

## **It's good to talk! English as an additional language as a medium for teaching and learning in primary mathematics lessons**

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This study analyses Malaysian Primary Teacher Trainees' perceptions of their experiences of learning through the medium of English. These learning experiences include their practical engagement with alternative pedagogical practices for teaching mathematical concepts and their engagement with mathematics education research-based literature. The students reflected on how the use of English throughout the course had affected their learning, their ability to develop conceptual understanding and how this had impacted on their own practice in primary classrooms.

### **Introduction**

The study arises from a collaborative project funded by the Malaysian Ministry of Education. At the onset of the project, the political and economic position was that English should be the medium for teaching mathematics and science in schools. In 2003, policy indicated that this practice would be introduced to primary schools with effect from 2008. (However, most teachers in primary schools (other than English specialists) were not fluent in the language; recently, the policy has been reversed with effect from 2012.)

The Malaysian Primary Mathematics Curriculum emphasizes teaching the knowledge and skills for the operation of number. The subject is taught by specialist teachers, who move to different classes within the school. Children are streamed according to their overall achievement assessed through summative testing at the end of each unit and at the end of year. The pedagogical approach is primarily textbook based. Mathematics textbooks are published by the Ministry of Education and are written in English with illustrations. The children are taught an algorithm and then practice. The emphasis is on computation and the memorization of mathematical facts. Word problems are used to apply the algorithm within a context. Calculators are not allowed. Resources commonly found in primary classrooms in the UK to support the learning of mathematics are rarely available.

The study focuses on the complexity of the process of developing mathematical understanding; the interaction between developing conceptual understanding, context, and language or linguistic processing. Which comes first? Do you need language to access the mathematics or do you need mathematical understanding as a means to access the language? Barwell (2010) discusses three tensions which occur in multilingual mathematics classrooms; between mathematics and language, between using formal and informal language to talk about mathematics and between the learners' home (or first) language and the official language of schooling. What appears to be significant is the level of proficiency multilingual learners have in all (or any) of their languages with low levels of proficiency putting the learners at a cognitive disadvantage and high levels of proficiency in more than one language indicating cognitive advantage. (Cummins 2000)

If talk enables learners to construct new meaning (Wells 1999 and 2010, Mercer 2000) it follows that mathematics classrooms should provide an environment where children are able to discuss their thinking and learning in such a way that their cognitive development progresses at their own pace and according to their individual paths. Proficiency in the language used for that discussion is essential. This suggests that learners should be able to use the language they are most comfortable with when they are developing conceptual understanding – implying informal language initially and key mathematical vocabulary introduced when the learners are comfortable with the idea it embodies. Switching codes from one language to another enables learners to focus on the mathematics they are trying to understand, the problem they are trying to solve and gives them more confidence. (Clarkson 2005).

Askew (1999) recognized that effective teachers of numeracy provide meaningful contextual reference points for learners. This is evident in the Realistic Mathematics Approach in the Netherlands (Treffers and Belhuisen 1999), where the understanding and operation of number is developed through problem solving activities situated in contexts within the realm of children's familiar everyday life experiences. Teachers also need to be "language aware"; finding ways of imparting knowledge in multilingual classrooms without simultaneously creating barriers to learning (Andrews 2007). Using familiar everyday informal language to verbally manipulate emergent understanding of a mathematical concept seems to be an essential pre-requisite before more formal articulation of understanding using the correct mathematical vocabulary can occur. This suggests that mathematical language should develop alongside conceptual learning.

### **Key questions**

How does teaching through the medium of English as an additional language (EAL) affect the development of understanding in mathematics?

Will Malaysian trainee teachers be able to articulate something about their own experiences of learning mathematics, engaging with alternative pedagogies and mathematics education research, and teaching primary mathematics on placement, through the medium of English as an additional language, which may give some insight?

### **Methodology**

The study was qualitative. Surveys were conducted through semi-structured interviews with an individual student at end of the second semester (Level 1), with a group of seven students at the end of the course (Level 3) and with two Malaysian primary mathematics tutors. The interviews were recorded and transcripts were made. The interviews were conducted in English. It is recognized that there may be limitations to the interpretation of the transcripts due to the researcher's own cultural conventions. In addition, although proficient speakers of Malaysian English (some syntactical and grammatical variation from standard English evidenced below), the interviewees may not have expressed themselves fully; again, this may have been due to cultural convention or to the fact they were speaking in English. In the final group interview with the students, however, the interviewees seemed to be relaxed and trusting in their relationship with each other and with the researcher. They appeared to be open in the discussions, speaking in English confidently, sometimes switching into bahasa melayu (the official Malaysian language), and then, after affirmation within the group, continuing in English.

The whole cohort was also asked to record, anonymously in writing, brief reflections of any key incidents (highs and lows) they had experienced during their course.

### **Findings, analysis and discussion**

The findings presented below outline the problems the students encountered as they engaged with the primary mathematics module of their course. These relate to learning through the medium of English, both as they experienced an alternative pedagogical approach by reading current research-based mathematics education literature to provide a theoretical base and by engaging in practical and problem-based mathematical tasks. Over the four years of the course, the students developed a range of strategies to overcome these problems and successfully achieved standards comparable to students following a similar course in their first language. Through metacognition of their own learning processes using English as an additional language; they were able to adapt their own practice as teachers of mathematics.

The anonymous written student reflections at the beginning of the course identify issues relating to learner's confidence and their ability to distinguish sounds, words and establish meaning. All of the students commented on the difficulties they experienced with understanding the language of the CCCU tutors with different intonations and stresses from the Malaysian English they were familiar with. Some encountered cultural shock of moving to a different part of the country with a more traditional Islamic society compared to their home state, which added to their stress.

This problem was mirrored on their teaching practice in their second semester (Level 1). When the students tried to teach mathematical procedures in English, the children joined in happily with songs and games but became easily distracted when teaching became more formal. The students' reflections on their teaching at this point were generally superficial, focusing on enjoyment and behaviour management issues rather than on the children's learning. Discussion in seminars helped the students to realize that using the textbooks was not sufficient; they needed to help the children to understand the mathematical concepts and adapt their teaching to meet the children's needs.

Reflecting at the end of the course, one student commented,

In this course, I think the interesting part is introducing them the concept using resource, implementing resource because...Er... my experience in Malaysian school.... I do not have the experience to know 1+1 concept using resource.... Just mental calculation and then I think the best thing I learn through this course and I think it should be applied when I am teaching. (Chinese student November 2009 Level 3)

The students found that when they used resources to support the children's learning of mathematics, the children could develop conceptual understanding and explain it in bahasa melayu even when most of the teaching had been undertaken in English.

I have experienced that when I taught in English, I think they are not understanding but when I see the concept behind that they understand and use the new words, I am quite shock because they understand in Malay language. How they do that? (Malaysian student November 2009 Level 3)

The second problem the students experienced relates to the learner's ability to express themselves in the second language. At the beginning of the course, they thought in bahasa and translated from English into bahasa and vice versa. In the group discussion, another student added,

I think the thing that hinders us is (discussion in bahasa melayu) us to express our feelings our reflection on something is about the lack of vocabulary. We have it in mind but we don't have suitable words to do it.

I have the same problem as Haswani because when I want to write something I have a lot of ideas but to transfer in English, it is hard for me. (2 Malaysian students reflecting back to Level 1 November 2009)

This extract illustrates how the students learned to switch codes in order to express their ideas to each other. Initially, the students were not comfortable with collaborating on shared study tasks and assessed group presentations. Working together in study groups was encouraged to help them to access readings. Informal presentations and discussion of several articles in bahasa melayu preceded formal tutor-led sessions in English. Tutors found that this led to richer discussions and demonstrated the students had understood key ideas. The students realized how group work had helped them with their own learning and one applied it specifically to their own learning of mathematics.

Before I not like maths...lack confident. Sometimes I am good but I not know what answer is right. Other day same answers wrong. Why? Now with CCCU maths, I can do. I like use resources. I can see pattern. I know what I go badly. I can make it right on my own. I see why good to work with group. Children working with resources can talk about task. Seems better understand than workbook only. (Malaysian student Level 3 November 2009)

As the course progressed, the students became more confident on placement allowing the children to work in groups and to speak informally with each other before they introduced and modelled the correct use of key mathematical vocabulary in English. They encouraged children to use informal methods to record their thinking and to get a sense of the mathematics before introducing an algorithm.

## Conclusion

The Malaysian students were able to pinpoint aspects of their own learning of mathematics in a different language which gave them insight into some of the difficulties primary children were experiencing. They adapted their practice to resolve these issues. They felt that developing conceptual understanding was of paramount importance. Resources should be used to support mathematical thinking. They thought that informal talk about the mathematics task should be encouraged in the children's first language. Specific vocabulary in English should be by developed alongside the conceptual understanding and modelled by the teacher.

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