

BSRLM Day Conference at Birmingham, 11 November 2006

Conference sessions

1- Al-Murani, Thabit

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The realistic research problems of a mathematics intervention project: teachers' awareness of dimensions of variation

Mathematics education interventions are often beset by contextual and implementational problems that are seen as barriers to uniformity and credibility. In this paper I discuss how consideration for these methodological problems informed the design of a realistic study that embraces them as factors that can increase pragmatic validity. The DVP intervention utilises Martons' theory of Dimensions of Variation to explore how deliberate and systematic variation can be used to raise awareness in teaching and learning situations.

2- Barmby, Patrick & Harries, Tony

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What does multiplication look like: exploring representations with pupils

One of the big ideas that KS2 pupils work on in mathematics is that of multiplication and division. It would seem that often the way in which the idea is approached is through skip counting, learning tables and then learning algorithms for calculation. This is quite different to the approach to addition and subtraction which makes extensive use of the number line. We have been exploring with pupils possible ways in which multiplication could be represented visually. We will report on some preliminary thoughts from the pupils.

3- Bills, Liz & Rowland, Tim

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Examples in mathematics teaching and learning – the student teacher's task

Examples are an integral part of mathematics as a discipline, and in particular of the teaching and learning processes. Teachers use examples as part of exposition and traditional 'exercises', in designing tasks and intervening in students' work, in planned and unplanned situations. They may also, more or less consciously, work with learners on generating examples as part of the learning process. In this session we would like to engage participants in constructing a framework for the knowledge, understanding and awarenesses that a teacher might demonstrate in making use of examples in their teaching. We will attempt this by considering several extracts of data from classroom teaching episodes (both primary and secondary) and conversations with student teachers as well as drawing on a range of theoretical ideas. The plan is to make this a very participative session.

4- Gilmore, Camilla

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Profiles of understanding and profiles of development in early arithmetic

Children's knowledge of maths is made up of many components (e.g. conceptual understanding, procedural skill, factual knowledge) and is therefore difficult to capture with a single measure. Profiles of understanding map children's performance across tasks and can

reveal differences among children in the relationship between components of mathematical skill. As an example, I will present a re-analysis of studies examining children's conceptual and procedural knowledge of addition and subtraction. Across several studies there are similar subgroups of children with particular profiles of understanding. These subgroups may represent different routes to the development of arithmetic knowledge and so it may be important to consider profiles of development as well as profiles of understanding. I will finish by discussing a proposed longitudinal study.

5- Griffiths, Rose

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Young children counting at home

This small-scale study sent a film crew to twelve families with children under five and asked them to show us some of the things they did to help their children learn to count, to use in a DVD for other parents. The film clips provide examples of children aged 11 months to 4 years 11 months, engaged in counting with a parent, sibling or on their own. What did the parents see as important? How did they support their children's learning? And what can teachers learn from this?

6- Hardy, Tansy

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Participation and performance: Keys to confident learning in mathematics?

This session will be an exploration of both what is often named 'identity' and of what it means to be confident in learning maths. Some models of self-image and individuality can produce restricted understandings of the experience of many learners and teachers of mathematics (Henriques et al. 1984). I will discuss the notion of 'subjectivity' and consider ways in which it offers a better analytical frame.

I use data and reflections from an analysis of teacher guidance video material together with extracts from interviews with practising and pre-service student teachers to explore the discursive practices of teachers and children in exemplar mathematics lessons, and the effects of this teaching. I aim to shake up constructs of a 'good learner' or 'confident' learner of mathematics and discuss new understandings that are generated. The key theme of being willing and able to participate in mathematics classrooms in ways that are seen as valid was highlighted through this research and will be offered for discussion.

Henriques, J., Hollway, W., Urwin, C., Venn, C., Walkerdine, V. (1984/1998) *Changing the Subject: Psychology, Social Regulation and Subjectivity*. London: Routledge

7- Inglis, Matthew & Mejia-Ramos, Pablo

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What type of arguments do mathematicians find persuasive?

Harel and Sowder (1998) have proposed the "proof schemes" framework for categorising the factors which affect whether or not students find an argument convincing and persuasive.

They suggested that the goal of instruction is clear: "to gradually refine current students' proof schemes toward the proof scheme shared and practised by contemporary mathematicians".

However, there is scant *empirical* evidence for what this proof scheme actually is.

In this session we will report a research study which looked at how persuasive mathematicians found three different mathematical arguments. The arguments were of different types and were taken from various sources. We will ask the audience to discuss how persuasive they found the arguments, and, after presenting the empirical results, will initiate a discussion about the pedagogical implications of our findings.

8- Dietmar Küchemann
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Observations on the development of structural reasoning in a four-phase teaching sequence

In this session we discuss fifteen Year 10 students' written responses to a homework task about the sum of consecutive numbers, and their further responses to the same task in a follow-up lesson. The task asks students to make observations about the sum and to explain why they think these are true, thereby giving students the opportunity to engage in structural reasoning. The teaching sequence was in four phases which allowed students to make, share and develop their observations and reasoning, and we found a clear improvement in the quality of students' responses. This suggests that limitations in students' reasoning may stem at least in part from a lack of familiarity with the nature of mathematical reasoning and that they can benefit from sharing their ideas.

9- Lacefield, William O.
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Methods of connecting mathematics to communication in the primary classroom

Effective communication is a key to meaningful mathematics learning. Session participants will explore a rationale for integrating communication and mathematics in the primary curriculum, focusing on the importance of shared experience, the necessity of building mathematical knowledge and skills, and the nurturing of positive dispositions toward literacy and numeracy. Vignettes from beloved children's books will serve as frameworks for ideas and discussion.

10- Mason, John
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Supporting & promoting continuing professional development in mathematics teaching

I will present current thinking and seek advice about how the NCETM website can provide not only a 'framework for professional development' but also a useful and dynamically evolving source and resource for working on teaching mathematics: in short, a Wiki for Maths Education, currently called PedMaPedia.

11- Petridou, Alexandra, Pampaka, Marie, Williams, Julian & Wo, Lawrence
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Developmental assessment of measurement performance in KS2

The purpose of this study is to describe a developmental map of pupils' measurement performance in KS2 by using data from a large-scale assessment project in the UK. The map was constructed by using Rasch measurement methodology on test data from a sample of 6296 pupils in the UK. Specifically, we have used the Partial Credit model from the Rasch-family of models. This model enabled us to plot item difficulty and pupils' ability/development on the same scale and, additionally, the most significant common errors and misunderstandings that were observed alongside this empirical hierarchy. We interpreted the scale from the analysis as a hierarchy of four levels of measurement performance. Our empirical developmental sequence confirmed the National Numeracy Strategy's hierarchy as expected (since the test items used were written to assess the National Curriculum hierarchy as it is taught and assessed here in England) but contradicted it in some ways which we find very interesting and therefore discuss further in the paper/presentation.

12- Pratt, Nick and Woods, Peggy
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Understanding problem-solving: PGCE students' experiences of mathematical problem-solving in primary schools

Discussion about the nature and role of mathematical problem solving (MPS) has been ongoing for at least 150 years. The current incarnation of the National Curriculum, and the National Numeracy Strategy through which it is taught in English schools, have discrete sections on 'Problem Solving'. As tutors working in ITT we set about answering the question: 'how, in practice, do our PGCE students experience this MPS curriculum on their programme and what perspectives do they take with them into their first post?' Here, we report on the outcomes of a small scale study in this respect with particular reference to: how 14 PGCE students understand MPS; how involvement in the project itself influenced their thinking; the implications these findings have for the way in which we should approach MPS in teacher education.

13- Stuart Rowlands
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A Historical introduction to mechanics

There are very few laws and principles in mechanics, yet internationally, cross-culturally and independent of age or 'ability' students have found them very difficult to understand and apply. The biggest difficulty is the concept of force – the basic interaction variable in mechanics – and how to represent force as two components. This session reports on the results of a teaching initiative that aimed to overcome these difficulties through an historical approach.

14- Watson, Anne
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Towards classifying qualities of questions and prompts in mathematics classrooms

This session will take the form of a research workshop.

I have been trying to make fine distinctions between the types of questions and prompts teachers use both in whole class and 'going round the room' sequences. The teachers are secondary teachers working in schools which are explicitly trying to make a difference to previously low achieving students at KS3. In analysing their utterances, and the mathematical activity afforded, I have found Van Hiele, Bloom at al., Biggs & Collis, Watson & Mason all to be of some help, but none of these capture fully the subtle mathematical differences I am observing. In this session I shall present my initial thoughts about this, and I hope to get permission to present an excerpt of video so participants can work on 'real' data.

15- Wilson, Paul
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The introduction of the Key Stage 3 National Strategy: its effect on Y8 pupils' affective responses to mathematics

Before the implementation of the KS3 National Strategy there was concern that the teaching approaches recommended for the Strategy would have a negative impact on pupils' affective responses to mathematics. The attitudes items from the first TIMSS study were used on one group of Y8 pupils the year before the implementation of the Strategy and on another group

the year after. These results were compared with each other and with the TIMSS UK results. The items were used again with another sample of Y8 students two years later. In this session we will review the results of this project and possible implications.

16- Witt, Marcus

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Do different mathematical operations involve different components of the working memory model?

Children of 9 and 10 years of age were given a range of working memory and mathematical measures in a bid to unravel the complicated relationship between these two. The results suggest that different components of the working memory model (Baddeley and Hitch, 1974) may be involved in different mathematical operations. The findings are discussed in terms of an increased understanding of the role of working memory in children's acquisition of arithmetical skills and possible educational implications.

The session will comprise a presentation of the findings from this study and a chance for questions and discussion at the end.

Working Group

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ITE Mathematics

Many institutions are introducing accreditation at M level for their one year PGCE course. Following discussions at the AMET conference, it was requested that follow-up discussions could take place through the BSRLM ITE mathematics working group. There are significant implications for ITE tutors, not least how beginning teachers can be supported in developing the academic skills necessary for successful completion of M level work at this early stage of their career.