

## BSRLM Day Conference St. Martin's College, Lancaster: 19<sup>th</sup> November 2005

### Speaker

**Frank Eade**, Manchester Metropolitan University

Trialing Realistic Mathematics Education (RME) in English Secondary Schools

Time: 1 hour

The three year project, funded by the Gatsby Foundation, is trialing RME at KS3 in a range of secondary schools. The address will explore the development of our understanding of the pedagogy of RME as both a theoretical paradigm and as a practical approach to teaching. The project has allowed the tutors and teachers involved to recognise the power of realistic situations to both instigate and sustain mathematical development. As well as sharing insights into the pedagogy of RME the address will also explore how teachers' attitudes and practices have developed and how pupils' attainment and inclinations have changed. Comparisons will be highlighted between the RME approach to teaching and approaches encouraged by the NNS.

The address will utilise video extracts, survey and test results and examples of RME classroom activities.

### Working group sessions

**Steve Lerman**, South Bank University

**Andy Noyes**, Nottingham University

Mathematics Education and Policy

Time: 1½ hours

**Abstract:** This second meeting of the working group will be divided into three sections. In the first of these Sue Sanders will talk about her experiences of trying to influence policy through subject organisations. She will reflect on recent successes and make suggestions as to what the community in general, and this working group in particular, might do to engage with the policy makers. The second section of the session will be a discussion building upon the comments made by Sue. In the third and final section Heather Mendick will present a paper about students' transition to AS level maths which includes a clear policy focus.

**Sue Pope**, St. Martin's College, Lancaster

**Keith Jones**, Southampton University

Induction for secondary mathematics ITE tutors

Time: 1 hour

**Abstract:** BSRLM along with AMET, ATM and MA have been funded by the TTA to produce an induction pack for new ITE tutors in mathematics it is to include 'the best advice which experienced subject specialist trainers in ITT in England can produce' (TTA, 2003) and one of the areas to be addressed is research. BSRLM has agreed to support the development of material in the area of research.

This working group session is an opportunity to review what has been achieved thus far and to identify priorities for the remaining funds.

You are encouraged to review the materials at [www.itemaths.org.uk](http://www.itemaths.org.uk) before joining this working group.

## Conference sessions

**Sandra Pendlington**

The balance of power in the mathematics classroom

**Cancelled**

Time: 1 hour; Age: primary; Topic: pupil learning; teacher education

~~**Abstract:** Some psychologists see power as a dimension of self-esteem – having power over ones situation maintains high self esteem. Within the classroom the teacher can be seen to have the power to 'direct learners' and be a 'holder of knowledge'. The learners are 'the directed' and 'the receivers of knowledge'. During the presentation I will explore whether these views of the roles of teachers and learners are necessary and unavoidable or in need of change. I will present data from a teaching project done with low achieving 10 year olds, who presented as feeling 'powerless' when learning mathematics at the start of the project. Post project interviews indicated a change in this position. Analysis indicated some possible reasons for this change. Audience discussion will form part of the presentation.~~

**Richard Barwell**, University of Bristol

Exploring a discursive perspective on mathematical explanation

Time: 1 hour; Age: primary; Topic: language

**Abstract:** The nature and role of explanation in mathematics classrooms has been investigated from a variety of different perspectives. In this session, I introduce an approach derived from discursive psychology. This approach sees explaining as a situated, discursive practice and seeks to understand how explanations are locally accomplished in interaction. Analysis seeks to uncover the structure of explanations from the participants' (rather than analysts') perspective. By working on examples of mathematics classroom interaction, I invite participants to explore with me how this perspective could be useful for research in this area

**Fay Turner**, University of Cambridge, Faculty of Education

I wouldn't do it that way: Trainee Teachers' feelings of restrictions in their mathematics teaching

Time: 1 hour; Age: primary, teachers; Topic: teacher education

**Abstract:** The session will take the form of a presentation and discussion of some initial findings from a longitudinal study into the development of mathematics teaching in beginning teachers. The study focuses on the way in which teachers draw on their knowledge of mathematics and mathematics pedagogy in their planning and teaching. A framework known as the 'Knowledge Quartet' forms the basis for observation and discussion of the mathematics-related knowledge of these teachers.

The first year, of this four year study, entailed the observation of eleven trainee teachers teaching a mathematics lesson during their final placement. Lessons were analysed in terms of the 'Knowledge Quartet' and discussion with the trainees focused on issues that arose within the four dimensions. One theme that arose from these discussions was, that when questioned about why they taught in certain ways, trainees responded that if they had no restrictions they would have done things differently. It has been suggested that once in school and faced with the practicalities of the classroom,

the understandings of good practice developed in training become more 'realistic' and that teachers suppress their former 'theoretical' beliefs in favour of more pragmatic concerns. This did not seem to be the case for the beginning teachers observed in this study, rather, they seemed to hold firm to their beliefs about good practice but felt they had to conform to the curriculum and teaching methods they thought to be the policy of the mentor, school or government. There appeared to be a fairly widespread feeling that if allowed to teach in the way they thought to be most appropriate they 'wouldn't do it that way', but would have used practices more in line with their own beliefs about teaching mathematics.

**Chris Kyriacou and Maria Goulding**, University of York, Department of Educational Studies

A systematic review of raising pupil motivation in KS4 maths

Time: 1 hour; Age: secondary; Topic: pupil learning

**Abstract:** This paper reports the findings of a systematic review of the literature looking at the following question: What strategies can raise motivational effort in Key Stage 4 mathematics amongst pupils in the mid-below-average to average range of mathematical attainment in England? The review has identified four key areas: (i) grouping; (ii) pupil identity; (iii) teaching for engagement; and (iv) innovative methods.

**Andreas Koukkoufis and Julian Williams**, School of Education, The University of Manchester

Teaching integer operations in the primary school: a semiotic analysis

Time:  $\frac{1}{2}$  hour; Age: primary; Topic: pupil learning; language

**Abstract:** This study attempts to better understand how children may learn integer operations (after the approach of Linchevski & Williams) through Radford's semiotic analysis of the means of objectification. It involves two versions of the instruction based on Linchevski and Williams' approach which are being contrasted and students' (semiotic) processes in the two versions are being compared. Example data from the pilot study will be examined using Radford's categories and participants will be invited to explore some data for themselves.

**Sue Pope and Kathryn Fox**, St. Martin's College, Lancaster

Gifted and Talented Mathematicians

Time:  $\frac{1}{2}$  hour; Age: secondary; Topic: pupil learning

**Abstract:** Part of the provision for members of the government funded National Academy for Gifted and Talented Youth (NAGTY) includes two week summer schools hosted by various higher education institutions across the country. In this paper we explore the responses of young people on a mathematics summer school for 11-16 year olds held at Lancaster University and tutored by mathematics educators. Two main areas are considered: the students' attitudes towards being labelled as 'gifted and talented' and their mathematical experiences during the summer school.

**Patricia George**, University of Leeds

Mediating Mathematics: Rules and Other Things in Caribbean Classrooms

Time:  $\frac{1}{2}$  hour; Age: secondary; Topic: pupil learning

**Abstract:** This presentation seeks to explore the association, if any, amongst mediational means, cultural capital, and students' approaches to mathematics. Excerpts of some

students' attempt at working an Algebra problem will be presented, and this will then be related to student background, school type, their feelings about mathematics, and self-reports of mathematics performance and behaviour in class. The data for this presentation comes from an ongoing PhD study which is looking into Caribbean students' views of mathematics and factors that may be involved in the formation of those views. I look forward to a lively debate and your ideas/perspectives will be most welcome.

**Maria Pampaka and Julian Williams**, School of Education, University of Manchester  
What do teachers believe about problem solving in their maths classrooms?

Time:  $\frac{1}{2}$  hour; Age: teachers; Topic:

**Abstract:** Based on a quantitative study of teachers attitudes, a model was constructed that shows how teachers knowledge and beliefs about problem solving relate to their perception of their own practice of problem solving in the classroom. In particular, significant factors were, (i) on the positive side their knowledge and attitudes, and (ii) on the negative side their reported teaching difficulties. Some interesting differences between Cyprus and UK were also noted.

**Asghari, A.; Inglis, M.; & Mejia-Ramos, J. P.**, University of Warwick  
On the minimality of mathematical definitions

Time:  $\frac{1}{2}$  hour; Age: secondary; Tertiary; Higher Education; Topic: curriculum

**Abstract:** In this session we aim to provoke a discussion on the nature of mathematical definitions. In particular we are interested in the so-called criterion of minimality which has assumed a position of some importance in some parts of the mathematics education literature. However, there are several examples of mathematical definitions in everyday use that do not seem to adhere to this criterion. We will present some examples and start a discussion about why this difference between practice and theory exists.

**Nigel Calder**, University of Waikato, New Zealand  
**Tony Brown, Una Handley and Sue Darby**, Manchester Metropolitan University  
Forming conjectures within a spreadsheet environment

Time:  $\frac{1}{2}$  hour; Age: primary, teachers; Topic: pupil learning

**Abstract:** This paper is concerned with how both children and pre-service teaching students engage in mathematical investigation using spreadsheets. It considers how this pedagogical medium might evoke particular dialogue, and hence fashion the conjectures that are produced. It also considers how these conjectures are then tested. More broadly it considers how mathematical notions are altered as a result of being accessed through this medium and how this might enrich understandings achieved through pencil and paper environments.

**Sue Gifford**, Roehampton University  
Dyscalculia: issues of existence, identification and prevention

Time: 1 hour; Age: pre-school; primary; Topic: curriculum, assessment, pupil learning

**Abstract:** Dyscalculia or an arithmetic learning disability is acknowledged by the DfES. However, while the PNS recommends the 'Dyscalculia screener' computer test, the DfES says there is no assessment tool available to teachers. There is growing consensus that identification is problematic, and that a focus on particular mathematics difficulties is

more effective. However, research evidence links mathematics difficulties with a particular brain area and identifies difficulties with number processing, relating to the ways numerical information may be represented by young children. Issues therefore arise relating to the concept of a mathematical learning disability, to the nature of evidence, to identification and to the ways in which teachers help children form number concepts. Implications for possible intervention will be discussed in relation to Wave Three initiatives and early prevention of mathematics difficulties.

**Julian Williams**, University of Manchester, School of Education  
Mathematics assessment for learning and teaching: an overview

Time:  $\frac{1}{2}$  hour; Age: primary, secondary; Topic: assessment

**Abstract:** Children's mathematical performance and diagnosis of pupils' strengths and weaknesses in mathematics were investigated. This project, by the University of Manchester with Hodder Murray, researched and developed a new set of standardised diagnostic assessment materials with a view to reporting and informing teachers, pupils and parents in ways that can improve learning and teaching. Data was collected in February and March 2005 and responses analysed from a nationally representative sample of 12591 pupils aged 4-14 (minimum 1015 and maximum 1390 per school year group) from 120 schools in England and Wales. The sample was stratified by geography, school type/status and pupils attainment. The tasks were assembled into tests and the scores produced by the sample for each test were then age-standardised and scores were matched against National Curriculum levels. A Rasch model was used to vertically equate and explore performance levels between school year groups. Age-standardised scores enabled comparisons to be made between maturation and curriculum-related effects and differences were found. Pupils' mathematics progression through the school years was also explored and one challenging finding was that mathematics progression slows with age. It was found that at age five, mathematics progression was around one year per level and this decreased gradually to two years per level at age eight onwards. We will present and discuss some of these findings.

**Ray Huntley**, University of Gloucestershire, Cheltenham

An evaluation of primary trainees' views of the subject knowledge audit process

Time:  $\frac{1}{2}$  hour; Age: primary; teachers; Topic: teacher education

**Abstract:** This paper reports on the findings of a small study exploring primary trainee teachers' experiences and perceptions of the mathematical subject knowledge audit carried out during their training. Many trainees described the exercise as a form-filling waste of time, although the institution is required to gather evidence of trainees developing their subject knowledge for inspection amongst other purposes. Through a combination of questionnaire responses and written reflective comments gathered from across the ITT programmes, some views appeared to be commonly held by trainees about the nature and purpose of the audit process. This paper examines the data with a view to modifying the mathematics subject knowledge audit for future cohorts of trainees.

**Alice Hansen, Liz Jackson, St. Martin's College, Lancaster**

To what extent do trainee teachers feel prepared to use software in their mathematics teaching?

Time:  $\frac{1}{2}$  hour; Age: primary, higher education, teachers; Topic: curriculum; computers/IT; teacher education

**Abstract:** Over recent years, the DfES have directed teachers to incorporate Information and Communications Technology (ICT) across the curriculum. In-service teachers have all been encouraged to attend New Opportunities Fund training (at an appropriate cost to the government of £450 per teacher) (Fox, 2000) and Initial Teacher Training institutions have been required to address the QTS standards (DfEE, 1998, TTA, 2002).

In the light of this, ICT has been a particular focus of our Undergraduate and Postgraduate Primary Mathematics Curriculum courses over the last five years. The aim of our study was to review trainees' perceptions regarding how well they felt their college experience within mathematics had prepared them to use software in their primary mathematics teaching.

**Alexandra Petridou and Julian Williams, School of Education, University of Manchester**

Identifying sources of invalidity in a mathematics test from the point of view of misfitting examinees

Time:  $\frac{1}{2}$  hour; Age: primary; Topic: assessment

**Abstract:** This study identified and interviewed children (and their teachers) whose test responses suggested that their responses misfit the traditional measurement model (e.g. they got difficult questions right and/or easy questions wrong) in an attempt to identify sources of invalidity in test-measurement. Previous literature suggests that personal (e.g. anxiety, motivation) administration (e.g. cheating) and curriculum effects might be responsible. We will present emerging patterns that suggest that different explanations apply to children at different levels of attainment, and that classroom administration is responsible for some degree of misfit.

**Alison Clark-Jeavons, The Mathematics Centre, University of Chichester, Bognor Regis Campus**

**CANCELLED**

~~To drag or not to drag: Teachers' emergent uses of Dynamic Geometry~~

~~Time:  $\frac{1}{2}$  hour; Age: secondary; teachers; Topic: pupil learning; computers/IT; teacher education~~

~~**Abstract:** This session reports on ongoing PhD research that explores the nature of secondary mathematics teachers' integration of dynamic geometry software into their classroom practice. The study involved nine secondary teachers and one graduate trainee, eight of whom were being introduced to the software, tracking them over a fifteen month period which ended in October 2005. A design research methodology was adopted, involving semi structured interviews, workshop sessions, classroom observations, questionnaires and journals. Some early data analysis will be presented, in which the nature of the dynamic geometry software activities created by the teachers is contrasted with their professed mathematical ideologies.~~

**M. Kerem Karaagac**, University of Leeds, School of Education

The Tension between Teacher Beliefs and Teacher Practice: The Impact of the Institutional Context.

Time:  $\frac{1}{2}$  hour; Age: teachers; Topic: teacher education

**Abstract:** This paper presents part of my research on teachers' beliefs and practices in state schools and privately owned exam preparation schools in Turkey. Extracts from an interview with a teacher who uses a technique that he disapproves of will be reported, revealing a tension between the teacher's beliefs and his classroom practice. Drawing on this, I will discuss the significance of the institutional context in understanding teachers' classroom practices.

**Julie Ryan**, Faculty of Education, Liverpool John Moores University

Profiling the Subject Matter Knowledge of Pre-Service Teachers

Time:  $\frac{1}{2}$  hour; Age: tertiary; teachers; Topic: teacher education

**Abstract:** This study reports the development of an assessment instrument that provides a profile of the mathematical attainment of pre-service primary teachers across the curriculum. The profile includes the errors made and misconceptions held by the pre-service teachers. The study will also report how trainees used a personalised diagnostic map to approach their own subject knowledge development.

**Una Hanley**, Manchester Metropolitan University

Between paradigms

Time:  $\frac{1}{2}$  hour; Age: not stated; Topic: Teacher education

**Abstract:** With the introduction of any new initiative into the mathematics classroom, there is normally an assumption that it will produce visible and measurable effects on teaching approaches and pupil progress. Yet, there is a body of research that undermines such optimism, drawing attention to a series of mitigating factors, for example the deep-seated nature of teacher's practices, their implicit or stated beliefs and values, and their lack of detailed awareness of how they perform in the classroom. Rather than make associative links between these factors and the success of the initiative, our intention here is to examine the ways in which teachers are trying to interpret what a new scheme requires of them and how in turn, engaging with it causes them to re-describe both their pedagogic understanding and classroom practices relationally to earlier practices. Employing data from a project in progress, we seek to examine how some teachers grapple with this attempted shift from one teaching paradigm to another by focusing on how a key term, discussion, serves to anchor the teachers' conceptions of their practice during this transition. This shift of paradigm, however, is seen in the context of governments seeking strategies to enhance performance in international comparisons. A theoretical framework derived from some neo-Marxist writers supports a thesis that such moves may work to the detriment of local needs.

**Linda Akitt**, Tadcaster Grammar School

**John Monaghan** and **Louise Sheryn**, University of Leeds

Students setting up their own business - a mathematical activity

Time:  $\frac{1}{2}$  hour; Age: secondary; Topic: curriculum; pupil learning

**Abstract:** How does a plumber determine what his/her hourly rate should be, or a hairdresser determine how much to charge for a haircut? If they go to a bank for a loan, then the manager will want some assurances that the rates charged will keep the business

a float. We describe the work some Year 9 and 10 students did as they engaged in these activities and set up their own virtual business. We discuss how the task could be improved and some implications for functional mathematics.