identify the way that learners overwhelmingly define mathematics in relation to the presence or absence of number and we explore what alternative ideas they had about what makes something maths.

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Variations on a theme: introducing new representations of fraction into two KS3 classrooms

Two teachers in different schools participated in a research project looking at the introduction of technology based representations of mathematical objects into classrooms. Each used the same software, incorporating a novel representation of fraction as a dynamic functional relationship between values on two number lines. They planned together, discussing the characteristics of the software, the educational goals and modes of use as well as sharing resources and ideas about student tasks. In practice, the lessons each taught were very different and the ways in which students made use of the software also differed substantially. In the session we will discuss influences on the nature of teachers' incorporation of new elements into their pedagogic practice, including consideration of explicit and implicit theoretical frameworks and of institutional and cultural contexts.

Pepperell, Sandy
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Studying the developing mathematics teaching practices of primary teachers from PGCE training into the first year of teaching

This paper reports ongoing work from a study into the developing mathematics teaching practices of primary teachers. I am following the progress of a small group as they move from a university based PGCE course until the end of their NQT year. My broad interest is in the impact of ITE on future teaching and my particular focus is in how we might theorise the transition of mathematics teaching knowledge from university course into school practice. I aim to discuss this relating to some early evidence from one NQT's experiences.

Singleton, Damon Vosper
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Pupil's characterisations of 'mathematical' - What elements do they take from the classroom?

A report of the preliminary findings of a study intended to explore year seven pupils' perceptions of the characteristic 'mathematical'. Following a protocol based on the methods of Personal Construct Psychology, participants ranked a set of paintings in terms of 'how mathematical' they felt the paintings were, and were then asked to explain their decisions. The exercise was repeated with a set of five activities. Participants were seen to respond with a not inconsiderable uniformity to the tasks, although the individual explanations of what makes an activity 'mathematical' provided some intriguing insights which indicate possible further exploration. Implications of this finding in terms of future research approaches are discussed with the aim of understanding what determines whether an activity is described as 'mathematical'.

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A conceptualisation of "proof" and "proving" in school mathematics: Implications for instruction

The concept of proof and the corresponding activity of proving are vehicles to deep learning in mathematics, for they allow pupils to explore why things work, thus providing a solid basis for conceptual understanding. Accordingly, there is growing appreciation of the idea that proof and proving should become central to all pupils' mathematical experiences throughout the school years. Yet, it is still unclear what proof and proving mean in school mathematics, especially in the primary grades, and what is the role of teachers in cultivating proof and proving among their pupils. In this presentation, I will present research that takes a step toward addressing these issues. Specifically, I will propose a conceptualisation for the meaning of proof and proving in school mathematics, and I will use classroom episodes to elaborate key elements of the conceptualisation and illustrate its applicability even in the primary grades. Also, I will present a framework that derives from this conceptualisation and that I will use as a tool to analyse the classroom episodes and discuss aspects of the teachers' role in cultivating proof and proving among their pupils.

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Issues in identifying children with specific arithmetic difficulties through standardised testing: a critical discussion of different cases

The paper discusses issues related to the assessment of children's difficulties in arithmetic and in particular to the identification of children with extreme difficulties who are regarded as potentially having dyscalculia. Taking a critical approach to the construct and the tools for identifying such difficulties, we present cases of 7 year old children with very different approaches to a standardised computer-based test. The special purpose screening software is designed to diagnose dyscalculia in children aged 6 to 14 years and to distinguish this condition from other mathematical disabilities and other issues that can affect performance in mathematics. We discuss the issues that the cases raise and reflect on how such tests can inform those who use them and whether they enable or not the identification of children's specific difficulties in mathematics learning.

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Super-Ordinate communities of practice: crossing boundaries, 'transfer' and identity

In this session I plan to discuss a theoretical construct – super-ordinate or overarching communities of practice – which I have developed with Cristina Frade and Selma Brage as a contribution to the discussion of transfer. More specifically, we seek to reconceptualise what, within the school context, might be thought of in Bernstein's terms as the transfer of knowledge between two insulated vertical discourses. I will describe how this theoretical construct was developed from interdisciplinary work carried out by secondary mathematics and science teachers in Brasil. I will tell some stories about the learning of two fifteen year-old students and use these to ground the ideas presented. I will conclude with some theoretical suggestions of how we might develop and make use of the concept of super-ordinate or overarching communities of practice.

B. CONFERENCE WORKING GROUPS

Sutherland, Rosamund¹ and Colin Matthews²

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NCETM/BSRLM Working Group: Developing a framework for researching CPD in mathematics

The aims of the research projects instigated by the NCETM are:

- a) to investigate “what works” in terms of professional development in mathematics;
- b) to promote and develop a culture of PD where action research is at the heart of good professional practice, by encouraging teachers to become active researchers and supporting them in doing so; and
- c) to develop communities of practice as a result of the research.

The aim of this group is to work on a framework for researching CPD in mathematics. We shall also discuss outline plans for a review of literature in the area.

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ITE Mathematics Working Group (continued from previous conference session)

Addressing the New Standards

Following the successful bid to the TDA to continue funding the ITeMaths project, groups have been established to develop material to support both new and experienced tutors. BSRLM, AMET, ATM and MA are active partners in this initiative with AMET playing a lead role. In order to draw on the wide experience of the mathematics ITE community the ITeMaths working group provides a forum for sharing experiences and identifying ways forward.

Following work at the recent ITeMaths writing weekend, it was suggested that follow-up discussions might take place on ‘Addressing the New Standards’ through the BSRLM ITE mathematics working group. To what extent do the new standards have significant implications for ITE tutors? The New Standards can be taken as a context for addressing questions such as: How do ITE tutors deal with changes in government agendas? How do we assess student teachers’ professional skills? We would welcome discussion about what is happening in your institution with your courses and the impact that the new standards may have on both the development of professional skills and attributes and their assessment.

If you cannot attend the session, please send your thoughts and experiences to Sue Pope: SAPope@ucsm.ac.uk

C. CONFERENCE PLENARY SESSION

Dr Val Gillies

London South Bank University, Families and Social Capital ESRC Research Group

Parents and Education: exploring classed experiences of school involvement

This presentation draws on empirical research to examine how parents’ experiences of school involvement are profoundly classed. It will show how middle class parents’ active and visible investment in their children academic attainment is underpinned by access to particular social, cultural and economic resources. For working class parents however, strong boundaries between home and school can be crucial in managing the experiences of failure, disappointment and limited control associated with disadvantage. In short the presentation challenges mainstream assumptions about successful childrearing, arguing that the personal and cultural values underpinning parenting are necessarily grounded in social and economic conditions.