Teaching Mathematics in Multilingual Classrooms: The Global Importance of Contexts

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I. INTRODUCTION

Globalisation is impacting on education, even in the classroom which is very localised site. One aspect of this process is what and the way language is used in the teaching of mathematics. This paper draws attention to mathematics teaching, which inevitably relies on deep communication, in various multilingual contexts. Some examples are there of the variety of possible contexts that do exist. Little research on teaching has been completed that takes these possible different language contexts into account. The question is raised as to whether research results like, the use of informal or exploratory talk in the students’ first language is vital before moving to formal mathematical language, and that exploratory talk may be a situation of broken communication which may not be recognised by participants, are applicable across all contexts.

II. NOTIONS OF GLOBALISATION AND IMPLICATIONS FOR MATHEMATICS EDUCATION

When dealing with notions like globalisation, there are difficulties of definition. In a review of an edited comparative education book, the framework used centred on "The problem of how the global affects the local ... one of the most important areas of research interest within global studies". Yet the editor commented that "nowhere in the book is there an accepted definition of globalisation or any common analysis of its relationship to education. Waters (1995) defined the term globalisation as "a social process in which the constraints of geography on social and cultural arrangements recede and in which people become increasingly aware that they are receding". He noticed that globalisation is often associated with "forces [that] are impersonal and beyond the control and intentions of any individual or groups of individuals". McGinn also makes the point “that the processes of globalisation are compelling rather than invitational, and therefore require careful scrutiny”.

There has been little research on the topic of globalisation in relation to mathematics education. Although there are some references in the literature, more often than not illusions are made to the process without explicitly using this term. The term "globalisation of mathematics education" is taken to refer to the phenomenon of knowledge, logics, values, principles and curricula, developed in a local context gaining a global adherence in such a way as to be perceived as being an inevitable outcome. Briefly noted here are just three issues, among a number of others, in which globalisation is having an impact. They are the mathematics school curriculum, mathematics education research and the reaction of mathematics students in universities.

Robitaille and Travers have discussed the relative similarity of content of school mathematics curricula around the world, and the near universal importance in which it is held. What has given rise to this has been debated at length. Clarkson has noted how curriculum decisions can change depending on which cultural group is dominant in a country, and the political decisions of the ruling group. The colonisation of education systems in developing countries has been noted by Begg (1995) and Clements (1995), and stands it
contrast to calls for increased collaboration from developing countries (Sawiran, 1995). Further to this, Nebres (1995) has argued that developing countries often modelled their curricula on that of developed countries that colonised them, often of course because they had no choice in the matter. In a response to such global imperatives, he has argued for what he calls "an axiom of collaboration ... The more global and multi-cultural we seek to become, the deeper must be our local cultural roots". Bishop (1992) has argued how the "growing mutual international influences of ideas, methods, practices, and expectations" has lead to the difficulties in identifying national perspectives of mathematics education in the different countries. Usiskin also noted "the extent to which countries have become close in how they think about their problems and, as a consequence, what they are doing new in mathematics education". Yet, he goes on to hope that there is not the development of "a common world-wide curriculum; our differences in how they think about their problems and, as a consequence, what they are doing new in mathematics education".

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Turning to research in mathematics education, international research conferences have been criticised in that they are dominated by American and European researchers and their views. Further, these forums often consist of brief reports of research projects that do not allow the discussion of the complexity of issues affecting mathematics education. One of the examples of this was when the writer experienced two South African researchers at a PME conference starting to discuss the crucial methodological differences that come into play when conducting research in South Africa, which at times are quite at variance with notions of good research in western countries. But the time devoted to such an important issue was swamped by the needs of the conference timetable. There has also been criticism of the other major way that research ideas are disseminated. It was observed sometime ago that most articles in JRME were authored, or at least co-authored, by students affiliated with universities in North America or Europe. This situation does not seem to have changed, and it is probably true for the other major research journals in our field (ESM, FLM, and MERJ). Again it seems that the forces of globalisation are making an impact on how can we disseminate our research? It should not be assumed that globalisation is short hand for Americanisation, or more generously westernisation. However in the cases outlined above this is clearly the case.

More recently, in a project focused on higher education, Clarkson and Atweh (2002) set out to research the impact of globalisation in mathematics education. In analysing focus group data gathered from colleagues in Mexico, Brazil, Columbia, New Zealand and Australia, there have been a number of consistent topics that educators have discussed. These include issues that have their origins in the economic/political debates on globalisation, but which have been reflected on in terms of mathematics education practice in higher education. An example that has emerged consistently as an issue is the impact of technology, and in particular email contact with peers in other countries. A political issue has been the influence of aid or research projects funded by such bodies as UNESCO or the World Bank. It has been noted that such projects often assume that western theories of education and western forms of curriculum, including assessment practices and their results, must be usable, important or indicate appropriate change in all countries. Another issue to emerge, more aligned to education, has been the nature of mathematics and whether it is a type of world wide language, or whether Western Mathematics is a cultural tool being used, albeit unwittingly but often, as a hegemonic, globalisation form of disempowering local mathematics and/or mathematical practice. As a counter to this, one group spoke of the rise of ethnomathematics, which in some way arose as a local disruptive force to the all embracing push of Western Mathematics. In turn ethnomathematics itself has spread beyond its original local environs. Clarkson and Atweh (2003) used a survey to follow up some of these issues with colleagues in Australia and New Zealand. They found that participants thought it was to be expected in mainly English speaking Anglo western cultures, such as those found in Australia or New Zealand, that most resources they used, and indeed the research they carried out, would be from within this cultural basis. However some suggested that it was a different thing if we uncritically viewed, for whatever reason, that what we practice and believe is, or indeed must be, universal or it may be the best possible option, no matter what the cultural context. The outputs suggested that there was quite a divergence of views that respondents held on this issue. There did seem to be a trend for colleagues who had experienced and observed at some depth non western cultures to appreciate more deeply some issues thrown into relief by the notions of globalisation, such as this one. There also seemed to be a wish for global collaboration.

Hence there is disquiet with what appears to be the impact of the global, and that this will leave no room for the local. The talk of collaboration may be an answer, or it may simply pave the way for the triumph of the global.

III. LANGUAGE AS A GLOBAL ISSUE FOR MATHEMATICS EDUCATION

The role of language is clearly another issue involved in the globalisation debate. When the United Nations (UN) came into being in 1945, there were a number of languages that would be deemed to be the languages of common use within the UN. For practical purposes of communication some designation had to be made. This is usual and happens in many places throughout the world. However with such decisions comes the danger of dominance of the cultural milieu within which that language exists. It is not surprising than that a language debate in
the context of the broader globalisation controversy should be a matter for mathematics education as well. Little has been written directly on this issue. However there are two issues which can be examined and observed. The first is the dominant use of English in research conferences and in research journals. This paper will concentrate on the other, language use in the mathematics classroom.

It may be useful to start by sketching in one view of the mathematics teacher in a classroom. In a recent forum that the author attended, deliberation was given to what might be some characteristics of an effective mathematics teacher. Some of these were that the teacher:

- understands mathematical reasoning, connections and proof,
- understands how these manifest in learners and how to scaffold such learning,
- encourages student inquiry and thinking for themselves,
- allows students to negotiate their own learning,
- recognises and enhances students’ mental strategies, and
- understands the sequencing of mathematical development.


What is interesting about these characteristics are the way they depend on effective communication between teacher and student(s). It is one thing for the teacher to understand this or that about mathematics, but the skills to recognise a particular ability in this learner, or provide scaffolding for that educator, in part depends on adequate communication. How do you encourage a learner to negotiate their own learning, and recognise and help a student hone their preferred mental tricks and then explore others, if you can not effectively communicate with them? These characteristics assume that there is meaningful and deep communication between the teacher and students. Such communication moves beyond the surface conversation of greetings, and perhaps chatting about the weekend sport that might be of interest to the student, or even of commenting on the latest news in newspapers or on the Internet, although being having ability to do this is also important for teaching. But the type of communication embedded in the above list of characteristics deal with cognitive functioning at a much deeper level when nuances of academic ideas not only elaborate the students’ thinking, but also become the heart of the mathematical concept that gives it its power.

In one sense one might argue that these characteristics are universal in the teaching of mathematics. But what if the culture we are considering does not condone children asking questions of adults? What if the culture prefers memorisation to scaffold? Will these characteristics still applicable? In my view it may well be that this is quite open to question. However it also seems to me that some type of clear communication between teacher and student is crucial to effective teaching no matter what the culture, and hence this notion of communication can be recognised as a universal aspect. How to communicate may be an issue more for the local than the global to edict.

IV. NEW CLASSROOMS AS A GLOBAL ISSUE

Before delving into the issue of why it is useful to look at the impact of globalisation on the language of the classroom, and in particular the teacher in this context, it is useful to review recent changes in classrooms, or at least the recognition of these changes. For the present purposes these revolve around cultural, linguistic, and social issues in learning, issues that until recently have been often seen as distant to and have little impact on the teaching and learning of mathematics.

Culture can be understood as knowledge, beliefs and conceptions about particular situations. However they can also be understood as a pattern of meanings, historically constructed and socially transmitted, that are embodied in symbols and language, through which human beings communicate, perpetuate and develop their knowledge and their understanding of life. The social transmission of such is clearly what happens in a classroom. However in many classrooms this is not as straightforward as it might often be supposed. For many teachers and schools, as well as much educational research, the common understanding of the ‘normal’ learning context for students is it will be a classroom that is ‘monolingual’, students will belong to the dominant culture, and they will have the social habitus of the middle class. If students are different in any of these three factors, then they, that is the student, will need to change. It is simply assumed that students know the ‘norms’ of the school, and the norms are often built around what middle class members of the dominant culture expect of children. As well, it is taken for granted that students have already a mastery of the language of the instruction and its subtleties, and this is some how automatically linked by the students to the discourses of different subject taught in the school. Interesting in such classrooms and schools, the assumption is often held that mathematics is free of culture, beliefs and values, and hence it is a small step to make the subsequent assumption that mathematics can be taught in the absence of a common language because it is ‘universal’.
... But this scenario is simply not the case for most classrooms throughout the world. In most places, students who are monolingual are not the total population of a classroom. Although there will be classrooms that have most children from a dominant culture, most classrooms will have students from a mix of cultures. And clearly again most classrooms will have a mix of socio-economic classes in them, although there will be many exceptions to this. Hence most classrooms will be places where different cultures are present, that is multiculturalism in a microcosm. This clearly brings challenges for pedagogical traditions of teaching, including mathematics teaching. It is no longer acceptable to assume that the answer is simple; that is, the students will have to change. Multiculturalism also has interesting ramifications for the broader school contexts within which individual classrooms sit, such as the forms of socialization that the organization and management of such schools promote, that in their turn clearly flow into the classroom, although we do not have room to pursue this notion here. Why this simplistic notion of the classroom has grown up and become the dominant view in the research literature, against which other situations are judged and either similar or vastly different, is an interesting question. It may be with the domination of research by American and European academics, they are reflecting what they take to be the common view for them, and this becomes the norm for the rest of the world. This is an example of the globalisation of an idea. The rest of this discussion examines this notion more fully and shows that this is clearly not the case for many, if not most, classrooms. Hence there is a need for change to what our research attends.

There are many processes that may bring about a mix of cultures, and for this discussion, languages, in a classroom. The phenomenon of migration is one of these. Migration can no longer be considered only as an ‘emergency situation’ for refugees, although there is a global increase in the number of refugees. However whether migrants are refugees or not, the result is we do have many adults and children living in places where the language and the culture are different from that of their origin. Clearly this has implications for classrooms. Another mixed culture/language classroom situation arises when the teacher may be from one culture, probably the dominant culture, but the students come from a non-dominant culture. There was a short documentary shown on Australian television recently that showed three Vietnamese women from an urban area, travelling to a remote mountain district of Vietnam to start three primary schools in adjacent rural villages. Each of them had to cope first in learning some of the local vernacular of ‘their’ village, and then begin teaching the children Vietnamese, and through Vietnamese some other areas of the curriculum including mathematics. Clearly there was an interesting mix of cultures operating. Other situations will be noted below. However these two examples, particularly that of migration, show how a global force is impacting at a very local level, and the result is never a simple mix of cultures, but indeed the process of hybridity is set into motion. It remains in the rest of this discussion to explore more of the details of the local context, the classroom in this instance, and the teacher’s role in particular.

V. THE VARIABILITY OF MATHEMATICS MULTILINGUAL CLASSROOM CONTEXTS

What then of the mathematics classroom, set within a multilingual scenario? It is clear now that mathematics teaching and learning is a process where cognitive, affective, emotional, social, cultural and linguistic factors are deeply interwoven (Bishop, 1988; Ellerton & Clarkson, 1996; d’Ambrosio, 1985; Lave, 1988). Further, the multiple links among these factors makes the teaching of mathematics a complex task, which becomes even more complex in multilingual or multicultural situations. In a classroom, neither the teacher nor the researcher may now assume that they are part of a homogenous group. Indeed there should be a recognition by the teacher and the researcher that there is a great heterogeneity amongst the several multicultural situations that can, and probably do exist in any one classroom. As an aside, this complexity of the research context requires the use of a multi-layered theoretical perspective, and a great sensitivity towards the different cultures that may be present. But more centrally, the critical question becomes, what does this heterogeneity do to the free flow of ideas in a mathematics classroom, difficult at the best of times given the abstract nature of the mathematical domain, and normally dependent on language?

The notion of the multilingual context of many classrooms is itself misleading. In fact there is not such ‘a’ context, but this term should be used as a general term covering many different contexts, something that has not been noticed in the research literature. Some of these contexts are:

- monolingual teachers teaching a stable mixture of monolingual and multilingual migrant students, with the multilingual students speaking a number of different languages (e.g. urban schools in Australia),
- monolingual teachers teaching classes of multilingual students all speaking the same language (e.g. Caucasian teachers and Hispanic students in parts of USA),
- predominantly monolingual teachers faced with an influx of new migrant students with different languages (e.g. various urban areas of Italy, Spain and Portugal), and
- multilingual teachers teaching multilingual students in a specified teaching language being neither the first language of either teacher or students (e.g. Papua New Guinea, West Timor).

These examples are related to real life situations. To extend this notion somewhat, it is useful to start trying to generate theoretical teaching contexts by considering some of the possible interacting sources of language in a mathematics classroom.
Clearly one of these is the students’ language or languages, then there is the teacher’s language or languages, as well as the official teaching language, and less often languages, that will be deemed to be so by the government. There is also the common language that will be used in normal conversation, which may be quite different to the official teaching language, or may be just a variant of it. For convenience this will termed the lingua franca. Then there is the language used to teach mathematics, which varies in a distinctive manner to both the official teaching language and the lingua franca, although it will probably overlap both. A first attempt to show these components of the teaching situation is found in Table 1.

Table 1: Languages used in the teaching contexts for mathematics

<table>
<thead>
<tr>
<th>Languages</th>
<th>Official teaching language</th>
<th>Lingua franca</th>
<th>Language of teaching for mathematics</th>
<th>Student’s first language</th>
<th>Student’s second language</th>
<th>Teacher’s first language</th>
<th>Teacher’s second language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Teacher</td>
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</tr>
</tbody>
</table>

Table 1 has been devised to try and show the potential language complexity of a classroom. However a particular classroom may well be a context where some of the columns included to the right may in fact overlay the first three. Take the situation in Australia where we have a student who is a monolingual speaker of Australia’s version of English. The teacher is also such a monolingual speaker. The official teaching language is also English. Now even in this situation most teachers will argue, I think quite correctly, that the language used between students out of the classroom, and probably between the teacher and students out of the classroom, will be a variant of the official teaching language. Hence I will still use the term lingua franca in this context, although the term is used loosely at this point. We also know that the language actually used to teach mathematics is not identical to either of the official teaching language, nor the lingua franca. Sometimes the differences are subtle when a common English word takes on a particular fixed meaning in a mathematical context (eg. set, circular, half). There will also be more use for instance of logical connectives (for example; but, if, and) because of the mathematics (see Clarkson, 2003). Within this context it is common teaching advice to move from the lingua franca, perhaps through the official teaching language, and onto the particular teaching language for mathematics. This strategy seems to be a good one for these students. If Table 1 was used to chart what languages the student and / or teacher was experiencing, then only the first three columns would be needed. We would have a very simple chart indeed. One in fact that resembles the traditional view of a classroom described above.

But this simple picture is not all there is to say. Again take my own situation in Melbourne in Australia. In many primary classrooms, the teacher will be a monolingual English speaker, the official teaching language, who is also well versed in the English lingua franca, and may have a reasonable grasp of the mathematical language that is needed. However one of her students is from a recent migrant family from Vietnam. The first language this female student learnt at home was Vietnamese, and this is the language normally used in the home. She actually never really started to learn English until she went to school. Now in grade 2 she is able to have conversations with other students in the English lingua franca of the playground. However she uses her first language with her Vietnamese classmates both in and outside of the classroom, and of course in Saturday school which they attend at the Vietnamese community hall. With the language she has learnt and still uses at home, Vietnamese, she has also learnt many norms of behaviour that may be quite different to others in the classroom. On the next table in this classroom a boy sits who has a similar story. But his family came from Greece 20 years ago, and although he was born in Australia, Greek is still spoken in the home and most family friends and activities are within a strongly knit Greek community. And so on around the room where we may well find something like six or more languages represented. Table 1 can not hope to capture all of this variation. However if a chart like Table 1 was drawn up for each student, then within the pile of charts we may start to see the complexity with which each student has to deal, and the teacher likewise.

Many have seen this complexity as a difficulty. And if the teacher makes the traditional assumptions of teaching in a homogeneous context already briefly outlined above in an earlier section, there is no doubt a very great difficulty. But trying to map the complexity is one way of being able to deal with it, and perhaps see that there can be advantages within the complex nature of this classroom context. In the first approximation attempted here, there are aspects of the context that have not been addressed. For example, there has been some hint in the description of the classroom that the competencies with the different languages may be variable for students and teacher, but this is not shown on any student chart based on Table 1. There are also other sources of language in a classroom. Clearly written language is one, be it board work, books, either texts or more general, and computer screens to list three possibilities. But these may be considered as derivative sources since each is at least in part dependent on the official teaching language and perhaps the language of the teacher. Hence although charting the context in the above manner may be useful, it is still too simple and should not be taken as the reality. However for the purpose of this discussion the above process does start to detail the nature of the language complexities in many classrooms in which
VI. THE ROLE OF MATHEMATICS TEACHERS IN MULTILINGUAL CLASSROOMS

It seems useful to start the consideration of the role of the teacher in this often complex, linguistic situation by looking at available research. To this end, volumes from 2000 to 2003 of four international research journals (Journal for Research in Mathematics Education, Educational Studies in Mathematics, For the Learning of Mathematics, and Mathematics Education Research Journal) where scanned. In looking through the English written contributions (about 300 articles) there are a reasonable number, and perhaps understandably so, which have students as the central foci. However there are very few articles that focused on the teacher’s role. That in itself is worth noting, with the clear implication that more research is needed to clarify the roles that teachers may play in multilingual classrooms. Secondly there seemed to be little if any importance attached to the specific language context that the teacher was in, and the impression is given, may be inadvertently, that all such contexts can be treated as the same. It is this issue that forms the crux of this discussion. It has been shown above that there are many different contexts that have been clustered together under such headings as, ‘Teaching mathematics in a multilingual situation’ as occurred at a recent research conference. This issue will be pursued by noting a number of different contexts that are portrayed in the literature, even though the authors of the contributions did not see the specific context as an important notion in itself on which to comment.

Multilingual teachers, multilingual students who share a language

South Africa, where students’ normal out of class talk (their lingua franca) is in a non English language but where the official teaching language is English, was the setting for research undertaken by Setati and Adler (2000). They discussed the language practices of teachers in some primary schools, and in particular their code-switching behaviour. Although they suggest that it makes a lot of sense for teachers to encourage students to code-switch, and to actually use this as a teaching strategy, they also note that there are challenges in this practice that can not be overlooked. At times it seemed to the authors that teacher talk is down played in some curriculum reforms, that incidentally have their origin in non multilingual situations, and yet it is teacher talk they suggest that often illuminate ideas for students. Hence such an emphasis in official documents may well be counterproductive. The authors note that it is important to understand the role of different types of discourses. For example starting with informal talk in the students’ first language, leading through to more formal mathematical talk finally in English, is a critical path to use in such complex lingual communicative situation.

Multilingual teachers, multilingual students, teacher / students may share a language

In Papua New Guinea, typically students in a classroom will share a lingua franca, although this may not be their first language and indeed they may well speak a number of other languages too. The teacher may speak the common student language if s/he comes from the same region, but will also be multilingual. Up to year 3, schools can choose which teaching language, but from year 3 the official teaching language is English, although teachers are encouraged to use a mixture of languages if possible through years 3, 4 and year 5. Of interest to this discussion, there is a suggestion based on classroom observations that although there is a judicious use of languages in social studies, religion and so on, teachers seem to prefer English only when it comes to teach mathematics. It seems that it is often difficult dealing with mathematical concepts in a vernacular or Melanesian Pidgin. This raises another interesting question. Teachers are encouraged to use indigenous mathematics in the school curriculum. However what has not been answered satisfactorily as yet is whether crucial nuances will be lost in the very act of translation into English of say a measurement practice, and hence embedded cultural meanings may well be marginalised. Should then the Ministry’s rule of using English be sidestepped so that the cultural meanings can be explored, if the teacher has command of the appropriate first language?

Bilingual teachers and students with languages common to both

Moving to the USA, Khisty and Chval (2002) contrast the teaching styles of two bilingual teachers who were teaching groups of Latino students. The two classes were of different levels in English proficiency, and hence there was more frequent use of English in one classroom than in the other. However that is not the critical thrust of their paper. The underlying emphasis is that bilingual students will not learn this type of English, which they need, unless they are witnesses to quite deliberately displayed examples of such discourse.

Multi or monolingual teachers, multilingual students speaking the same language

In some areas of the Northern Territory in Australia through the 1980s and early 1990s, there was political support for the use of the people’s first language to be used as the teaching language, at least in the early years of schooling, with a gradual move to English in later primary years. Further, there was insightful curriculum work carried out to devise mathematical curricula that commenced in the early years of schooling with Aboriginal ideas. Hence in one area in the desert, indigenous spatial ideas became the basis of the early years curriculum, where as on the north coast the notions of relationships were used as the key framework concept. In these instances not only were the teaching languages changed to that of the students and community, but the mathematics curriculum too was totally transformed. What then of the teacher? If the teacher was also of the local indigenous people then clearly there is the situation that they share the same first language, and switches into English could be negotiated within a particular classroom situation. However where the teacher was not of the same language group,
and then more often than not, a monolingual English speaker, such negotiation was not an option. Thus there are sometimes similar aspects to these situations to that of classrooms in Papua New Guinea, and yet as well, distinct differences.

**Monolingual teachers, new migrant students with a mixture of different languages**

Gorgorio and Planas (2001) were working in classrooms, where the teaching language was Catalan. The students were a mixture of Catalan, and immigrant students who spoke a variety of languages at home. The authors suggest it was very hard to separate the social, cultural and linguistic aspects of mathematics teaching and learning, something already noted from Papua New Guinea and Australia. Indeed they took the view that it was better to think of broader communication within the classroom than a narrow linguistic one, although language aspects could not be ignored. In particular they suggested that in such situations as these the informal or exploratory talk could often be broken communication, particularly for the teacher, since this inevitably occurs in the students’ first languages. Therefore helping students to move to the more formal mathematical talking and writing, which often involves a switch to the language of the classroom, can be fraught with unknown linguistic set backs for both teacher and students. Others who have also commented on this situation are Alro, Skovsmose, and Valero (2003), Favilli, Oliveras, and Cesar (2003), and Moreira (2003).

**Monolingual teachers, stable mixture of monolingual/multilingual migrant students**

In Australian urban schools, many monolingual teachers teach a mix of multilingual students. It would seem however that few teachers realise the role that a first language plays for these students. This is summed up by the total surprise of a primary school teacher, who had recently completed graduate studies in Teaching English as a Second Language, when she discovered how often her year 4 Vietnamese students were switching languages when doing mathematics in her class. Although there has been advice on the difficulties non English speaking migrants can face in mathematics classes, little has been done to study the teaching of them in any comprehensive manner.

**Advice for a new context?**

In Malaysia at the beginning of the 1970s in Malay schools, the teaching language was changed from English to Bahasa Malay. This was done mainly for political purposes. However from 2003, due again to a political decision, although the main teaching language in classrooms remained Bahasa Malay, the teaching of mathematics and science reverted to English. This has clear ramifications for teachers of mathematics. It is an interesting exercise to wonder what advice, if one was asked, could be given to the teachers. The context is that the teacher are at least bilingual, although their command of mathematical English may vary in quality. The teachers will share a non English language with their students. The students are also multilingual, but their command of mathematical English is probably not great. So this situation is probably akin to the context of bilingual teachers, teaching multilingual students who share a language. On this analysis the Malaysian situation is perhaps closer to that of Papua New Guinea than the USA, but given the different use of teaching languages for different subjects, it really is yet again a new category.

**A note of caution**

In Pakistan, Halai (2004) has been working with students who share Urdu as their first language, as does the teacher. The official teaching language in these schools however is English. The teacher has been taking the notion of understanding the language of the problem seriously and hence encouraging the students to code swap and to use informal English before moving into formal mathematical application. This approach is described as “classrooms where the teachers were using reform-oriented teaching approaches”, clearly influenced by US teaching reforms. However she comments that “My observation … showed that the teachers’ use of everyday words for mathematical concepts led to difficulties for the students. … using discursive strategies to teach mathematics where students are expected to build on their knowledge of the everyday context and language takes on an added complexity in a multilingual context. This complexity arises because of possibly unquestioned assumptions regarding students’ familiarity and understanding of the language of the language of instruction”. Again the apparently good notions for teaching taken from one context and applied to another may not be such a direct translation process as is so often implied in the literature by omission of the detailed language context.

**VII. CONCLUDING REMARKS**

These brief descriptions emphasise that the issues of teaching in multilingual contexts is not straight forward. The teachers need to cope in situations where they will not have full control of the discourse, unless they too are proficient in the students’ language(s), the lingua franca, as well as the teaching language. However the flow from informal verbalizing of ideas through to their formalising in the rich mathematical language, both verbal and written, seems to be a given across the contexts. How to manage the flow is the issue that’s needs further insightful research. In particular, what implications will the differing contexts have on this, needs exploration.

A further issue that becomes self evident in looking through the literature is the use made of English in so many contexts. The same criticisms that have been made of research conferences and journals in mathematics education may well apply to the policies invoked in many countries. A number of supportive arguments can be made for the deeming of English as the official teaching language for mathematics. However there are negative arguments as well, which do not always seemed to
be considered to any extent. One of them clearly demonstrated here is the complexity this adds to the language environments of many classrooms. Another negative argument, only touched on in this discussion, is the added difficulty of cogently teaching the mathematics that is embedded in the students’ culture(s) when a foreign teaching language is used. Another issue is the ease with which curriculum developed in an English speaking environment can flow that much more easily to multilingual contexts. This may well be intended of course. But the potential danger is in this process that the values, which may be unarticulated and deeply embedded in that curriculum, will also flow although and not be explicitly recognised and examined by the recipient group. Hence the recipients may be accepting values for which they are not prepared.

This paper began by using some notions that are important in the ongoing debate concerning globalisation. It was shown that the ways languages are used are both in disseminating research on mathematics education and indeed what happens in the classroom are influenced by differing degrees by this process. Many classrooms in which mathematics is taught are indeed micro sites of multiculturalism. With the recognition that mathematics itself, and more clearly what and how mathematics is taught, is influence by culture, language and the social milieu of the classroom, school and the wider society, deeper and complex issues for research immediately become the foreground. In this paper the different contexts and situations that arise with language have been briefly explored. There was no attempt here at deeply analysing the implications of such complexity, suffice to say the differing types of contexts that give rise to multilingual situations should become an important variable considered in future research. This recognition should also give pause to policy makers and curriculum developers before wholesale implementation of good practice in one setting is transferred to a new context. The often unspoken assumptions of globalisation imply that all contexts are the same. But the local is just as important, if children are to learn something of mathematics that will be of use to them.

REFERENCES

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