MULTILINGUALISM IN MATHEMATICS EDUCATION: A CONVERSATION BETWEEN THE NORTH AND THE SOUTH

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Richard: We are two researchers interested in multilingualism and I think we both see multilingualism as one of the key challenges yet to be tackled in research in mathematics education. Perhaps we should begin, therefore, by asking where this interest comes from. Why do you choose to do work on multilingual issues?

Kgethi: I am multilingual, I speak nine languages – in fact I cannot remember a time when I could only speak one language. Multilingualism comes with the package of being an African in South Africa. For many African people in South Africa being multilingual is normal. I cannot imagine life in one language. I cannot imagine mathematics without multilingualism or, should I say, I cannot imagine mathematics in one language.

Richard: Nine languages is impressive, at least to someone from the UK, where many people speak only English. I can speak four languages to some degree, but British society is broadly based on an assumption of monolingualism. Schooling, for example, is entirely in English apart from in some bilingual schools in Wales.

Kgethi: It is not the same Richard! You speak four languages but you are still monolingual. Multilingualism is not just about the number of languages you can speak as an individual, it is very much about participation in a multilingual society.

Richard: What's the difference? I know enough of Urdu, for example, to be able to think about how Urdu might shape mathematical thinking for Urdu-speakers.

Kgethi: I am sure you have observed how I start conversations with people in South Africa and suddenly we switch languages without explicit negotiation. When I start a conversation with someone I can, after the first utterance or two, tell what their home language is and whether they are comfortable with the language I am using. You have asked me before how I knew to change the language and the answer is that my multilingualism shapes my listening.

Richard: So, even though I can speak some other languages because I grew up speaking English in an English-speaking environment, my way of seeing (or hearing) the world and mathematics is in terms of that one language.

Kgethi: Yes, in my world languages are not separate, they are interdependent. My thinking about mathematics is mainly in a mixture of languages.

Richard: How do you mean, interdependent?

Kgethi: Well, for example, most of my schooling was in English, but this is not my first language. I started learning English as a subject at school in Grade 3, nine years old, but the language of learning and teaching was Setswana in all the other subjects. In Grade 5 when I was eleven years old, there was a transition to English as a language of learning and teaching. And of course, although the language of learning and teaching was English, my life was already multilingual.

Richard: How did the transition to English work?

Kgethi: It was mainly done through translating from Setswana to English. I remember very clearly a General Science lesson on the skull where we were given a diagram labelled in both Setswana and English. The task was to remember what the specific translations are. The focus during this year of transition seemed to be more on learning the English rather than the mathematics or science that was being taught. I am not even sure if we learned more mathematics that year or whether we learned how the different concepts we learned in Setswana are pronounced in English. We did not learn much English either. My fluency in English remained poor until I went to university. I think I became more confident to communicate in English during my second year at university.

Richard: So, you grew up in a multilingual society and this made a difference in your schooling. What about in your work as a mathematics teacher? You said that schooling is all in English. Was the multilin- gualism of South Africa an issue in your teaching?

Kgethi: During my first years as a mathematics teacher I insisted on only English in my classroom.

Richard: Why was that?

Kgethi: During that time, African schools were required by law to use either English or Afrikaans as a language of learning and teaching. My school, like many African schools, had selected English. The mathematics examination was in English and all the African learners had to study and pass English as a second language subject, in order to be promoted to the next level. So…

Richard: But you don't hold that view now – what happened to change your ideas?

Kgethi: In 1991, I was invited to participate in a research project. At that time I was teaching mathematics in Grade 11 (seventeen year olds). My learners and I had agreed on a strict language policy for our class: that during the mathematics period all communication must be in English. Watching videos of lessons recorded in my class for the research project, I realised that the learners were not following the policy that we had agreed on, particularly when they were interacting with each other in groups. I then reflected:

> As a mathematics teacher I would like to have my students understand the mathematical concepts and at the same time to have them master English as a language, especially that they learn mathematics in English. Grasping the concepts might mean allowing the

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> students to use the language they understand better; in which case they will be free to communicate in their groups although their use of English will not improve. On the other hand if they are forced to have their discussions in English they may either not do as required or they may withdraw and not communicate enough in their groups (Setati, 1994, p. 189).

Richard: In short, you saw that, although you had negotiated an English-only rule, your students were not able to follow it: they were just careful not to be too public about not using English.

Kgethi: Yes, and through this I learned that communicating mathematically is not neces- sarily learned best if the learners' main languages are not used. I became aware of the possibility that using the learners' main languages to explain some of the mathematical concepts might be helpful.

Richard: That must have led to changes in your teaching.

Kgethi: Yes, one of the changes I made was that I began allowing my learners to interact in any language they were comfortable with. However, their sharing of group work in the public domain of the class was in English. It is this experience that drew my interest as a researcher towards multilingualism in mathematics classrooms (Setati, 1996; 1998).

Richard: I see, you adjusted the rule to fit more realistically with what your students were doing.

Kgethi: What was your first experience of multilingualism in mathematics classrooms? Was it in the UK?

Richard: No, it was as a teacher in northern Pakistan. The children in my classes spoke three or four languages as a matter of course. Although school policy was, like yours, to teach in English, all the children's languages often came into play during mathematics lessons. This situation intri-gued me and raised many questions. Actually, now I can see that, for my students, multilingualism was normal in the way you described already.

Kgethi: Can you give an example of a question?

Richard: A question I frequently returned to was: how do they learn? How do students, working in a language they are still struggling to speak, manage to learn any mathematics? That they did so amazed and impressed me and provoked my curiosity. I wondered (and still wonder) how the use of different languages related to the children's understanding of mathematics. Is mathematics the same in English as it is in Urdu?

Kgethi: A monolingual view of multilingualism assumes that a multilingual person is like a sum of two or more monolinguals. That is not the case. I am sure that while they were learning mathematics in English, which as you say they were struggling to speak, they used a lot of Urdu and any other language they could speak. But why were you as a mathematics teacher bothered about their English fluency if they could do the mathematics?

Richard: In Pakistan, it seemed clear to me that the ways in which my students thought about mathematics was caused by the languages they spoke. On other occasions, however, it seemed obvious that this could not be the case, that the languages they spoke could have no influence on the abstract ideas of mathematics.

Kgethi: It is interesting that the first thing to which you attributed the way they think is language. Could it have been something else that caused the way they think?

Richard: That's interesting – I suppose that is because I am interested in language and, at that time, I was working hard to learn two languages I heard around me. Since I have that monolingual mindset, I naturally saw language as the key factor. At that time, I was particularly thinking in terms of grammatical structure. Now I tend to think about language in terms of practices – ways of using words. Language practices are a subset of social practice more generally. Social practices must also influence mathematical understanding. For example, when cooking, my students would measure out rice in handfuls, not with a scale, or with a measuring jug or cup. This practice, linked in with the many other practices of their society, is likely to shape how they understand quantity and measurement in some way.

Kgethi: From your story, I get a sense that your concern about multilingualism came through mathematics. It was through your work as a mathematics teacher in Pakistan that you became aware of and interested in the issues, while for me it was through my experiences as a learner and teacher. Your question is whether and how our languages shape our mathematics or our mathematics knowledge. In the field of ethnomathematics there is a view that there is not just one mathematics (Barton and Frank, 2001, p. 136).

Richard: Right – mathematics is cultural.

Kgethi: Yes, mathematics is viewed as a cultural activity practised by cultural groups such as urban and rural communities, labour groups, professional classes, children of a certain age bracket, indigenous societies, and many other groups that identify themselves through objects and traditions common to the groups" (D'Ambrosio, 1990, cited in Powell, 2002, p. 17). I suppose ethnomathematics is answering the question, "whose mathematics?" To bring this question closer to us, I can ask, do you think you and me learned the same mathematics? If so, whose mathematics did we learn? When we talk about mathematics, whose mathematics are we talking?

Richard: You make an astute observation: my interest in multilingualism did arise from mathematical concerns, although I was and am also interested in the interaction between mathematics, language and learning. In Pakistan, for example, many people say "one by three" where I would say "a third", or "two by three" where I would say "two thirds". I spent a long time wondering whether this meant we had different conceptions of what fractions were, and whether the different form of words had any effect on learning about fractions. My view at the time was that there were 'fractions', and different linguistic expressions could be used to describe them. If students were processing 'fractions' linguistically, more complex linguistic expressions would result in more complex processing. If students were working with the underlying concepts, the complexity of the linguistic expressions used would not matter. I am now more inclined to a Whorfian position: the linguistic structure influences how students understand and learn about fractions, but does not determine that understanding or learning (see Whorf, 1956, p. 159). Other influences abound, including cultures of learning and knowing and the nature of students' mathematical experiences.

Kgethi: So did we learn the same mathematics?

Richard: No, since the mathematics we have each learned derives from our different mathematical experiences, and is informed by the linguistic and educational contexts in which those experiences were situated. We may have learned similar mathematics, since there is an established field of study that we have both followed, but how we each know or understand particular elements of that field are individual to each of us. Your conceptions about fractions are likely to be different from mine, informed perhaps by the language of fractions used in Setswana and your schooling in English, and so on.

Kgethi: Yes, sometimes I like to think about the mathematics that I do as "mine" especially when it makes sense to me. Whenever I bump into some mathematics that does not make sense to me I draw on my social, cultural and linguistic resources to make sense of it. But how can children experience the mathematics that they are doing as theirs when it is spoken about in a language that does not make sense to them? When I was at school the mathematics I was doing did not feel like mine.

Richard: Here in the UK, there are many children who learn English as an additional language. They must learn mathematics in this new language. Unlike in South Africa, their home languages are often not valued by wider society. Urdu, for example, is widely spoken in some communities in the UK but has no official status. I wonder how many of these children feel, like you, that the mathematics they meet at school is not 'theirs'?

The issue of 'whose mathematics' raises another issue for me concerning how we can research students' mathematical learning in multilingual contexts, when such research necessarily cuts across the different mathematics we have been discussing. Given that research is always mediated by language in some way, how can I research the learning of children who are only beginning to learn English? And how can I make sense of mathematics classrooms in which interaction involves languages I do not understand?

Kgethi: Example?

Richard: During my visits to Johannesburg, we have visited several mathematics classrooms together. In one classroom, we observed a Grade 10 (age 16) algebra lesson. During the lesson we noticed that, although the teacher mainly used English and the students used English to talk to him, students were using up to three other languages as they worked, Tshivenda, Xitsonga and Sesotho.

Kgethi: Yes, I remember.

Richard: Actually, my description is inaccurate. You were able to notice the four different languages. I was only able to notice that there was English and non-English. And you are able to understand, I think, three of these languages. Straight away, therefore, our different linguistic backgrounds mean that we hear different lessons. I hear English interspersed with 'talk', whilst you hear discussions and conversations that happen to be going on in several languages at once.

Kgethi: Children may only be speaking in English but who knows what other language(s) they are using in their thinking? In some classrooms, English is only spoken in the public domain and other languages are used for other private conversations. This is exactly what was happening in the lesson we observed: students interacted with each other in their own languages. In a five-minute conversation in which they were working on an algebra problem they spoke four different languages and there was never a time at which they stopped to negotiate which language to use. I suggest that they spoke in their languages of mathematical expediency. I am sure that this happens in many classrooms all over the world. I have just been reading a paper by Rita Franceschini (1998) who argues that multilingualism is not an extraordinary case as approximately half of the world's population use more than one language in their everyday life. The big issue, for me, is the acknowledgement of the multilingualism that exists in many mathematics classrooms.

Richard: I agree, but the point I am raising is about what I do as a researcher. If the students are discussing an algebra problem in languages that I do not understand, what do I do? How do I know they are even discussing the problem? Should I decide not to venture into such classrooms and only work in classrooms of English-speaking students? Should I first learn all the languages present in a classroom (in the UK, there can be fifty or sixty in a single school)? Should I employ a translator to turn the transcripts into English? The course we have taken is to work together. Although each can never fully know what it is like to be the other, we can engage in dialogue. We can share experiences and attempt to make sense of them from our different perspectives. Indeed, our different backgrounds can be seen as an asset, since we each bring different awarenesses and interests to our dialogue.

Kgethi: You are raising an issue that is common in our field. Most published research in mathematics education is conducted in multi- lingual settings where learners learn mathematics in a language that is not their home language. While the focus of some of this research is not on the use of language, transcripts of learners and teachers' utterances are used to make interpretations about the teaching and learning of mathematics. Whether the researcher has fluency in the multiple languages of the classrooms in which they collect data or not is not as relevant to me as the researcher's awareness of the process of re-presenting that data and its potential consequences.

Richard: Yes, in most mathematics education research publications, transcripts are given in the majority (or dominant) language, usually English. This presumably happens for the benefit of readers who do not understand the languages originally used. For instance, in their recent paper entitled *Teaching mathematics in multilingual classrooms,* Gorgorió and Planas (2001) analyse transcripts that they present in English. As you have observed before (Setati, 2003), in the paper they only give an English translation of the interaction. It is not clear whether the students were using the main classroom language (Catalan) or some of the other languages they knew (*e.g.*, Urdu, Spanish), or a mixture. That's an important omission.

Kgethi: In my work, I approach teachers' and learners' utterances with an understanding that words are not just words, they emerge from a culture and thus the grammatical meanings of any utterance gives me only a clue of the meaning of what is being said. Most of the meaning of what is said is situated and thus has to be understood in context and the language that is being used is an important part of the context.

Richard: How can we do that?

Kgethi: In my recent writing (Setati, 2003) I have suggested that within mathematics education we should seek to highlight the re- presentation of data from multilingual mathematics classrooms by presenting the transcripts used in the languages of the actual interactions. Through this practice, I believe we can preserve the integrity of the interactants and allow our readers to judge the validity of our interpretations. In this way, we can act against what you warn about (Barwell, 2003), the privileging of a small number of languages (*e.g.,* English) and the ways of thinking, seeing and valuing that accompany them. We can also highlight the fact that multilingual classrooms are a norm in many parts of the world and not an exception.

Richard: Perhaps I can sum up the main issues that have emerged in our discussion. It is multilingualism that is the norm in mathematics classrooms around the world, although the particular manifestation of multilingualism varies in different contexts. In particular, multilingualism is not just being able to use a set of distinct languages. In many societies, multilingualism is about living with a changing mixture of languages. In many contexts, the language of the classroom is not the same as the language of the home or of wider society. This is a situation that may mean that students do not feel the mathematics they learn belongs to them; rather, mathematics is imported along with the language. Multilingualism in mathematics classrooms also presents challenges for researchers. Different researchers will see and hear the same lesson in different ways, depending on their familiarity with the languages used. A challenge for mathematics education research, therefore, is to find ways of dealing with linguistic diversity that avoid reducing mathematics classroom interaction to a monolingual (English language) norm.

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From the editor

LAURINDA BROWN

Firstly, apologies to Bob Speiser, Chuck Walter, Tara Lewis and readers for the mistaken signs on page 44, column 1 of their article *Talking through a method* in FLM **24**(3). The paragraph under Figure 9, beginning "Here, to emphasize", should have addition rather than multiplication signs throughout. The calculations can be checked by referring to Figure 2 on page 41, which also appears on the front cover of the issue. On page 32, column 2, the missing page numbers for the Speiser and Walter (2004) reference are 33-39.

Secondly, there are two authors called Tony Brown writing in this issue. In organising the contributors list, I wondered about the order in which to place them. The problem is made more interesting by the fact that they are both A. M. Brown. Given that one of them uses a.m.brown as part of their e-address and the other tony.brown I used that distinction for the alphabetical listing.

How will you know who to contact? Krista Bradford worked with the Tony Brown with a.m.brown in his e-address. This Tony Brown was working in New Zealand at the University of Waikato when the article was under consideration for the journal, but returned (January, 2005) to his post at Manchester Metropolitan University, UK. When the other Tony Brown submitted his article he worked at the University of Hull in the UK, but has now joined the staff of the University of Bristol, UK.