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Centre for Research in Mathematics Education

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Welcome!

Welcome to this second CRME newsletter. (Previous newsletters can be found at www.nottingham.ac.uk/education/research/crme/crme-newsletter.aspx.)

If having new pupils, student teachers and research projects was not enough to think about, we heard recently what the government's plans are for [reforming GCSE and A levels](#). It looks like there will be plenty of interesting things to be working on during the next few years. Below you can read updates on some of the current activities in the Centre. There's a lot going on and we look forward to working with you during 13-14.

Professor Andy Noyes

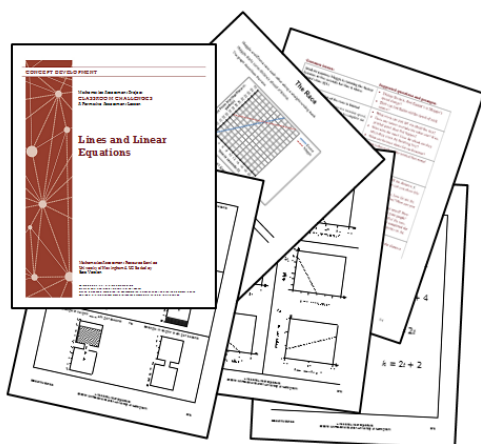
New Formative Assessment Lessons

For the past three years we have worked with teachers to develop over 100 formative assessment lessons for use with Year 7 to Year 11 pupils. The lessons are in line with the latest Ofsted recommendations that mathematics teachers use more formative assessment strategies in the classroom and increase the emphasis on problem solving. Each lesson is designed to develop pupils' understanding and use of key mathematical concepts and problem-solving processes. Each comprises a task supported by a detailed teacher guide.

There are two types of lessons:

Firstly, **Concept Development Lessons** are designed to reveal pupils' prior knowledge, then building on this knowledge, develop their understanding of mathematical ideas, connecting concepts to other mathematical knowledge. For instance, before one lesson, '**Lines and Linear Equations**', pupils work individually on an assessment task to reveal their current understanding and difficulties. During the lesson, pupils work in small groups matching graphs, equations and pictures. In a follow-up, pupils review and revise initial solutions.

What a teacher said:

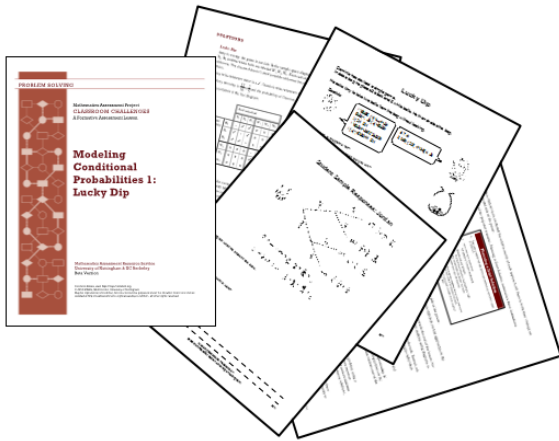


"It really highlighted for me what pupils could and couldn't do and helped me to plan my next few lessons ... I saw pupils with wrong answers but as they added cards it made them confront their misconceptions and helped them fix and change what they had."

"These lessons make me think more about my own teaching. I always felt I had to talk about every mistake that pupils make right away. Now I'm letting my pupils make mistakes and then they talk about it later (with their partner) – I think pupils are learning more this way."

Secondly, **Problem Solving Lessons**: designed to assess, then develop, pupils' ability to apply mathematical knowledge and reasoning to non-routine, unstructured problems in flexible ways. In small groups students decide on a strategy, apply the strategy, check their solution and justify their method to others. Each task includes a range of interrelated sample solutions that expose pupils to multiple perspectives on a problem. Pupils compare these different approaches to a problem, understanding, critiquing, and learning from them.

What a teacher said about a problem-solving lesson on conditional probability:



"The guide really helped me think about the different approaches pupils may use, the mistakes they may make and how I can ask questions that don't lead them to a particular method but do help them progress.

I now think pupils can learn more from working with many different solutions to one problem rather than solving many different problems, each in only one way."

These lessons are available to download at:

<http://map.mathshell.org.uk/materials/lessons.php>. They are free! Do use them!

Sheila Evans sheila.evans@nottingham.ac.uk

Bowland Maths Lesson Study Research

This year the Mathematics department at Heartlands Academy has been involved with Lesson Study research. 'Lesson Study' is undertaken as the developmental focus of the department's on-going professional development practice. The technique is to consolidate every teacher's experience into 'team teaching' practice in a continuous collaboration which becomes 'Lesson Study'.

Along with myself, two NQT teachers and our head of department hosted three 'Lesson Study' observations in our Academy. During the process we worked collaboratively with the University of Nottingham. There were three stages:

1. Pre-planning of challenging and interesting lessons
2. Joint observations
3. Post-lesson discussions between team teachers and third-party observers, along with the presence of a 'Knowledgeable Other' from higher education

The team felt that being involved in the process was the best professional development that they have gained from. The comments we received after every observation improved through each stage of the process. In the last observation, Akihiko Takahashi, who was the Knowledgeable Other, said that it was the best lesson study he had seen outside of Japan – which is particularly high praise, considering he lives and works in the US helping people to implement lesson study.

Our findings from the lesson study cycle in our Academy are:

1. 'Lesson Study' is a way to help any department to share good practice
2. 'Lesson Study' carried out by a group consists of future teachers and an expert teacher. In our third observation we demonstrated team teaching by involving an NQT and a PGCE student from Birmingham City University, both of whom found the experience worthwhile
3. 'Lesson Study' methodology is essentially supportive rather than critical

The next step for our Academy is that we are planning to establish lesson study with the involvement of all members of our department. We will be hosting a public research lesson on 21 October and inviting the teachers from our Academy from other subjects, as well as all E-ACT Academy teachers and leaders. On that day we are hoping to model the cycle of lesson study to staff from inside and outside our Academy.

Elnaz Javaheri, Heartlands Academy

Visiting Scholar

My name is Shafia Abdul Rahman. I am a Senior Lecturer at the School of Educational Studies, Universiti Sains Malaysia in Penang, Malaysia. My research interests are in the field of mathematical thinking and the development of tasks that promote mathematical thinking. Most recently, I was part of a nationally funded project called *Integrated System of Programmed Instruction for Rural Environment* (InsPIRE) that developed and tested specific approaches to improve the effectiveness of teaching and learning in underperforming primary schools in rural and remote parts of Sabah in north Borneo. Currently I am working with Dr Peter Gates on a collaborative project to investigate factors that contribute to mathematics underachievement among socially disadvantaged children in Malaysia and England and to design effective curriculum and pedagogy suitable to these children.

Shafia Abdul Rahman

Written lesson observation reports: the teacher's perspective

Schools and Ofsted routinely observe lessons for accountability and professional development purposes. These observations are important, both for a teacher's career and as an opportunity to improve practice. They are also of critical importance to a school's status. Unsurprisingly, the judgments made, usually by one observer, can be contentious and emotive. However, there is little empirical work that investigates how well lessons are observed. Most of the research

concentrates on the use of lesson observation to evaluate teachers' effectiveness in terms of pupil learning gains. This study aims to go some way to address this gap.

From the teacher's perspective, we are exploring the quality of written lesson observation reports in a range of subjects. The focus is on quality in terms of feedback most helpful to teachers to improve their practice.

If you are interesting in knowing more or being involved, or know teachers from other disciplines that may be interested, please contact me. I think you will find participating an engaging and informative experience, providing you with the opportunity to read observation reports from a range of subjects from another school.

Sheila Evans sheila.evans@nottingham.ac.uk

New hope for students with mathematics in the 'second chance' saloon

I realise that I should really be referring to the 'last chance' saloon but perhaps a more optimistic view is acceptable since I am considering the trajectories of students and their encounters with mathematics.

I am a full-time PhD student and my research concerns the experience of vocational students with functional mathematics in Further Education. Many students on vocational programmes have left school as disengaged 'failures' in mathematics and are happy to bury the subject along with their school uniform but, contrary to their expectations, they are often required to take a functional mathematics course alongside their vocational programme. Recalling mathematics from previous encounters also resurrects emotions that influence their attitudes, but college policies, teaching approaches and college teachers do have a part to play. The classroom culture and relationships with staff in colleges can be very different to school and my research suggests that these can be effective in re-engaging disaffected students whilst their understanding of the relevance of functional mathematics to their lives can affect motivation.

When I decided to leave an established position as a manager in a large Further Education college and become a student again I was aware that this would be a major transition. Having now spent many hours observing, questioning and listening to vocational students, I realise that they themselves have undergone a significant transition from a familiar school situation to a new college culture. My provisional results indicate that this transition can result in a positive change of attitude, increased confidence and effective learning. Engaging the disaffected is a challenge but there appears to be hope that productive transitions can be achieved when given a second chance in a new environment. I am, of course, only referring to the college students!

Diane Dalby

Please fill out my quick survey!

Please pass this on to any mathematics teachers who might be willing to complete a short online survey – thank you very much indeed!

In collaboration with Matthew Inglis from Loughborough University, I am investigating ways in which mathematics teachers describe tasks/activities that are given to students during mathematics lessons. Mathematics teachers use all sorts of words to describe mathematical tasks/activities (e.g., rich, open-ended, procedural, realistic, etc.), but the extent to which these are independent characteristics is unclear. In particular, the number of independent dimensions on which one can describe a given mathematical task/activity is unknown. This short survey asks you to think of a mathematical task/activity that you have recently used or seen used with students and to say to what extent each adjective provided describes it. It should take no more than 5-10 minutes to complete. We need about 300 responses for our analysis, so we would be extremely grateful if you could spare the time to fill it out.

Click <https://www.survey.lboro.ac.uk/mathsactivities/> to take the survey.

With many thanks indeed for your help.

Colin Foster colin.foster@nottingham.ac.uk

If you have any comments regarding this newsletter, or would like to be added to or removed from our mailing list, please contact mathew.crosier@nottingham.ac.uk. Previous newsletters can be found at www.nottingham.ac.uk/education/research/crme/crme-newsletter.aspx. The editor is Colin Foster.