

Plenary Lecture

Etienne Wenger

Learning and communities of practice: a journey of the self

Most institutions proceed from a similar set of assumptions: that learning depends on teaching, that books and classrooms are the locus of learning, and that the rest of life is application. What if we assumed that learning happens everywhere, that it is a natural part of life, and that if institutions have a role it is to support learning wherever it takes place? An important part of this shift in mindset is to recognize that the world of human knowledge is composed of a huge constellation of practices. The living communities that develop, share, and refine these practices then become a key element of learning. As we enter, engage with, and leave these communities, learning is a social as well as a cognitive process. Learning transforms both our forms of participation and our identity. From this perspective, teaching is not merely the transmission of information and skills, but an invitation to a journey of the self.

Research Sessions

Muharrem Aktümen, Tolga Kabaca

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Constructing the concept of “area under the curve” in mind for introduction to Riemann sums with help of CAS

Calculus concepts constitute a very important base for almost all applied sciences. The concept of Riemann Sums is among of these concepts. In this study, which is carried out with a group of students at an average Turkish university, students were taking an elective and elementary Maple course before of the implementation. An activity prepared for being estimating the concept of “area under the curve” for introduction to Riemann Sum with help of CAS. The activity is started with a real life problem. This problem is related to a stonemason who wants to locate wall tiles with a rule as pattern. After discussion of this problem, students carry out a series of experiments with maplet which is prepared by researchers.

Jehad Alshwaikh

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Mathematical visual forms and learning geometry: some preliminary results

(30 mins)

In my study I investigate the role of mathematical visual representations in the construction of mathematical meaning in learning geometry. To do so, I suggest a framework to 'read' diagrams and shapes in school geometry informed by social semiotics and multimodality accounts (Halliday, 1985; Morgan, 1995; Kress & van Leeuwen, 2006). This framework will enable me to analyse the meanings students make when they interact with each other and with the diagrams. A 'new' version of this framework will be presented and illustrated by examples that students produced in my pilot study. This framework needs more testing and feedback.

Emin Aydin

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Student teachers' perspectives on mathematics assessment in the process of a curriculum reform

The main purpose of the study is to explore the assessment perspectives of mathematics student teachers within a framework of six categories of assessment which reflect assessment dilemmas faced during the practice of teaching. Turkish national education is in the middle of a radical curriculum reform based mainly on constructivist theories. We believe that the student teachers should be ready for the changing requirements of the new mathematics curriculum. Data was collected from 50 student teachers who just finished the mathematics teacher education program but not yet started to teach professionally. Data collection instruments are questionnaires, practice teaching portfolios and semi-structured interviews. The questionnaire data were analysed using descriptive and inferential statistics. Data from the interviews and student teachers' reports is used to explore reasons for the trends emerged. Data indicated tensions in perspectives between the psychometric paradigm which is influenced by the assessment practices in their pre-university school years and the 'assessment paradigm' (Gipps, 1994) which emphasised in the teacher education program.

Jeremy Burke

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Mathematical modelling in the secondary mathematics curriculum

For at least the last 30 years there have been calls and proposals to include mathematical modelling in the school mathematics curriculum frequently in order to engage pupils, increase 'motivation' or make mathematics 'relevant'. This session looks at mathematical modelling in secondary school mathematics settings. It seeks to develop a sociological description of pedagogic strategies which recruit mathematical modelling practices. Reference will be made to some mathematics textbooks and a recent curriculum development project to explore the possible outcomes of mathematical modelling in the secondary school curriculum. The format of the session would be a brief presentation (using laptop presentation program) followed by questions.

Ali Delice

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Empathy through project; educating mathematics teachers as supervisors to their students' projects

There is a paradigm shift in Turkish curriculum recently seems to have "constructivist" features. The changes in the curriculum bring some new concepts with itself that Turkish teachers have difficulties to understand and apply it through their practices, such as portfolios, activities, projects etc. Among the, project serves and fullfill the conditions that students may develop their mathematical abilities and construct mathematical knowledge. Ministry of Turkish Education (MEB) encourages teachers and students to work in a project together. The Turkish Scientific Council (TUBİTAK) supports workshops which aim to educate teachers as supervisor to their students doing a project. This is a qualitative study and multi-method approach used in the study. Open-ended questionnaire was given to two groups of 140 teachers before the study. After a carefully planned 10 day long workshop on project training, open-ended and semi-structured post questionnaires were given to the teachers. Teachers were also observed during their projects and also diaries were kept. Results suggested that teachers had difficulties at every steps in project and generally were not able to properly define what

project means. They also experienced identity complications during the workshop that they could not decide who to be.

Mary Dodd

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The mathematical competence of adults returning to learning on a University Foundation Programme: a selective comparison of performance with the CSMS study

The Durham University Foundation Programmes provide a one year preparation course for many different degrees ranging from Primary teaching and Social Sciences to Biological Sciences and Engineering. All students are mature adults or from overseas.

As part of a pilot study within an Open University Ed.D project, all Foundation students were given a mathematics based questionnaire near the beginning of their course. Many of the questions were based on those used in the 1974-79 CSMS study (Hart *et al*,1981) with the addition of confidence ratings. Whilst many of the results are as might be predicted, some results are perhaps more surprising. The purpose of this workshop is to share some of these findings and invite discussion.

Ibikunle Farajimakin

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Modern Guided Discovery Methodology in Teaching Mathematics at the Primary School in Nigeria.

This paper tends to find out the modern guided discovery methodology in teaching mathematics at the primary school in Nigeria. The concept of the guided discovery method is looked into and their advantages are discussed.

keywords: Guided discovery method; The dynamic principle; The Constructive principle; Perceptive variability principle.

Paul Hernandez-Martinez & Julian Williams

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Ethics, performativity and Decision Maths

30 mins

The spirit behind the incorporation of Decision Mathematics (and Discrete Mathematics) into the A-levels Mathematics Curriculum was that of encouraging the creation of algorithms for problem solving. However, some students and teachers nowadays tell us it is “boring” and not “proper” maths. In order to have an insight into the role that Decision Mathematics plays in the current programme of mathematics, we observed Decision Maths lessons and interviewed teachers and departmental authorities. We found that Decision Maths in the classroom involves the students in carrying out the algorithms, without any sense of “agency” in problem solving and with few significant connections or applications of their pure maths. The DM option is said by teachers to provide an “easy” way for students to gain marks, and a “relaxing” module for them in contrast to core pure modules. Performativity and the “league tables” culture of the education system in Britain ensure that alternatives to DM are not really an option especially for weaker students, whatever the needs of the students or the teachers’ professional beliefs and ethics.

Jeremy Hodgen & Margaret Brown

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A Rasch analysis case study: children’s progression Year 1 to Year 7 Measurement Working Group

The Leverhulme Numeracy Research Programme (LNRP) was a 5-year programme of research in primary education 1997-2002, funded by the Leverhulme Trust. A key part of the programme was a longitudinal survey tracking two cohorts of approximately 2000 pupils, one from Reception to Year 4 and the other from Year 4 to Year 6 (and following a sub-sample into Year 7.) This presentation will draw on current and past analyses of the Leverhulme Numeracy Research Programme data set. I will discuss how and why Rasch analysis was used in the project to equate tests and thus track children's progression.

Tolga Kabaca & Yavuz Erdoğan

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Understanding the structure of a surface by plotting via CAS

The use of computers and especially Computer Algebra Systems in mathematics education offers new opportunities in teaching and learning the relationship between mathematics and the real world. Visualization is also the process of using geometrical illustrations of mathematical concepts. Over the past centuries, a decline in the geometric element in mathematical instruction has been observed. Computer Algebra Systems have given mathematics the opportunity to adjust the balance between the various modes that constitute the basis of mathematical education. In this paper, an algorithm, into how visualization is used to improve students' comprehension of the structure of a surface which is a two dimensional graphic, has been described. According to the constructivist learning theory, we tried to determine a road from the picture of a curve to a surface.

Chris Kyriacou & John Issitt

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Is effective evidence-based mathematics teaching possible?

Four key questions face those involved in trying to develop evidence-based mathematics teaching: (i) What counts as a good question for a review?; (ii) What counts as good evidence concerning which classroom practices work best?; (iii) How can such evidence be transmitted to teachers?; and (iv) How can teachers be encouraged/directed to adopt more effective classroom practices? Current initiatives in this area suggest that the value of trying to develop evidence-based education may lie in stimulating teachers, teacher educators, researchers and policy-makers to consider in an intelligent fashion what research can tell us about good practice, but this enterprise is unlikely to deliver an unequivocal blueprint for effective classroom practice.

Chris Little & Gwin Halsall

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On context and utility in algebraic word problems

An increasing body of educational research has been ambivalent about the effects of contextualising mathematical tasks. While some have pointed to the beneficial effect a context can have for pupils, by motivating the mathematics, or by providing them with a 'model to think with', others have pointed to the possibilities of misinterpretation of the task when presented in a context, and criticised the artificiality and lack of realism in routine exercises. This paper discusses the role of context in a number of textbook algebraic word problems, and suggests that criticism on the grounds of lack of utility is misplaced.

Yoke Mooi & Julian Williams

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Predicting and validating Differential Item Functioning in test items

Measurement Working Group

The purpose of this session is to introduce participants to the concept of differential item functioning and to experience a DIF investigation in the process of instrument-development. The participants will be given the opportunity to rate whether test items favour a certain group of examinees. Analyses of participants' ratings will be conducted based on the Rasch Rating Scale and Partial credit models. The participants' ratings will be then validated with the DIF analyses from the empirical data.

Mari Palmer

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Classroom management and dyslexic children in mathematics 30mins

In this session I will discuss my recent research into dyslexic children in KS2/3 mathematics classrooms. This was a small case study of Y6 and Y7 pupils who were reasonably proficient in mathematics for their age despite being dyslexic. I aimed to discover strategies they employed to overcome the range of difficulties associated with dyslexia in the mathematics classroom. I will discuss findings that relate to classroom management issues as well as to the children's experiences of group work and interactive teaching.

Maria Pampaka et al.

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Construction of a 'Transmissionism' instrument

Measurement Working Group

We report the construction and calibration of a teachers' self-report (Likert type) instrument to measure their 'classroom practice', and how this has been used in modelling the effect of pedagogy on learning outcomes. The instrument itself arose from a development of Malcolm Swan's items, but the scaling suggests that 'constructionism' and 'discovery' collapse onto the teacher-centred/student-centred spectrum.

Geoff Wake

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Applying mathematics: what's the story?

Central to individual students' emerging identities as learners and users of mathematics is their experience of mathematics in classrooms. Therefore as part of our research which seeks to understand how we might engage more students in mathematics and mathematically demanding subjects for longer we focus on mathematics lessons making observations in the ethnographic tradition with video and audio recordings. This allows analysis to focus on how teachers mediate the mathematics (i) using a range of different pedagogic practices, and (ii) by developing a mathematical narrative and interweaving this with other narrative forms. We report ongoing analysis of lessons from our case study colleges where we explore how two teachers in different case study colleges develop their narratives with respect to the application of mathematics whilst working with students who are following programmes leading to vocational qualifications in Engineering.

Julian Williams

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“But...”: signalling formation of a mathematical self-identity

When students tell us their mathematical biographies, the use of ‘but’ can signal a conflict or tension in their stories, and sometimes a transition in, change of, or development of self-identity. “I like maths but (I’m not as good at it as the others) ...”; “... sometimes (maths) is a bit boring and it drags on. But me personally, I kind of enjoy maths”; “but I went to a careers fair and they basically said if you don’t get extremely good grades there’s no point ...” or “... I was gonna leave but now I’m doing maths and I’m enjoying chemistry and I understand it, ... (because of the maths)”. What might such conflicts/tensions signify: contradictions in our cultural models of mathematical self-identity, or between identity-in-practice (what I do) and self-identity (what I am)?

Sibel Yeşildere & Hatice Akkoç

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Prospective mathematics teachers’ practices of technology integration: a case of definite integral

This study focuses on prospective mathematics teachers’ practices of integrating technology into instruction for the case of definite integral. We are particularly interested in how prospective teachers use technology to address student difficulties concerning the limit process to define definite integral. For that purpose, two prospective mathematics teachers were selected to investigate their pedagogical use of technology. The data comes from micro-teaching videos of prospective teachers, interview transcripts, prospective teachers’ lesson plans and teaching notes. In this presentation, we will discuss implications of our data to diagnose prospective teachers’ difficulties and to identify the areas in need of development for a successful integration.

Working Groups

Christine Hirst, Jenni Back, Marie Joubert, Ros Sutherland & Els De Geest

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Developing a Framework for Researching Professional Development in Mathematics

This workshop will present the current status of the RECME project focusing particularly on the development of research instruments and their mapping with the research questions. The development of a questionnaire is a key issue at present but discussion about other ways of collecting data would also be useful. Participants will be invited to contribute critical feedback to the presentations and to make suggestions regarding future directions; the aim of the workshop is to take into account the voice of the community so that RECME develops as a collaboration between all interested parties.

Jeremy Hodgen & Julian Williams

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Measurement

This working group aims to provide a forum for discussion about measurement in mathematics education. If there is sufficient interest, we hope that this will be a continuing group tackling and discussing topical issues. In this first session, the focus is on Rasch modelling techniques. These techniques are widely used to analyse test performance, yet are rarely discussed in mathematics education. There will be two presentations and a practical hands-on workshop. (See Research Reports: Hodgen & Brown; Pampaka; Mooi & Williams.)

Elena Nardi & Tim Rowland

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Research in Mathematics Education, BSRLM's new international journal: the experience so far...

Research in Mathematics Education, BSRLM's new international, peer-reviewed journal (a follow up to *RME Vol 1-9*) was launched in 2007 and will be published by Routledge. Its first issue is due to appear in March 2008. As we are approaching publication of Issue 10(1) the Editors of *RME* would like to invite members to a discussion about the journal's present and future. The session will start with an update by the Editors on setting up the journal (Editorial Boards, Publisher), submissions received so far (quality and quantity), the reviewing process, promotion – and, an (exclusive!) revelation of 10(1) contents! Then members will be invited to contribute views and suggestions for *RME*'s vision, strategies for attracting significant papers and promotion. Some members of the Editorial Board and International Advisory Board will be present in order to contribute their perspective on the experience of offering their assistance to *RME* so far. We aim the discussion to continue in future day conferences as well.