

**THEMATIC WORKING GROUP 10**  
**TEACHING AND LEARNING MATHEMATICS**  
**IN MULTICULTURAL CLASSROOMS**

Núria Gorgorió

Universitat Autònoma de Barcelona (E)

Bill Barton

The University of Auckland (NZ)

Ed Elbers

Utrecht University (NL)

Franco Favilli

Università di Pisa (I)

**INTRODUCTION TO THEMATIC WORKING GROUP 10:  
TEACHING AND LEARNING MATHEMATICS  
IN MULTICULTURAL CLASSROOMS**

Núria Gorgorió (Universitat Autònoma de Barcelona, E),

Bill Barton (The University of Auckland, NZ) and

Philip Clarkson (Australian Catholic University, Melbourne, AU)

In several European countries, and indeed in other parts of the world, the great majority of teachers may now expect to work with pupils from ethnic, linguistic, and cultural groups distinct from their own. Cultural, linguistic, political, and social issues in mathematics learning have until quite recently been often seen as distant to and have little impact on the teaching and learning of mathematics. But the problems of ‘others’ that are ‘different’ from ‘us’ are now a reality. If mathematics education is to become an equitable practice, then these issues need to be seriously addressed in most of our classrooms.

The TG10 group that met at CERME3 strongly believe that what can be learnt in the researching of the teaching and learning experiences of multi-cultural, multi-ethnic and multi-linguistic groups can be useful to the research field of mathematics education in general. Multicultural classrooms are research sites that can offer new insights into socio-cultural theory, methodology and practice. Even though researching multicultural and multilingual situations is a complex task, it may broaden our understanding of teaching and learning in general, because it foregrounds research questions that are not often addressed in more homogenous classrooms.

In Group 10 we were particularly interested in theoretical, methodological, empirical, and developmental work that addressed one or more of the following issues: the meaning of the term "multicultural classrooms"; identity in multi-cultural, multi-ethnic, multi-linguistic classrooms; language, communication and discourse in multicultural classrooms; gender and ethnicity in multicultural classrooms; learners' transitions between home and school numeracy practices; lived experiences and expectations of teachers, parents and students in multi-cultural, multi-ethnic, multi-linguistic contexts or communities; relationships between school policies and practices in the multi-cultural, multi-ethnic, multi-linguistic classroom; teaching and curricular strategies that promote inclusive classrooms; issues related to teaching and learning of migrant children, refugees, and returned emigrants.

During eleven intense working hours, fourteen papers were discussed and reflected upon by more than twenty participants in the group. The group itself was multicultural and multilingual. Scholars from more than a dozen countries and many

different linguistic backgrounds were present and joined a discussion that was taking place mainly in English, but quite often we broke into other languages so that all participants understood particular nuances of the discussion. This was a discussion that was approached from the academic perspectives of mathematicians, mathematics educators, linguists, language educators, sociologists and politicians. It was a discussion around ideas coming from different personal and research interests, and different experiences and expectations.

The papers were presented in a way that lead to interesting discussions around several aspects. One of those aspects was the understanding of the role of the teacher in a multicultural/multilingual setting. In particular their attitudes and strategies of teaching, as well as their way of seeing their own practice and their students' learning processes were important foci. The understanding of general teaching practices in the complexity of a multicultural classroom also emerged as an important issue. Thirdly the understanding of how particular teaching strategies, such as peer collaboration which appears to be particularly effective for the development of students' participation in a wide range of cultural settings, were discussed.

There was an agreement within the group that nowadays the teacher education process is beginning to promote a teacher profile that is more highly sensitive to, and has a more positive attitude towards, multicultural and multilingual situations. But both pre-service and in-service teacher education is still far from providing teachers with tools and strategies to face these growing and complex challenges of changing classroom settings.

Another topic addressed by several papers was linked to the presence of different cultures within single mathematics classrooms. Cultures can be understood as knowledge, beliefs and conceptions about particular mathematics topics. 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. Multiculturalism poses challenges for pedagogical traditions within mathematics classrooms, and the the forms of socialization that organization and management of schools promote. The particularities of these challenges were also discussed within the group.

The learning and teaching of mathematics in a variety of non-homogeneous linguistic situations was also discussed. These situations include classrooms where the language of instruction is different from the language of the students, the teaching of recently arrived immigrant students in an 'English speaking country', to the teaching of mathematics in English in a country whose official language is not English. The issues discussed included how communication and learning take place when the languages spoken are not shared, how the fluency of the language of instruction is related to the mastery of mathematical discourse, how using a particular language is linked to different ways of learning or facing a particular mathematics issue or topic, and the strategies used by students and teachers when facing the challenges posed

when the language of instruction and the language of all or some of the students differs.

There was an agreement that more research is needed on the learning and teaching of mathematics in multilingual situations, and that researching such complex settings would allow a better understanding of the relationship between language, mathematics, and mathematical understanding in general. There was also agreement that the complexity of multilingual situations poses new challenges and demands on teachers, curriculum, schools, policies and, of course, also on researchers.

The time devoted to discussing each paper was enough to allow consideration of how each presenter's work contributed to the understanding of the pupils' cultures and of school policies with regards multicultural issues. We also began to understand how diverse research approaches contribute to the understanding of theoretical frameworks and research methods, and we gained insight into their appropriateness and/or limitations.

Some time was devoted to general discussion of four different but intertwined issues; namely the relationships between theory and practice, what were good research questions to address, theoretical perspectives, and methodological questions. Although these four issues overlap, they did serve as useful nodes for the thinking of the group.

Regarding the relationships between theory and practice, there seemed to be agreement that there is a need in mathematics education for the explicit understanding of and using of theory. This means we need to clarify our notions of theory. As well we need to be proactive in allowing the interplay between theory usage and theory development.

Regarding the relationships between teachers and research, we asked how could we better use the questions of teachers to drive research. What teachers have to contend with in their day to day teaching experiences may not readily match the rhetoric of university thinking, and this does lead to a gap between university knowledge and teacher knowledge. These can give rise to potential dilemmas that need to be kept under scrutiny. In our research, we need good practical descriptions of teaching within multicultural classrooms, which may be best generated by teachers. This would give us the context in order to inform the research questions developed perhaps by teachers in consultation with university staff. In other words, the culture of the practice of teaching should be a rich resource for research questions and may well lead to possible ways forward in our theorisation as well in our attempts to help generate more insightful practice. It is probable in this dialog that the university perspective with its wide ranging resources and knowledge of theory may well give a general frame for such teacher generated questions. Hence a dialogue between the two is needed, as both teachers and researchers stand in the overlap of their domains.

In thinking of the relationship between theory and practice when working with multicultural issues, we should recognise that society will also frame questions for us.

For example, the statistics that get generated by the bureaucrats are in themselves a societal set of questions which can be used by us as a resource. At times we need to address these. Such discussions also need to address the political angles as well as the more obvious 'pure' educational issues. We need to learn how to deal with the politicians, who will also be framing their questions and perhaps not the logical answers that may flow from the statistics generated.

This brings the relationship between audience and research to mind. The notion of audience has not been explicitly addressed within the mathematics education community to any great extent, but needs to be addressed in a much more coherent manner. Each audience will take from our research what they will, because they come to it from their own frame of reference. We should at times try to become aware of their reality and communicate in such a way that addresses their context as much as our own. This is not always possible, but the attempt is never to be ignored. From time to time we must communicate/write/speak to other audiences (eg. for example, teachers, bureaucrats, text-book writers, politicians) in language they can understand.

Regarding research questions, the difficulty in producing insightful questions was discussed at length. It seemed better to develop some of the background thinking within which the questions may sit. The discussion focussed on language, but an analogous discussion surely follows for culture. When discussing the complexity of language linked to mathematics education four practical difficulties were identified. These were:

- (i) different 'levels' of language (families of languages, distance between languages)
- (ii) different language contexts (indigenous, multilingual, immigrants)
- (iii) contexts within language (for example, speaking, listening, writing, reading) as well as the immediate context (conversational compared with academic)
- (iv) content realities (cultural, social, political).

There were also four theoretical issues identified, although there are clearly more:

- (a) the structural relation between language and mathematics;
- (b) the register and discourse relating to mathematics;
- (c) the interactions in the classroom;
- (d) the different theoretical tools and approach (eg. linguistic approach, Vygotsky social/cultural approach, education didactic approach).

Regarding the theoretical perspectives, the interplay between mathematics education and other fields was discussed. There seems to be little written on how we make use of theoretical perspectives that come from outside our own area. The question becomes how to use these other perspectives, without using just the surface features of the theory only. Another aspect of this issue is how to properly appreciate the

depth of the ‘other’ approaches. We need to be explicit about what theories we are using and how we are using them.

We need to guard against never theorising within mathematics education, but only using other perspectives to look in on our own context. The responsibility for theorising our own field rests with us. How do we do more of this? Is there an infrastructure or *modus operandi* that will encourage us to theorise more? However, in taking such an approach, this should not prevent us using something from another field, perhaps as a start for our own new thinking.

More generally, we are involved in the creation and recreation of ideas. There will always be a tension between using others’ ideas, and understanding the original reference framework of those starting ideas. Therefore, we need to spell out the way we are using an idea, how it is to be understood in our reference frame, and just as importantly how it is not to be understood within our reference frame. We saw as extremely important when researching mathematics education in multicultural contexts, the need to establish a dialogue with other communities as well as our own community.

When addressing methodological questions we agreed that the research completed in multicultural situations must make explicit the context within which the research is situated. This is crucial when developing research questions and methodologies in mathematics education. The construction of mathematical concepts and mathematical knowledge incorporates the reality of each individual and, in particular, the context of their learning experience. In trying to be explicit about context, group terms such as ‘immigrant group’ can be too general, as are the terms African and Asian. We need to adopt more specificity in the terms we use, and always exercise care with them. Other fundamental cultural issues can easily be overlooked. For example, the importance of mathematics in schools may be quite different in different countries. This can impact on the discourse engaged in within the community and in classrooms. We need to make the context explicit in our writing so that our readers have some hope of partially entering into our viewpoint.

Another reason why the audience for our research is also of crucial importance is because it conditions how our research is written up. This should be regarded as a methodological issue and addressed explicitly. Hence, for example, a purposeful decision should be made early in the life of a project on what type of language should be used to explain the methodology when writing a research report.

In particular, research journals may be considered as audience: How do we mesh what we want to write with the ‘form’ that is expected by specific research journals? One particular aspect of this issue is that we are now having to report more and more in English. What happens to the nuances that may get lost when the original thinking and research was in another language? How the diversity, language in this example but it is only one of many such dimensions, within a research project is dealt with can be crucial to a study.

Another example of reporting research to an audience was indeed the very process we found ourselves engaged in within our working group. Our working group was itself a multicultural group and we were reflecting on our practice and that of others together, and not surprisingly there appeared some conflicts in the understanding of a number of basic constructs. However, since we constituted a real community of practice, we found ways to develop a rich process of meaning negotiation that made the meeting a rich experience for all. Within this multicultural experience, there were important shared commonalities regarding the understanding of pupils' cultures, of the researching and teaching strategies, and of the school and educational policies.

Among the agreements that the group came to is the acknowledgement that the research completed in our field can be justified on a number of grounds. There is its contributions to the field of mathematics education in general. Another contribution is the impact it may have on the understanding of the complexity of the teaching and learning of mathematics in multicultural situations, and the possible benefits this may have for a more equitable society. There is also the notion that the researching of the teaching and learning of mathematics in multicultural situations is closely linked to the phenomena of migration. Migration can no longer be considered only as an 'emergency situation'. There is a global increase in the number of refugees, migrant people and children living in places where the language and the culture are different from that of their origin. Hence the contributions that this research makes can also be seen in the context of a growing social global phenomenon that many societies see as a problem rather than as an opportunity. Such a context is important to consider given the traditional narrow focus that many teachers of mathematics at all levels hold, and which we consider next in some detail.

There is still an assumption among many mathematics educators that mathematics is free of culture, beliefs and values. This assumption holds that mathematics can be taught in the absence of a common language because it is 'universal'. For many people, the common understanding of the learning context of a student is 'monolingual', belonging to the dominant culture, and having the social habitus of middle class. Such an assumption does not countenance that there is a reciprocal dynamic; learning is influenced by language and culture, but language and culture influence what is taught. For them, the mathematics classroom is not the best place to learn the language and the norms of the school. It is taken for granted that students have already a mastery of the language of the instruction and its subtleties, and this is somehow automatically linked to the discourses of different contents by the students. It is also a common assumption that the students know the 'norms' of the school. Thus it is particularly difficult for children from a non-western background to learn western Mathematics when it is understood as part of western culture, and the curriculum is intended for monolingual, middle class students belonging to the dominant social group.

For a long period, most of the research concerning ethnic, cultural or linguistic minorities and their learning of mathematics focussed on the mathematics

achievement of those groups. It is only recently that researchers' interests have turned to the understanding of how and why for most such students, who normally obtained low achievement scores in mathematics, although there are very interesting exceptions for a particular small group of such students. It was easily agreed within the working group, that mathematics teaching and learning is a process where cognitive, affective, emotional, social, cultural and linguistic factors are deeply intertwined. It was further recognised that the multiple links among these factors make the teaching of mathematics a complex task, which becomes even more complex in multilingual or multicultural situations. When facing a classroom, neither the teacher nor the researcher may now assume that they are in front of a homogenous group. Further there should be a recognition by teacher and researcher that there is a great heterogeneity amongst the several multilingual or multicultural situations that can be present in any one classroom. This complexity of the research contexts in our domain requires the use of a multilayered theoretical perspective, and a great sensitivity towards the different cultures we are approaching.

In the search for an understanding of the mathematics learning of individuals belonging to groups which are culturally different to the dominant one, it seemed that the idea of 'participation' is crucial. It may be useful to substitute for this idea for that of 'achievement' in the research agenda. Participation refers to both participation in the mathematical conversation and in the mathematical discourse that takes place within the classroom, as well as participation in the school culture. Both seemed to us to be crucial. Participation is an essential process for inclusion. It has to be mediated by the teacher, and has to take into account both the students' background and foreground. The formal mathematics education of an individual requires his/her participation in an institutional network of practice where empowerment, recognition and dialogue are tools to face conflict in a positive way. Conflict should be understood not only as cognitive conflict, but also as cultural, social and linguistic conflict, and in this broader sense, it must be seen also as a tool for learning. Indeed it may be the critical strategy for learning.

The researchers present in the discussions had in common their commitment towards equity of mathematics education, and agreed that there is much research still to be done to help the understanding of teaching and learning of mathematics in multicultural classrooms. Such research will also help teachers to face the challenges they meet in such heterogeneous situations, but also will develop positive and active policies towards multiculturalism. There is a lack of well-grounded and coordinated policies in this area. Too much is left to the actions of school boards, teachers and local communities who so often take well meaning action although it is based on naïve grounds. On some occasions such actions might be locally effective, but often such action is too narrow to help improve the general situation within a region, let alone within a country. Understanding the complexity of mathematics education in multicultural situations may allow us to turn implicit habitus into more reflected actions.



We finish this introduction of TG10 working group by considering again the title under which we constructed our discourse. We came to understand through our formal and informal discussions that the name of the group, focussing as it does on multicultural classrooms, was too narrow to include all the concerns we had as a group. We hope that at the next CERME the group will be under a more broader name that would approach a more global idea, but not so broad that the explicit emphasis with which we wish to concern ourselves is lost. A compromise may well be ‘mathematics education in multicultural situations’.

[List of contributions](#)

[List of Thematic Groups](#)