Research Update

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Mathematics Education Centre · Loughborough University www.lboro.ac.uk/mec

Welcome

Research Update is a newsletter sent out three times a year to schools by Loughborough University. We hope you find this newsletter useful and we welcome feedback and suggestions.

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Upcoming Research

Here at Loughborough we're often seeking teachers and students interested in participating in upcoming research studies. If interested please do get in touch.

Lost in Transition. Many students find the transition to university mathematics very difficult, particularly those who for multiple reasons do not come with an A-level mathematics qualification. Soon they find themselves lost in their mathematics modules. A team of two university mathematics students and one mathematics lecturer are developing a research-based on-line software to help students in their transition to mathematics at university. We would welcome the expertise of a teacher "from the other side of the transition" to complement our understanding of transitional issues. This would be a good opportunity to engage with a research project that has very practical implications. If you are interested, please contact Dr Paul Hernandez-Martinez (p.a.hernandez-Martinez@lboro.ac.uk).

Calling All Teachers! A new project is exploring the educational outcomes of premature-born children. We are gathering the views and experiences of teachers in a short survey at www.prime-survey.org. Please spare 10 minutes to complete the survey whether or not you have any experience with premature-born children. Contact Dr Camilla Gilmore (c.gilmore@lboro.ac.uk) for further information.

What Do You Know? Assessing students' conceptual understanding in mathematics is known to be really tricky, because it is so entwined with procedural knowledge. For example, it is easy to assess whether a student knows the steps required to solve a problem. However, do they know why they are doing this and do they understand the relationships between this and related concepts? In the upcoming months, we will be recruiting schools to take part in a project aiming to develop a better way of measuring conceptual understanding. We would like to teach and assess Year 5 and Year 11 students for this project. If you think your school might be interested, please contact Dr Marie-Josée Bisson (M.Bisson@lboro.ac.uk).

Recent Research

In this section you can find a round up of recent research studies of interest to teachers. More Loughborough research can be found at mec.lboro.ac.uk

The Conceptual Difference. There are three important numerical skills which can predict how good we are at mathematics. These include factual knowledge (memorised number facts like 2 + 2 = 4), procedural knowledge (being able to follow a set of steps to solve a problem) and conceptual knowledge (understanding the relationships among numbers). A recent study looked at how important each of type of knowledge is for success in mathematics. Eighty-three children in Year 4 completed two mathematics achievement tests, as well as three tasks that measured each type of knowledge. We found that procedural and factual knowledge are closely related, while conceptual knowledge is a somewhat separable skill. As research has found that conceptual and procedural knowledge develop iteratively, with a gain in one leading to a gain in the other, which in turn leads to improvement in the first, this finding suggests that it is important that conceptual understanding is nurtured in the classroom. For more information please see www.sumproject.org.uk or contact Sarah Keeble (s.keeble@lboro.ac.uk).

Mathematics Education Centre MEC

Loughborough University

Introducing Professor Merrilyn Goos

The Mathematics Education Centre has the pleasure of being visited this year by Professor Merrilyn Goos from The University of Queensland in Brisbane. Much of Merrilyn's research aims to enhance school students' understanding and enjoyment of mathematics. These projects are conducted in Australia, but the issues and outcomes to date are also relevant to teachers in the UK. Merrilyn describes three projects below.

Keeping Things in Proportion. One project, which involved teachers and their Years 4-9 students in 29 schools, focused on the development of proportional reasoning – the ability to understand situations of comparison in a relative sense (e.g., determining the better buy; scaling quantities for cooking; processes associated with multiplication and division). Teachers participated in a series of professional development workshops that offered learning activities for promoting students' proportional reasoning. Between workshops they adapted and tried out the activities with their own students. The researchers designed a diagnostic test of proportional reasoning and administered it to participating students at the beginning and end of the first year of the project. This provided data from more than 2000 students. The pre-test identified common areas of difficulty as distinguishing proportional from non-proportional situations, erroneous application of additive strategies to proportional reasoning tasks, and misinterpretation of visual representations (e.g., graphs) of proportional reasoning situations. One year later, the post-test revealed a level of performance improvement equivalent to gains that would be expected over at least two school years. In addition to the diagnostic test, another product of this project is a scope and sequence chart that outlines the development of proportional reasoning in the mathematics curriculum from Years 1 to 10.

Counting Curricula. In another project we are working with teachers in eight schools to develop strategies for embedding numeracy across the whole school curriculum, in both primary and secondary schools. Teachers are introduced to a rich model of numeracy that gives attention to real-life contexts, application of mathematical knowledge in mathematics and other school subjects, use of representational, physical, and digital tools, and positive dispositions towards mathematics. These elements are grounded in a critical orientation to the use of mathematics. Over a school year, the teachers work through two action research cycles of numeracy curriculum implementation. The research team supports the teachers through professional development workshops and school visits to observe lessons and provide feedback on teaching plans and strategies. We have observed many examples of creative teaching in mathematics and other subjects, such as science, history, and English, that highlight these subjects' inherent numeracy demands and engage students in meaningful learning that is relevant to their lives outside school.

After Maths Aftermath. A new three-year project, starting in 2014, seeks to understand and arrest the decline in participation in post-compulsory mathematics in Australian schools and universities, particularly for educationally and socio-economically disadvantaged students. This project will systematically explore disadvantaged students' academic aspirations and subject-choice decisions during the early and senior secondary school years, track the development of these aspirations within the dynamic interplay of individual, social and schooling influences, and explore effective schooling practices capable of sustaining engagement and increased enrollment in advanced mathematics.

If you would like to know more about my research please do get in touch.

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