

SHORT COMMUNICATIONS (& POSTER PRESENTATIONS)

Mary Barnes & Gaye Williams, University of Melbourne

"Magical" moments in mathematics: insights into the process of coming to know

Students in a senior mathematics classroom were videotaped, and some were later interviewed, as they worked collaboratively on challenging problems. The paper's title comes from a remark by one student about what is sometimes called the "Aha!" experience. We present examples of "magical" moments, and conclude with some hypotheses about why such moments appear to happen fairly frequently in this particular classroom.

George Booker, Griffith University—Nathan

Number sense vs number skills: children's use and interpretation of mathematics in the upper primary school

This paper reports on research which investigated classroom contexts and activities that might promote the development of mathematics as problem-focussed and sense-making activity. Situations were presented which were judged likely to foster the communication of mathematical ideas, provide processes which might initiate and guide the growth of problem-centred learning, and bring about changes in student's mathematical thinking from a procedural and answer dominated focus into one in which making sense of, about and with mathematics come to the fore.

Gillian Boulton-Lewis, Tom Cooper, Bill Atweh, H Pillay & Lynn Wilss, Queensland University of Technology

A cognitive perspective on the transition from arithmetic to algebra

This paper is a discussion of development of algebra knowledge, a mathematical sequence for learning complex equations, strategies used to teach early algebra, the understanding of a sample of 7th grade students of arithmetic and prealgebra, the strategies they used and the implications for teaching algebra.

Coralie Daniel & John Curran, University of Otago

A profile of top achievers in a primary school mathematics problem solving scheme

A survey of the top 114 Form 1 achievers in the New Zealand 1994 Problem Challenge competition indicated that these students came from a range of economic and educational backgrounds; were found in most types of schools; enjoyed problem solving and challenging maths more than their teachers thought they did; were competent readers; had relatively wide interests; and were cooperative, enthusiastic, and thoughtful in the classroom but did not exhibit noticeable confidence or the desire to work independently.

Freda Goodall, Victoria University of Wellington

Mathematics education in New Zealand

By overseas standards our mathematics education results are unsatisfactory. (IEA 1987, Second International Mathematics Survey 1991). Research over the past fifty years points to the weakness being due to the dearth of qualified mathematics teachers in both primary and secondary schools (Werry B, 1980; Goodall F G, 1993). In order to help teachers and give them a tool so they may diagnose a student's weakness and strength in mathematics the researcher has created individualised diagnostic tests in mathematics which range in an orderly progression from 7 years to 14 years.

Evan Harris, Australian Catholic University—McAuley

Constructing initial algebraic understanding: a methodology

Many studies into the development of initial algebraic understanding have used a methodology that consisted of testing large groups of students. This paper presents a proposed methodology to be used as part of a study which is exploring how students construct initial algebraic understanding. The in-depth analysis of students' thinking is intended to complement the findings of such large scale research projects. The methodology employs a naturalistic inquiry in which the case study approach is used.

Georgina Herbert, Deakin University—Geelong

Assessment of young children in mathematics

The educational climate in Australia is increasingly concerned with, and driven by, issues of accountability and results or *student outcomes*. My investigation into the assessment of lower primary children in mathematics seeks to gain a picture of assessment practices that are in use, and to explore the ideas and influences that have shaped teachers' decisions in this area. During this session I will discuss my research plan and the early stages of the project and seek comments and discussion from participants.

Ruth Hubbard, Queensland University of Technology

The tasks we give students and their impact on learning

This paper is a wish list of aspects of a topic I'd like investigated. The topic is the use of large numbers of repetitive exercises at all levels of mathematics instruction. Why are they so widespread? Are they essential for learning? Do they improve conceptual understanding? What do they achieve? Do they hinder understanding? What effect do they have on attitude to and feelings about maths. Do they distort the view of what maths is? Do they motivate students to use maths outside the classroom? Finally, can we find other activities and demonstrate that they are more effective at achieving our goals

Anthony Jones, La Trobe University

Young children graphing with technology: producing and understanding

Computer technology has given primary school students access to powerful graphical tools. Some mathematics curricula now encourage student use of spreadsheets and other graphical software. This paper examines one primary teacher's attempts to provide her grade 1 and 2 students with experiences in collecting, recording and graphing data using a spreadsheet program.

W T Kaleva, Monash University

Secondary teacher beliefs and practices about mathematics in the PNG context

Official Papua New Guinea (PNG) Government education policies encourage a "community oriented and culturally based" education and curriculum. This paper reports on the research which examined Papua New Guinea secondary teacher beliefs about various aspects of mathematics and culture. The research shows that even though teachers' expressed beliefs are clearly in line with government policies on the need for a culturally based curriculum, these beliefs are not necessarily translated into classroom practice.

Francis Kari, Monash University

Bridging mathematical cultures for adult distance learners: a case study concerning beliefs from Papua New Guinea

This paper describes some of the results of a survey conducted with mathematics students who are enrolled in the matriculation programme offered by the University of Papua New Guinea Institute of Distance and Continuing Education. The particular issue discussed in this paper concerns the existence of mathematical ideas in home cultures, and whether or not these ideas are rationally related to formal mathematics learning situations.

Sergiy Klymchuk, University of Waikato

A comparative analysis of mathematical courses taught to university economics students in the former USSR and New Zealand

This paper discusses some advantages and disadvantages of 5 aspects of the teaching and learning of mathematics courses for university economics students in the former USSR and NZ. The aspects are: curricula, professional development, assessment, language, ethics and evaluation of the lecturing. The author spent 16 years teaching mathematics to university economics students in Ukraine, visited universities in Eastern Europe, spent sabbatical at the University of Waikato, and is now researching effective teaching in such courses.

Tom Lowrie, Charles Sturt University

The use of imagery in primary school mathematics: a case study

Visual imagery in thought and memory has been viewed from a variety of perspectives in education. In this paper the view is taken that a subject is more likely to use visual means in information processing if they are unfamiliar with a task and have no symbolic procedures readily available to handle the task. During three years the types of imagery evoked by primary school children were examined. It was found that different types of imagery serve different purposes for students solving mathematics problems.

Pramote Markshoe, Naresuan University, Thailand

Strategies in solving mathematics problems of the ninth-grade students in the Lower Northern Region of Thailand

This study investigated the computation strategies in solving mathematics problems of grade 9 students in five provinces of the lower Northern region of Thailand. Four hundred students in 15 public secondary schools were selected for the study. A subjective test composed of 10 verbal problems adapted from EMQ test, a video-taped recorder, and interviews were employed to gather the data. The findings were: 14.95 percent of the students preferred to use definable strategy, 47.31 percent preferred to use propertied strategy, 37.37 percent preferred to use definable and propertied strategy, and 0.37 percent preferred to use independent strategy.

Beth Marr, Royal Melbourne Institute of Technology

It's not what you do, it's the way that they view it - differences between adult learners in mathematics/numeracy classes.

This presentation will explore the differences observed in TAFE adult mathematics/numeracy learners. Research aimed at studying differences in mathematical talk generated by a variety of learning activities, has instead revealed differences more dependent on the individual learner's view of mathematics, learning and their own self perception, than on the style of mathematical activity. Characteristics of the learners' participation tended to remain consistent through problem solving and discussion in groups and pairs, writing exercises, individual practice worksheets and hands on experiences.

Colleen McMurchy-Pilkington, Auckland College of Education

Maori students and pedagogical practices in mathematics classes implications for all maths teachers

Maori women teacher trainees in this study recall their schooling experiences and relate how the pedagogical practices contradict the socialisation of their home and preferred way of learning. This study suggests, in line with Walkerdine (1989), that the pedagogical and social practices of teachers contribute to the positioning of women, particularly Maori women, as not mathematically competent or confident.

Ramaiya Naidu, Te Kauwhata College

Ways that graphics calculators might contribute to learning and understanding of calculus concepts

Calculus has long been a difficult subject for many students. Graphic calculators offer a way for mathematics teachers to improve their students' involvement in constructing their own understandings of calculus concepts. Participant observation with interviews, conversations, field notes and journals will be the major means of collecting data. In the first phase of the study a unit of course in year 13 calculus using graphics calculators will be prepared and trialed. In the second phase the program will be implemented and data collected.

Stephen Norton, Queensland University of Technology

Leonie Rennie, Curtin University of Technology

Sex-role stereotypic attitudes of secondary mathematics students in single-sex and coeducational schools

The Fennema-Sherman Mathematics as a Male Domain Scale was used to examine the attitudes of secondary school boys and girls from grades 8 to 12 in single-sex and coeducational schools. There were clear attitude differences between girls and boys, with girls being less stereotyped in their perceptions than boys. There were also differences relating to the school environment with girls in a single-sex schools being less stereotyped than girls in the coeducational schools.

Tamsin Roberts, Maningrida CEC

Mathematics curriculum for indigenous students

The mathematics curriculums used in remote Aboriginal communities in the Northern Territory are the same as those for mainstream urban students. My PhD will involve the trialling of a mathematics curriculum framework which could be used by individual Aboriginal communities to develop a curriculum which reflects their needs and aspirations. The framework consists of a range of issues that each community must consider. These include deciding on what maths to include, what methodology to use, how to assess, how to include teacher professional development, what resources to use and the choice of the language of instruction. The research will involve interviewing participants in the appropriateness of the issues chosen and their presentation within the framework.

Deborah Scott, University of New South Wales—St. George Campus

Decreasing the incidence of the I'm hopeless at maths syndrome: is number sense the key?

There increasing body of literature (both research and popular) highlights the failure of the traditional school system to develop effective numeracy skills for the majority. Despite a growing awareness of the important role of attitudes in mathematics learning, at best, a fairly small minority of students enter high school with mathematical confidence. Recent research suggests that this trend can be reversed but the question of how to marry innovative approaches with long standing traditions remains.

Dianne Siemon, Royal Melbourne Institute of Technology

Representing decimals - an unconscious marriage of convenience

A discussion with teacher education students about their performance on a mathematics test revealed what appeared to be a relatively common misconception in relation to the ordering of decimal fractions (approximately 10% of commencing students in 1988/9). Since then a number of experienced teachers have admitted that they too shared the same construction. This is worth reporting for two reasons. Firstly, the means by which the misconception was identified has important implications for traditional constructivist research methodologies, and secondly, the nature of the construction, a marriage of unrelated models on the basis of a perceptual similarity, has implications for future research on the understanding of place-value and the use of number lines in the teaching, learning and application of number ideas

Dianne Siemon, Royal Melbourne Institute of Technology

Visual learning the contribution of part-part-whole ideas to an understanding of number

Much post neo-Piagetian research on children's early number ideas has focussed on counting and children's use of symbols to indicate the numerosity of a collection. While this has expanded our understanding of the difficulties involved in counting and coming to an understanding of number in terms of countable units, its focus on conscious, verbal behaviour has tended to overshadow other forms and modes of learning such as unconscious, perceptual learning. This paper will explore the role of visual text in relation to young children's emerging ideas about number.

Ron Smith, Peter Grover & Russell Tytler, Deakin University

Professional development: a case study of teachers involved in a change program in the topic of probability

This research compares two Victorian teacher professional development programs: Learning in Primary Science (LIPS) and Mathematics in Schools (MIS). Coding of responses showed that LIPS teachers valued the development of activities and discipline knowledge more than the MIS teachers. However, NUD•IST coding of interviews has shown that the schools focussing on probability have taken an approach similar to that of science, where teachers responded favourably to specific curriculum content knowledge and activities for the classroom. Possible reasons are considered.

Tan Boon Tee, Universiti Brunei Darussalam

Preservice primary teachers conceptual difficulties with mathematics in physics

Numerous preservice primary student teachers complain that they find physics numerical problems difficult. Apparently, it is not the incorrect choice of algebraic formula that is the root of the difficulty, but rather the inability or weakness in manipulating the algebra leading to the answer. To find the extent that student teachers have mastered the basic maths skills required in solving physics problems, a test consisting of 19 mathematical cognitive tasks was administered to 108 student teachers. The result left much to be desired. Many still lacked the skills to solve numerical problems in physics

Steve Tobias & Sally Oakes, La Trobe University—Bendigo

A classroom teacher's perceptions of a collaborative teaching practicum

This paper discusses a teacher education program that promotes teaching and learning approaches consistent with current reforms in mathematics education. It aims to encourage a reconceptualization of teaching and learning mathematics via intensive and fundamental classroom experiences centred on social-constructivist approaches. Collaborative interaction, as a 'classroom-team', is expected between the classroom teacher and two preservice teachers while planning, implementing and reflecting on classroom teaching sessions. The experiences and incidences that cause one classroom teacher to reconceptualize her beliefs about teaching and learning mathematics are reported.

Gurudeo Anand Tularam, Queensland University of Technology

Interaction effects between algebraic knowledge, higher-order thinking, and affective factors in algebraic word-problem solving

This study examined the interaction effects between algebraic knowledge, higher-order thinking and affective factors in novel algebraic word-problem solving. The findings indicated that the 3 factors were related to performance and higher-order thinking seemed to have the most effect. Algebraic knowledge appeared to be a stronger predictor of success than affective factors, but students' beliefs, attitudes, persistence and confidence played an important role in problem solving. It seems that for students to perform well they need to demonstrate high levels in all the factors studied.

Gurudeo Anand Tularam, Queensland University of Technology

The role of algebraic knowledge, higher-order thinking, and affective factors in algebraic word-problem solving

This study examined the effect of algebraic knowledge, higher thinking and affective factors on performance on novel algebraic word-problem solving. The performance of the year 11 high school students' seemed unsatisfactory. Three factors appeared to influence performance—algebraic knowledge was one predictor of success; metacognition and critical thinking were related to performance; and students' beliefs, attitudes, persistence and confidence played a role. For students to solve algebraic word-problems satisfactorily or better, they need high levels in all three factors.

Boguslawa Welna, Murdoch University

Errors, history and humour as a tool in learning and teaching maths

There are several reasons for humorous component in mathematics lessons. One of them is that humour has a power to dispel fear and anxiety about mathematics which are still among our students. Fear and anxiety in most cases occur when there is limited or no understanding of mathematical ideas. The natural question arises. Does humour facilitate the understanding of mathematical ideas? The poster presents one part of a larger study of the nature and significance of errors for learning and teaching mathematics. It is illustrated how errors, history and humour altogether can be used as a powerful aid in overcoming cognitive and epistemological obstacles in order to attain a deeper understanding of mathematical ideas.