BSRLM DAY CONFERENCE
UNIVERSITY OF LEEDS, 12TH JUNE 2004
ABSTRACTS

MORNING SESSIONS

10.30 –11.30: PAPER PRESENTATIONS

Learning Communities in Mathematics: developing communities of inquiry in mathematics learning, teaching and teaching development (1.16)

Barbara Jaworski, Agder University College, Norway

I will introduce a new research project on which we have just embarked with funding from the Norwegian Research Council. In this project, didacticians in mathematics education at Agder University College will form partnerships with schools and teachers to explore the development of mathematics teaching based on inquiry at a number of levels:
a. inquiry in mathematics in classroom learning
b. inquiry in designing mathematics teaching
c. inquiry in the research process; which includes a scrutiny of research processes themselves and of relationships in community building within the project.
It is very early days within this project, so I shall talk largely about theoretical perspectives and research design, with just some early recognition of outcomes and issues related to school recruitment and planning of workshops.

Winging it!": Control, structure and freedom in mathematics teaching (G11)

Hugh Kidd, King's College, London

Ideas such as "standards", "effective teaching" and "school inspection" shape educational practice. In particular they shape what is taken as good and bad classroom teaching of mathematics. Good teaching is associated with clearly articulated learning objectives and with thought-out, readily communicated lesson plans. Such teaching in turn shapes what is perceived to be good learning of mathematics. Unclear objectives and inadequate planning are usually taken as an indication of poor teaching resulting in poor learning. In this paper I explore relationships between control, structure and freedom in mathematics teaching and unsettle an assumed good/bad duality. I invite participants to explore with me the subtle shaping of 'teaching', 'learning' and 'mathematics' by attempts to control and improve them.

The exercise as mathematical object: dimensions of possible variation in practice (1.17)

Anne Watson, University of Oxford and John Mason, Open University

By treating collections of questions as mathematical objects, that is ordered sets containing individual questions as elements, we gain insight into the potential role of exercises in learning mathematics. We use the notion of 'dimensions of possible variation', derived from Ference Marton, to discuss some exercises. There are implications for the design of question sets, for pedagogical decisions in the use of question sets, and for reflective questioning by learners.

10.30 – 12.00: WORKING GROUPS

ITT Trainer's Induction Pack – research (G03)

Sue Pope, University College of St Martin's and Keith Jones, Southampton University

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 support material in the area of research. This working group is intended to allow as many people with the appropriate expertise who wish to contribute to be able to do so. The areas we envisage covering include:
How research supports effective practice; Identification of useful research sources - what is known about the subject?; Contemporary research issues; Developing a research proposal; Identification of gaps in research; Formulating a hypothesis; Literature Reviews; Writing an abstract; Source of funds for research projects; Planning and executing research projects; Collecting, Collating and Managing Data; Time Management; Getting published; PhD options, routes, supervisors, etc.
Do come along with your ideas about these or any other areas related to research for ITE tutors in order that we can produce the sort of support material we wish had been available when we started the job....

Mathematics Education and Applied Linguistics Working Group (G02)

Richard Barwell, University of Bristol

The ideas of the linguistic philosopher Paul Grice have been influential in the sociolinguistic study of everyday interaction. He was interested in analytic problems arising from the use of logical operators such as 'and', 'or' and 'if'. To tackle these problems he took as his starting point the idea that conversation is a co-operative activity. His thinking led him to identify four maxims which guide participants' interpretations of interaction: quantity (be as informative as necessary); quality (be truthful); relation (be relevant); and manner (avoid obscurity and ambiguity). This session offers the opportunity to explore these ideas and to consider their potential relevance to research and teaching in mathematics classrooms. An example of mathematics classroom interaction will be provided, but participants could also bring short transcripts of their own.

The Adrian Smith Enquiry into Post – 14 Mathematics Education (G15)

Ros Sutherland, University of Bristol

Within this working group we shall discuss the substantive issues raised within the Smith Inquiry and decide on a possible course of action for BSRLM. In particular we shall consider Recommendation 6.11 which relates to the role of research in mathematics education.

11.30 –12.00: PAPER PRESENTATIONS

Student teachers research into 'realistic mathematics' in the context of activity days for girls (1.16)

Corinne Angier and Hilary Povey, Sheffield Hallam University

This paper will report on a project designed to engage some initial teacher education students in research. The students are in their first year of a two year route into mathematics teaching. In the context of a mathematics education module they have drawn on ideas from the Realistic Mathematic education tradition from the Netherlands to develop and run four 'engineering mathematics days'. A group of schools from a disadvantaged area in Northern England have been funded to send groups of 50 girls to attend the activity days. The European fund is for initiatives which might raise girls' participation in higher education in general and in engineering subjects in particular. The student teachers have used a range of practical activities to engage the girls in mathematical thinking. We will describe the project and present some initial analysis from the students' research reports.

Differences in Time Given to Students to do mathematics in two different types of schools (G11)

Mehmet Kerem Karaagaç, University of Leeds

In this paper, I will look at the structure of mathematics lessons in Turkish state schools and private colleges. Although both have same structure, the time given to student engagement with examples differs. In private colleges, time allowed for students engagement with problems is markedly less than in state schools. I will explore educational implications of this contrast.

GCSE effects of the CAME project (1.17)

Michael Shayer and Mundher Adhami, King's College London

The long term (after 3 years) effects of the CAME Project will be briefly presented to focus this question: Should the practice of maths teaching now evolve to integrate 'teaching for thinking' with 'teaching for maths'?

12.00 -13.00: PLENARY

The mathematics of human motion

Tom Roper, University of Leeds

Room 1.17

AFTERNOON SESSIONS

14.00-15.00: PAPER PRESENTATIONS

Year 8 students' interpretations and evaluations of other students' written explanation (1.17)

Dietmar Küchemann and Celia Hoyles, Institute of Education, University of London

In the Longitudinal Proof Project we amassed a rich bank of students' written explanations on a range of algebra and geometry tasks. In this session we report on work with a group of four Year 8 students who were shown a variety of such explanations and asked to interpret and evaluate them. We will focus on what proved to be a highly challenging divisibility task ("Is 100! exactly divisible by 31?").

Mathematical Induction used even by 6 year-olds?What does this imply for their learning? (1.16)

Les Smith, Lancaster University

Mathematical Induction is often thought of as part of a mathematician's equipment once he/she has grown up. Piaget's work, on the other hand, is often thought of as charting children's development of logic. Yet deductive logic, scientific induction, and mathematical induction are three different things, and Piaget did publish (unknown here) work on children's use of mathematical induction. The work reported here on 5 to 7 year-olds provides more mathematical detail, based on Piaget's groundwork, of how quite young children, as part of their cognitive development do use 'in some intellectually honest way' mathematical induction as part of the growth of their mathematical thinking. This has three main implications for the actual teaching of mathematics in Primary schools, one about an important type of reasoning at KS1 which is not covered by our National Curriculum, another about necessary knowledge in children's reasoning, and a third about task design in formative assessment.

Scaffolding, abstraction, and emergent goals (G03)

Mehmet Fatih Ozmantar, University of Leeds

This study examines the role of scaffolding in the achievement of a mathematical abstraction by focusing on emergent goals. An activity-theoretic approach to abstraction in context is taken. The examination is carried out with regard to the verbal protocols of two 17-year-old students working on a task related to the graphs of f(|x|). This examination suggests that abstraction is likely to be achieved through satisfaction of several emergent goals. These emergent goals are observed to be contingent upon four parameters: the scaffolder's interventions, students, tasks, and prior emergent goals. Dynamic and dialectical interrelationships amongst these parameters are discussed with regard to the students' verbal protocols.

Have daily mathematics lessons enhanced pupil confidence and competence: a systematic review

Maria Goulding and Chris Kyriacou, Dept. Educational Studies, University of York **(GO2)**

A systematic review group for mathematics education funded by the DfES was established at the University of York in October 2003. Its first review question 'Has the daily mathematics lesson, in the context of the National Numeracy Strategy for primary schools in England, helped pupils to develop confidence and competence in early mathematics?' This session will describe the processes and dilemmas involved in conducting a systematic review, and report early findings.

Mathematics Teachers' Learning about and incorporation of ICT into classroom practices (G11)

Cosette Crisan, Newman College of Higher Education, Birmingham (14.00 –14.30)

In this session I report on a study of secondary school mathematics teachers' use of ICT . The study adds new dimensions to understanding teachers' use of ICT by treating the teaching of mathematics and ICT use as interwoven aspects of a teacher's practice. The analysis of the data collected using a case study research strategy yielded a number of salient factors, of both contextual and personal nature, which were identified as key to the integration of ICT into mathematics teaching. A framework which conceptualises teachers' learning about ICT and teachers' incorporation of ICT in their teaching of mathematics will be advanced with the aim of contributing to a better understanding of the pedagogy of teaching mathematics with ICT.

Thinking Together - Using ICT to develop collaborative talk in mathematics (G11)

Frank Monaghan, Open University (14.30 –15.00)

The session will report on ongoing research taking place in primary schools as part of the OU's 'Thinking Together' project, led by Neil Mercer, Karen Litleton and Rupert Wegerif (www.thinkingtogether.org.uk). In this project we are using SMILE software with Y5/6 pupils to develop collaborative talk. The project is a joint venture between the OU and SMILE and as well as providing valuable research data on language in the mathematics classroom it is also planned to develop a set of CPD materials for teachers.

Linking School Mathematics to Out-of-school Mathematical Activities (G15)

John Monaghan, University of Leeds (14.00-14.30)

I have just started an ESRC project on the above theme. I would like to use this BSRLM session to outline my research questions and how I propose to answer these. I look forward to a two-way exchange of ideas (I promise not to talk for more than half of the time). Details of this project are available on http://www.education.leeds.ac.uk/research/mathseducation/out_of_school_maths.htm

For those without access to the web: this research will investigate ways that mathematics, done in secondary mathematics classrooms, can be linked to or undertaken in a manner similar to how it might be approached in out-of-school activities. Aims include:

* to understand the problems in linking school mathematics to out-of-school activities;
* to understand how learning activities can be designed so that links between school mathematics and out-of-school activities are made manifest;
* to understand the role of the teacher and of resources/tools in making links between school mathematics and out-of-school mathematical activities;
* to develop a set of measures to evaluate the learning outcomes of designed learning activities.

Parents and mathematics in the primary school (G15)

Margaret Sangster, Sheffield Hallam University (14.30 –15.00)

This was a small scale study of the way a community primary school promoted knowledge about the taught mathematics of the National Numeracy Strategy with parents whose children were entering their final year (10 -11 year olds). A range of strategies were explored and evaluated.

15.00-16.00: PAPER PRESENTATIONS

Evaluating a mathematics/citizenship project (G02)

Geoff Tennant, University of Leicester

Funded by the DfES Innovations Unit, a group of 7 people are currently looking to write, refine, trial, evaluate and disseminate materials on the mathematics / citizenship interface, aiming initially at year 8 across the attainment range. This session will briefly look at the background of the project and some of the materials written to date, but will particularly focus on the issue of evaluation: how can we get behind the immediate 'feel good' of an approach different to normal, in order to discover what children have really learnt and, crucially, the extent to which their world-view has been expanded and attitudes changed? A number of models will be presented, with suggestions invited from participants.

Quantities measured by ratios and their possible impact on the mathematics curriculum (1.17)

Terezinha Nunes, Peter Bryant, Ursula Pretzlik, & Jane Hurry, Oxford Brookes University

Researchers have recognised for a long time that there are two types of quantities, extensive and intensive quantities, and that their mathematical representation differs. Extensive quantities can be represented by natural numbers – e.g., 5 marbles, 2 centimetres. Teachers of young children spend considerable effort in promoting pupils' number concepts in the context of extensive quantities. No comparable effort is invested in promoting pupils' understanding of intensive quantities and their representation. Intensive quantities are represented by ratios (e.g., 2 spoons of sugar for 1 glass of water) or fractions (e.g., a mixture of 1/3 water and 2/3 orange squash). There are basic logical relations which could be explored in the classroom: e.g., one variable is directly proportional to the intensive quantity (e.g., the more sugar, the sweeter the taste) whereas the other variable is inversely proportional to it (the more water, the less sweet the taste). This session will present research that describes the performance of pupils in years 3 to 5 on a variety of intensive quantities problems and two teaching experiments that documented the difficulties pupils have in learning about intensive quantities. Time will be allowed for a discussion on how quantities measured by ratios and fractions could be used in the curriculum.

Using the Plenary to Develop Reflective and Critical Thinking and to Enhance Metacognitive Awareness: Student Teachers' Perceptions and School-based Experiences of the Daily Mathematics Lesson Plenary (G11)

Fiona Lawton, St. Martin's College

The National Numeracy Strategy is "firmly established" (Ofsted, HMI 333, 2001: 1) in primary schools and has "had some influence in virtually all primary classrooms in England". (OISE/UT, 2003: 3). However the plenary of the 3-part Daily Mathematics Lesson is perceived as the "weakest" element. (Ofsted, HMI 1973, 2003) In an attempt to 'unpick' the purpose of the plenary, I researched student teachers' perceptions and experiences of it in school. Student teachers were exposed to and encouraged to engage in plenaries whose focus was to support reflective and critical thinking at the end of each of their mathematics specialism sessions. Evidence of the impact of the college-based plenaries on the students' own learning and on their practice in school was sought. In the session, I will share my findings and encourage delegates to reflect upon and share their perceptions of the purpose of the plenary.

No more difference, please (G15)

Tim Rowland, University of Cambridge (15.00 – 15.30)

For more than 30 years, UK Early Years discourse has referred to 'subtraction as difference' in contrast to 'subtraction as take away' (see, e.g. the Teaching Programme for Year 1 in the National Numeracy Framework). My unease with this use of 'difference' has been nothing more than irritation until recently. An offshoot of a study of videotapes of trainee primary school teachers' lessons has been clearer thinking (on my part) about the rationale for my objection to this use of 'difference'. I shall explain what it is in this short technical paper, and plea for a change in the way UK practitioners refer to this aspect of subtraction.

Sum and Difference Problems at Key Stage 2 (G15)

Hilary Evens and Jenny Houssart, The Open University (15.30 –16.00)

Abstract: This session will look at how 11 year-olds approached two questions about the sum and difference of two numbers. We will consider methods for answering these questions as well as possible difficulties and incorrect answers. Finally we will look at different ways of posing such questions and how this might influence children's responses.

Mathematical beliefs of trainee teachers during the first year of higher education (1.16)

Ray Huntley, Anglia Polytechnic University (15.00 –15.30)

Trainee teachers bring various backgrounds in terms of their mathematical views. Prior learning experiences help them develop beliefs about the nature of mathematics and how it should be taught and learned, which help shape the nature of their training experience. This paper explores the nature of those beliefs and how they are influenced during the first year of training, in which trainees study two mathematics modules and undergo a period of teaching practice. Using ethnographic methods a cohort of trainees in one institution were surveyed about their initial mathematical beliefs. The results of the study indicate evidence of both change and stability in beliefs of the group, and stated intentions for teaching mathematics are challenged by school demands to meet national criteria for pupil performance

Mathematical reasoning and students beliefs (1.16)

Lovisa Sumpter, Department of Mathematics, Umeå University, Sweden (15.30 –16.00)

Earlier research by Lithner (2000) indicates that students in problematic situations tend to rely on mathematically superficial experiences, instead of relevant mathematical concepts. In a study (Bergqvist et al, 2003) similar to Lithner (2000), focusing on upper secondary school students, we asked *What makes students succeed or fail in a problematic situation?* The problematic situations were described by using a four step reasoning structure and the argumentation concerning the strategy choice and the conclusion was classified. Out of seven students, six chose their strategies on only or mainly surface property considerations, focusing on algorithms. When failing to carry out the chosen algorithm, two main approaches was found: to stop work, or deciding to change to another algorithm chosen from a 'toolbox' of possible alternatives, all made on surface considerations. This new reasoning type was one of the results from this study. In an ongoing study, I look at the factors behind different types of reasoning. The general question is *How do beliefs affect reasoning?*. I investigate what beliefs influences the students during the problem solving sessions; affecting the students reasoning in these problematic situations. A preliminary result is that there is a connection with identified beliefs that seem to have a strong influence.

The influence of lecturers privileging different aspects of derivative on students' conceptions (G03)

Erhan Bingolbali, University of Leeds (15.00 –15.30)

This paper explores the influences of university lecturers privileging of different aspects of the derivative, on calculus courses for mechanical engineering and mathematics undergraduate students, on these students developing conceptions of the derivative. The data are based on interviews with four mathematics and two physics lecturers, observations of calculus courses and students calculus course notes. The results suggest, with regard to the two groups of students, that lecturers: privilege different aspects of the derivative; provide different types of examples; set different questions on examination questions; and perceive the two departments as having distinct mathematical goals and aims. These differences influence students developing conceptions of the derivative. Students performance on test items suggest that mechanical engineering students develop- a proclivity for rate of change aspects of the derivative whilst mathematics students develop a proclivity for tangent-oriented aspects of the derivative.

Approaches to investigating word problems in the primary school (G03)

John Butlin, University of Central England (15.30 –16.00)

This session reports on pilot activities carried out with small groups of primary children with the aim of enabling them to engage deeply with addition and subtraction word problems. Approaches involved include sorting problems and mental imagery.