The growing immigrant population in Catalonia is experiencing the inadequacy of the educational system in general, and of the teaching of mathematics in particular. Most of the ethnic minority students are from Magrib (North Africa), but the presence of students from other countries in Africa, Latin America, Asia and Eastern Europe is also significant, not to mention the Catalan Gipsy students.

In 1997 a project was commissioned by the Ministry of Education in Catalonia, an autonomous region in North-eastern Spain, concerned with mathematics teaching in schools that have large numbers of immigrant students. The project is concerned with finding more appropriate ways to teach mathematics to immigrant students, both in primary and secondary schools. The project is funded by the Fundacio Propedagogic, a Catalan private foundation devoted to education. During the first two years of the project there was also some financial support from the Ministry of Education. It is based at the Universitat Autonoma de Barcelona, and the local research team, led by the first author, consists of academics at the university, among them the second author, and secondary teachers. Two of the secondary teachers were given time-release from their school commitments for one year. The third author assists with the development of the project as a research consultant.

The research team works in several schools in Catalonia, most of which have a high proportion of immigrant students. The research is collaborative not just in the sense of working in a team, but also in the sense that the project team works with the teachers and their students in the schools. More details about the project and its theorisation may be found in Gorgorió, Planas and Vilella (2002).

Explaining the difficulties immigrant children have in these schools in terms of cognitive deficit is, in our view, too simplistic and questionable (Ginsburg & Allardice, 1984; Nunes, Schliemman & Carraher, 1993; Rasekoala, 1997), particularly because this interpretation itself has social implications in the way it projects particular expectations onto diverse cultural groups. In our view, mathematics education should be interpreted as being embedded in an understanding of the social and cultural reality where it takes place (Oliveras, 1996). Thus the starting point of the project for the team was to consider the cultural contributions of ethnic minorities and of the different social groups as a source of richness to be maintained and shared. We did not see cultural differences and the cultural conflicts
arising from them, as a ‘problem to be solved’ nor as a ‘diversity to be treated’ but as a potentiality.

The stated goals of the project are, among others, to analyse the difficulties that immigrant children experience when learning mathematics in Catalan schools, and to identify their potentialities as well as their knowledge; to come to know the values, expectations and beliefs that they associate with in-school and out-of-school mathematics; to analyse the dynamic of the mathematics classroom from the point of view of the different interpretations of the various norms that regulate it; and to identify successful teaching strategies, such as teaching methods, students grouping, content selection and class dynamics.

However, perhaps more important than the stated goals, for this chapter, is the fact that the whole development of the project is based on five crucial assumptions. First, we understand mathematics to be a cultural product (Bishop, 1988), that is, our understanding of mathematics acknowledges and shows the relationships between mathematics and culture, in other words, the cultural and social origins of mathematics. We also understand culture in its broadest sense (Geertz, 1973), in which culture is a pattern of meanings historically transmitted that are embodied in symbols, through which human beings communicate, perpetuate and develop their knowledge of, and their attitudes towards, life. We approach mathematics education from an integrated perspective that takes into account cognition, values and emotions (Abreu, 1995); this means that constructing and using mathematical knowledge goes beyond a purely cognitive aspect of human capacity; it involves affective and social factors linked to particular contexts. We understand socio-cultural diversity as implying different participants’ interpretations of the norms that regulate the dynamics of the mathematics classroom (Yackel & Cobb, 1996). The social context of the mathematics classroom includes the social norms of functioning and the sociomathematical norms that regulate the mathematical practice itself. The understanding and the interpreting of those norms change according to the initial meanings of those who interpret them. Finally, we understand linguistic diversity as a socio-cultural factor that conditions mathematical learning (Ellerton & Clarkson, 1996). The different languages, as vehicles of the learning in the mathematics classroom, act as mediators between the goals and the visions that the teachers have and those that students have.

This then is a basic outline and ethos of the project. The remainder of the chapter will contain more information about the project but this will be presented in the context of the pertinent social and political issues arising in the course of the project. The chapter will concentrate on the discussion of the challenges that working in a clear situation of political and social conflict —such as the education of immigrant children— posed to us as researchers and to our conceptions and actual actions when interacting with the many actors involved, directly or indirectly, in the project. We engage in this discussion by identifying five sets of dichotomies, complementarities and tensions concerning the different fronts and actors on which our research activity had an impact.
THE SOCIAL MEANING OF THE RESEARCH PROJECT:
WHAT IS? VS. WHAT MIGHT BE?

As a first dichotomy, or complementarity, research in mathematics education can be understood in two major ways (Bishop, 1992). On the one hand, there is research that is concerned with the study of the present mathematics educational situation and its complexities. On the other hand, there is research concerned with future possibilities and alternatives in mathematics education (e.g., Skovsmose & Borba, this volume). However, when researchers want to consider the social aspects involved, it is difficult to talk about ‘what is’ without at the same time suggesting or implying ‘what they think, or wish, might be’. From that perspective, in this section we will consider the social dimension of mathematics education in the sense of Bishop (1988), as furthering the development of society and of the individual, and we will take into account that if research has to have a social meaning we will have to recognise the societal, institutional and cultural contexts in which the teaching and learning take place.

At the societal level we can see immediately the tensions between ‘what is’ and ‘what might be’. Indeed it is also necessary to be aware of ‘what is not’, when interpreting ‘what is’. For example, the Catalan educational administration has always had a clear policy regarding the right of all children to attend school to the age of 16, regardless of the legal situation of their parents. However, it is also the case that, for the most recent immigrant children, due to the family re-groupings in many cases, there are delays in their schooling arrangements that can hardly be justified. Despite having laws that regulate the right of those children to attend school, the reality is that society and the government do not make the effort, nor create the necessary means, to make this right effective.

Regarding the institutional level, there are again tensions between ‘what might be’ and ‘what is’ which have strong implications for both teaching and researching mathematics education. As a result of the rapidly increasing and uneven immigrant situation, schools’ populations located in what have become ‘ghetto areas’ have changed rapidly. We can find public schools in Barcelona that contain nearly 90% immigrant students. Moreover, since immigration is often linked to economic deprivation and social risk in the areas where immigrant students live, what could be ‘normal’ schools turn out to be what we could name ‘ghetto’ schools, with huge implications for the kind of research that could take place there.

A further aspect of context concerns the negotiations with the educational bureaucrats in order to carry out the research. The official regulations of the educational system do take into account the diversity of the students, but old beliefs have not yet been abandoned by the administration. For instance, the implicit theories underlying the administration’s proposals for dealing with cultural differences are based on ‘deficit theories’. In many working documents of the educational administration, immigrant students are referred as ‘students with special educational needs’, a description that is also used for students with specified cognitive deficits or physical handicaps. At the pedagogical level, the difficulties that many teachers encounter today, especially when facing mixed abilities groups and multilingual or multiethnic groups, are due in part to the fact that the official
documents describing the reforms or the in-service teaching programs do not help
teachers to overcome the ‘invisibility’ of the social and cultural factors that crucially
affect the teaching and learning process. The data coming from our project show
that, too often, the teachers associate the idea of ‘immigrant student’ with the idea of
‘disruptive student’, and that, most of the time, teachers project negative
expectations onto their immigrant students.

There is no doubt that research in mathematics education cannot remain
indifferent to this whole situation. All the decisions, both methodological and
practical, that the team has made throughout the development of the project, have
had to take into account the ‘what is’ and ‘what might be’ political and social
aspects that go far beyond the domain of the mathematics classroom. These aspects
constrain and structure not only the teachers’ practices but also the researchers’
goals and methodological approach.

In our research study, focussed at the pedagogical level, we have gathered
information about both ‘what is’, and ‘what is not’ the present situation regarding
the teaching and learning of mathematics in classrooms with large numbers of
immigrant students. We have also collected data that show that the situation could
be improved in different ways through implementing different teaching strategies
and content selection (e.g., Gorgorió et al., 2002; and Gorgorió & Planas, 2001). The
results of our research, and those of similar projects developed in other contexts
(e.g., Abreu, Bishop & Presmeg, 2002), give an idea of ‘what might be’ possible in
such classrooms.

However, even if from the project we can suggest and propose what could be
done to improve the situation, it is the Catalan society which has to decide, if it
wants as a reality, what we consider ‘might be’. Furthermore, it is the Catalan
educational administration that has to make available not only the means to research
further the ideas from our project, but also the means to disseminate and to
implement the ideas that we are generating.

RESEARCH AND THE ‘REAL’ SOCIAL WORLD:
RESEARCH VS. PRACTICE

A second dichotomy which relates to the first and which became very obvious from
the start of the project concerns research and practice. This is a dichotomy which has
been fully documented, both in mathematics education and in general education. It is
clear however from various research summaries (Bishop, Clements, Keitel,
Kilpatrick & Laborde, 1996; Grouws, 1992) that this dichotomy is no longer
acceptable, and that there is an urgent need to strengthen the complementary
relationship between educational research and practice (Hoyles, Morgan &
Woodhouse, 1999).

In any educational research that wants to call itself socially committed, the need
exists to know more about teachers’ perspectives on practical issues that researchers
could seriously address, and for counting on their expertise and knowledge to find
ways to research those issues and to interpret the results (Bishop, 1996). As Ruthven
(1999, p. 212) states we ‘have the challenge of finding an appropriate transposition
of the methods, evidence, and findings of research into the currently very different context of school practice’.

Given that the main aim of the project is to ‘promote changes’ in the educational context, since the beginning we considered, as Zuber-Skerrit (1996) does, that the best overall methodological approach would be that of action research; that is, research done by people on their own work, following an essentially critical approach to schooling, and with the explicit aim of improvement (see both Atweh and Knijnik in this volume). We consider, as Cohen and Manion (1990) did, that action research is a powerful alternative both to external research that has little connection with classroom realities, and also to subjective practice, which omits external observers who can ensure triangulation of the data and its interpretation.

However, rather than discussing here the recurring issues associated with doing action research, which, on the one hand, are well documented (see, for instance, Cohen, Manion & Morrison, 2000) and that, on the other hand, have been presented elsewhere concerning our project (Gorgorió & Planas, 2000), we would like to highlight the political context and its influences on the research process. For example, it rapidly became clear to us that the development, if not the survival, of action research in this situation would not be possible without the contribution of the different educational administrations. They need to facilitate it by such means as giving economic support, reducing the teachers’ school schedules, facilitating their attendance at conferences, promoting in-service working groups, reforming rigid working structures, and restructuring the power hierarchies as also pointed out by Baumann (1996). So, having received the request to address an issue that is mainly connected with schools, we argued with the Catalan educational administration the necessity of working in a team that included different members of the educational community. The negotiation with the educational administration resulted in a collaborative team, and with such a team we consider that we not only have the support and expertise from the university level, but also the knowledge and expertise of the school practitioners, and, what is more important, we have been considering issues directly related to practice.

However, doing research within a collaborative model with in-service teachers, and having teachers participate in action research projects implied changes that, at least in the Catalan context, still needed to be justified within both the university community and the school system. Elliott (1989) concluded from different examples that action research is only reluctantly accepted or considered because of the complexities of the many value decisions that this kind of research involves. This conclusion —still valid nowadays— is reiterated by Atweh (this volume). For instance, our university system, both academically and administratively, is still reluctant to accept in-service teachers as full members of research teams. Academics at the university do not consider that school teachers have enough knowledge and expertise in the field of research. Neither does its administrative system consider school teachers as members of research groups for the provision of grants. Moreover, within the school system, teachers in mathematics departments, principals and inspectors and, more globally, the educational administration, find it difficult to accept and justify teachers devoting part of their time to research.
From another perspective, the complexity of the social context makes it difficult to do the research; as it creates many tensions between the research activity and the people affected by it. Because of the roles and responsibilities of the educational administration, the characteristics of immigrant students and their families, and the ethical ideas of what we understand as research, we faced several challenges. In particular, how to achieve a full acceptance of the project by the educational politicians by convincing them that our project is not only ‘politically correct’ but also fulfils a real social need. We had to encourage the school principals and inspectors to accept the project, and to convince them that the mathematical education of children within a multicultural framework was, and still is, a priority at the present time.

We also had to gain the trust of the students, and establish the credibility of the research team with their immigrant parents and with significant members of the different communities. The methods used within a qualitative research approach, whose ‘objects of study’ are individuals, obviously require their acceptance to be ‘studied’ and their willingness to cooperate. To study real mathematics classrooms we needed not only the engagement of teachers but also of students, and therefore we had to convince them of ‘our good intentions’, to overcome some practical matters related to different cultural traditions or personal situations—e.g., accepting to be videorecorded—, and to overcome the linguistic barrier—e.g., finding ways to analyse the interactions in small group work when they took place in a language unknown both to the teacher and the university researcher. Moreover, due to the unstable social and economical position of the students’ families it became difficult to focus on some case studies—e.g. some students ‘disappeared’ during our study.

The team negotiated strongly, and continues to do so, to change what initially was a policy driven ‘research’ project into a research project with no inverted commas. The initial request from the administration was to create ‘ready-to-use’ materials to be given to the teachers having immigrant students with an incomplete knowledge of Catalan language. Behind the request for ‘packaged materials produced in different languages’ to be spread throughout the schools are many of the hidden assumptions of the educational administration. The Catalan educational administration obviously wanted a quick answer to society’s demand for caring better for the immigrant children.

Since the goals of the research project were not fully appropriate in the eyes of the educational administration, we had to argue with their representatives on many points, in particular on the focus and the methods of our research. The educational administration was reluctant, for instance, to accept that part of our study was focusing on ‘ghetto schools’. It was reluctant to provide help for overcoming the linguistic barriers within the schools, or to make available any general data about the students. We also had to convince them of the need to use some particular research procedures—e.g., videotaping mathematics classes—and to facilitate the collaborative research process—e.g., providing a partial time release of the teachers involved.

After five years of working on the project, we are aware that there are still plenty of unresolved issues, which are of concern not only to us, but also, we suspect, to anyone involved in such kind of research. For example, up to what point can the
research on mathematics education reflect the real needs of the society where it takes place? Who determines these needs? Who is in charge of deciding which changes should be implemented in the mathematics curriculum in order to guarantee mathematics learning for all? Why, so often, does the educational administration pay so little attention to what is being done in the research field? Is it the fault of the university researchers themselves because of failing to communicate their results in such a way that they can be useful for the classroom? Or is it because the research questions emerged far away from the reality of the classroom?

RESEARCHING TEACHING CO-OPERATIVELY: STUDYING TEACHERS VS. STUDYING WITH TEACHERS

Our starting point when structuring the research team was to consider that since it is the teachers who should benefit from the outcomes of the research, they were important in the research, not just as ‘subjects’. At present, research agendas are still dominated by the researchers’ questions and aims, and not by those of the practitioners, if we can make that distinction. However, we are addressing a crucial issue related strongly with social demands within a particular context. Change being the final goal of the research, the teachers’ contributions to clarifying the points that should be addressed and how to address them were crucial.

The issues addressed in the research are actual teachers’ problems that have to do with actual teaching constraints and limitations. It is essentially the teachers who are more aware of them and who can conform more to practitioners’ criteria and methods for addressing this issues. We agree with Ainley (1996, p. 18) that ‘far from leading me to feel that I must deny my identity as a teacher in order to be an effective researcher, I see the skills that I have as a teacher as crucial in enabling me to frame such interventions effectively [...] To be an effective researcher (and perhaps also an effective teacher) I believe that I need to be aware of the attractions and constraints of both roles’.

Moreover, school teachers’ questions and explanations derive from a knowledge domain that is distinct from, and complementary to, that of university workers isolated from educational system realities. Within the research team collaboration means that everyone’s view is taken as a contribution to understand the situation; and theory and practice are seen as two interdependent, yet complementary, aspects of the change process. Moreover, school teachers, as full members of the research group, legitimate and facilitate the contact and the communication process with other teachers; and they also help with disseminating the ideas from the research and the innovation proposals.

Besides that, the presence of teachers on the research group strongly enriches the process of interpreting the situation and the triangulation of the data, illustrating the complementary points of view of university researchers and school teachers. For example, the following ‘vignette’, which forms part of one of the interviews with the teachers, illustrates a pattern that we have found repeatedly in the interviews:

Interviewer: How are you getting on with your classes? Do your immigrant students follow the mathematics you teach them?
Teacher: It is very difficult for them. They find it difficult to concentrate, to behave, to respect me and to respect their mates, they find it difficult to realise that they are in another country, and that here things are different...

I: What do you mean?

T: For instance, if you give them homework, they do it at the Mosque with the Imam. And then, if you find something which is not exactly correct, and you mention it to them, they feel it is an offence to the Imam. They are too arrogant.

I: Arrogant?

T: Yes, yesterday, for instance, Kamrum, a Pakistani student that arrived here two years ago, left the class.

I: For any particular reason?

T: Well, I gave them a problem to solve and suggested that the students work in small groups to think about it. Kamrum refused to work in the group, where there were three girls. I explained him, once again, that things here are different from the way they are in Pakistan, that we have to learn to work with boys and girls... But, while I was saying that, he took his notes and his book and left the class...

I: And he was all the time in the corridor...

T: Yes... and when the class was over, he asked for permission to come in and showed me the problem solved. It was correctly solved. In fact, he solved it in a very clever way. It is a pity that he is so arrogant!

From the perspective of the university researcher one could easily generate other explanations for Kamrum’s behaviour, inferring for example how often cultural conflicts within the mathematics classroom do not appear significant to the teachers. The research has clearly shown how difficult they find teaching multicultural classes; yet in many cases the teachers revealed to us that they were not aware of the fact that the mathematics classroom is a cultural and social scenario. But these are all researchers’ interpretations and constructs. The team’s real research task has been to try to understand how the participants in the classroom encounter interpret the ‘conflicts’ that arise in their classrooms, how they often do not see them, or perhaps how they often choose to ignore them (see Gorgorió et al., 1999 for details), and why they see classroom events in the terms that they do.

Thus the collaborative work allows us to take into consideration not only the factors that condition teaching practice, but also the connections with published theory. Both of these play an important role in shaping the research, by establishing the possibilities, limitations and constraints of the context, and also by offering the dimensions of generality that give sense to the research. The study thereby has become both an analysis of practice and a search for explanations towards the development of theory.

One of the needs we were aware of was how to ensure a distance between the simultaneous roles of being both a teacher and a researcher for both the school and university members of the research team. In particular, we had to deal with the tensions between the teachers’ responsibility to the students and to the research. For
example, there were tensions regarding issues of students feeling reluctant to participate in the research, by, for instance, not wanting to attend a class if it was going to be videotaped. Our response to this kind of tension was this: The research team explicitly agreed that we all had a responsibility as teachers that was over and above that which we had as researchers, even if that could mean a ‘loss’ for the study.

We also had to face the obvious risk of bias when interpreting the data obtained from a classroom where the roles of teacher and researcher were played by the same person. Analysing the data obtained in a study developed on one’s own class requires important control actions (Robinson, 1998). Discussing and contrasting the different points of view within the research team, having an observer in the classroom who is different from the teacher, documenting and analysing the development of the lessons through the video recording and the teacher’s diary have all helped to control the biases.

After five years working, we are convinced from the perspective of our project, that the understanding of the situation and the outcomes we could achieve through a collaborative and action research approach, under a qualitative and interpretative paradigm, were worth all the conflicts we were facing in getting involved in action research (see Gorgorió, 1998 for details about the research procedures used). We are convinced that, despite the difficulties and tensions, it has been more important for our goals to study with teachers rather than to consider teachers only as objects of study, or having their roles consisting only in developing the researchers’ proposals, without knowing the grounds for their actions.

RESEARCHING WITH STUDENTS: NORMS VS. DIFFERENCES

At the individual student level of the social dimension the research project relates to the diversity of the students, and to how to interpret this diversity. Aspects such as language, gender, age or place where they come from, shape and affect not only the research but also the teaching and learning. We have discussed elsewhere (Gorgorió & Planas, 2001) how the diversity of languages in the mathematics classroom conditions and affects the teaching and the learning processes. Gender differences are a reality in all mixed classrooms and many researchers have studied gender differences in the learning processes of mathematics. There is also a wide range of studies that document the mathematics learning processes throughout different ages. However, in the context of this research project we have to consider such explicit differences as gender and age from another point of view.

Gender and age differences are extremely important to us when related to emotions, beliefs and expectations, and therefore to cultural and social conflicts. In Western societies mixed gender classes are commonplace, but it is not the same in other societies, such as Muslim societies. When students come from a Muslim cultural background to attend Catalan schools they find it difficult to adapt to a situation where it is ‘normal’ to have working groups with girls and boys together. In Western societies, it is ‘normal’ that parents have positive expectations regarding the possibilities for both boys and girls to have an academic career, while in other
societies girls, from a certain age, are expected to leave school and to devote themselves to other activities. When girls come from this kind of social and cultural background into Catalan schools, and discover their potentialities, they often face a cultural conflict between their two coexisting worlds: the family’s world where they are supposed to leave school early, and the school world where they have teachers who foster in them the interest in continuing their studies. The personal values linked to cultural backgrounds also condition the research and, in particular, the research methods. For example, while ‘normally’ students have nothing against being videotaped during a mathematics lesson, it was hard, if not impossible, to convince some girls from other cultural backgrounds to allow us to videotape them.

The social dynamic of the mathematics classroom also reflects the complementarity of ‘differences’ vs. ‘norms’. When talking about differences in a social situation, we mean differences from the socio-cultural ‘normality’, where this is defined according to the assumptions and expectations of the individuals concerned. Thus, our teachers find immigrant students to be ‘different’ from what they expect students to be. Immigrant students find their teachers ‘different’ from those they were used to, as they do the dynamics of the classroom and the school they are in. The interactions among students and between students and teachers are also culturally ‘different’ as are the relationships between parents and the school system.

As a result of the empirical work done so far, we can claim that the different interpretations of what is ‘normal’ concerning the social dynamics of the mathematics classroom among its members can interfere significantly with the actual teaching and learning process. Moreover, the different interpretations are clearly present, whether ‘visible’ or not, in all mathematics classrooms, both in ‘ghetto’ schools and in ‘normal’ schools. In the following paragraphs we show how the social norms that regulate the dynamics of the mathematics classroom can be differently understood by its participants, both in a ‘ghetto’ school and in a ‘normal’ school (see Lerman & Zevenbergen, this volume, for a similar discussion).

As part of the work of the team, we hold regular in-service sessions with groups of teachers. In one of these sessions one of the members of our research team doing action-research in a ‘ghetto’ school, explained a situation of cultural conflict in her class in the following way. She asked her students to work in small groups to solve some mathematical problems, and she explained to the students that in such a way they could help one another. However, two of her students, Imram and Nadia, refused to work in small groups. When the teacher insisted, Imram said ‘I do not want, if you insist I do not come back to school’, and Nadia’s answer was ‘If I have any doubts I ask you, you are the teacher, that is why you are here’.

Rosa, one of the teachers participating in the in-service sessions, said at one of the subsequent meetings: ‘I had never thought that some of my students would feel so uncomfortable when working in small groups, but they just accept it to please me!’ In fact, one of her students told her during an interview: ‘Working in small groups is very nice, but in one’s life one has to do real things alone […] Moreover, in the examination we do it alone, don’t we?’ In her class, the students accepted the norms that regulate its dynamics without apparent conflicts, but this acceptance did not mean that the students did not experience conflicts arising from their different
interpretations and valorisations of the norms. The conflicts are less ‘visible’ in this class than in a class with a high percentage of immigrant students where, from the start, the teacher expects the students ‘to behave differently’.

On another occasion, a teacher member of the research team presented an example of a conflict within her immigrant students’ mathematics classroom: Nadia refused openly to share her mathematical knowledge with her peers by saying ‘To learn with them? They do not know a single thing about mathematics, they always fail their examinations!’ Whenever some of her peers contributed to the whole group discussion, Nadia got very anxious, because she really wanted to have an answer from the teacher on the blackboard, ‘Come on teacher, we will not have time to finish it, do it yourself on the blackboard’. While her peers discussed the problem, she did the homework from other subjects. She explicitly and noisily put her books on the table to show her disagreement, in fact, to show that she did not accept the other students as valid discussants of mathematical knowledge.

As a reaction to that explanation, one of the teachers in the working group, Rafa, explained that he suspected that some of his students also experienced similar conflicts. He is teaching in a secondary school located in a wealthy neighbourhood, which is well known for having high scores in the external examinations. At the next meeting Rafa came with the example of a brilliant student, who engaged in the following conversation:

Rafa: Do you take notes when your friends explain how do they solve the problem?
Student: No, I wait until I know it is correct...
Rafa: And how do you know it is correct?
Student: Because you say it!!
Rafa: But, sometimes we have two or three groups presenting different ways to solve the problem all of which are correct and I say that you may choose the one you like the best. Which one do you choose then?
Student: [smiling] Montse’s one [Montse is the girl with better grades in the class]
Rafa: And when neither I nor Montse present a solution?
Student: Then, I copy nothing and when I come back home I ask my father!
Rafa: And what happens all the time while your friends are presenting their solving processes? Is it useless?
Student: [smiling] It is your problem, you will not finish the program!!

These are a few of the examples that we have collected throughout our research that give us evidence of the existence of cultural conflicts within the mathematics classroom, in terms of the norms of both the social dynamics and the mathematical practices. Our research has also shown that cultural conflicts exist both in schools with immigrant students, whether they are a majority or not, and in schools with no immigrant students at all. This fact reaffirms our belief that the outcomes of our research might well be beneficial for all teachers and in all classes regardless of the number of immigrant students present.
As has been pointed out, the initial request from the administration was for 'packaged materials produced in different languages' to be spread out in the schools. We understand that behind this request was, on the one hand, the idea that once having overcome the linguistic barrier all the problems would be solved and, on the other hand, the idea that there was a need for materials to help immigrant students to reach 'the same level' as local students.

On the basis of the assumptions of our research project, stated earlier, and in the light of our findings, we have argued with the administration that 'ready made' materials would be of little help for teachers and students. Instead we argued that any change towards an improvement of the learning experience of immigrant students should come through developing and disseminating teaching strategies that facilitate the discovery of cultural and social conflicts and their positive handling, and through giving clues to teachers that allow them to create their own materials adapted to their own classroom’s realities.

In the process of searching for teaching strategies suitable for multicultural classrooms, we organised a working group of in-service teachers, with the aim of, on the one hand, discussing and analysing their actual needs regarding teaching in multicultural situations and, on the other hand, to experiment with teaching strategies and learning activities that were suitable in their particular contexts (see Meaney, this volume, for further discussion on working with teachers in similar contexts). The examples we have presented concerning norms and differences are from this working group and illustrate how it developed. From this work we have been able to offer some recommendations for teachers on how to deal with the diversity they have in their classes. These recommendations include adopting an approach to the curriculum that is non-reductionist in its contents, articulating different meanings for every mathematical idea, and using a participative methodology to promote the contribution of all the students.

To summarise, the following are what we consider essential conditions to help to overcome the ‘invisibility’ of the cultural difference and to ‘positivise’ it within the mathematics classroom, thereby facilitating the immigrant students’ learning process:

- to clearly make explicit, as far as possible, the implicit rules that regulate the classroom social dynamics and the classroom mathematical practices,
- to allow the acceptance of out-of-school mathematical knowledge and skills in order to reach those whose family’s culture is far from the school culture,
- to acknowledge and rehabilitate the mathematical knowledge linked to every culture in order to ensure the survival of the different mathematical models that relativise the unity of mathematics,
- to accept the challenges of cultural diversity’s fact in order to promote a process of establishing a real cultural interaction.
Social change via educational research is a difficult and time-consuming process. Moreover, we agree with Ahmed (1987, p. 81) that ‘improvements and change can only be sustained if teachers in the classroom believe in and support the developments taking place. Impositions from above are therefore unlikely to work’. In particular if research has to have a direct application in school practice it requires, as Ruthven (1999, p. 12) states, ‘supporting work within schools directly aimed at the improvement of mathematics teaching through scrutinising current practice and its outcomes, and the identification and the appraisal of viable adaptations and alternatives’.

Moreover, development through research of a social nature is a process which requires overcoming some obstacles, as Ruthven (1999, p. 12) points out in the phrase following the one previously quoted: ‘An initiative of this type would, however, be likely to encounter two particular obstacles, one is the currently restricted range of research tools tuned to collecting and analysing evidence about teaching and learning under typical conditions, the other is the lack of a powerful means through which teachers can actively explore and evaluate alternative perspectives and practices in mathematics learning’.

Developing socially-oriented research that analyses mathematics classroom practice under its normal conditions, and through the methods that are presently available, is a long process. It takes time to get data from classroom observations, and to analyse them in a collaborative framework in order to have feedback for the possible modifications to explore. Having teachers participating in research teams takes time, time that has to be allowed to them by reducing their teaching hours. In short, time is probably the most crucial resource for developing any research agenda which aims to reform educational practice.

Rephrasing Lappan (1997, p. 233), time is required:

– for politicians to understand the ideas of the reform and to figure out and accept what they might mean for the existing practice, and to create opportunities for administrators and teachers to learn about these ideas,
– for all those involved in the reform process to learn the knowledge required,
– for teachers to grasp the reform ideas and to come to understand how they might reshape their existing practice around these ideas, and
– for educators to reflect on their attempts in carrying out these supposed improvements.

We would add to those points that, it is not only time that is required, but also big efforts need to be made by any individual researcher in order:

– to encourage the educational system to accept the crucial role that research may play towards a positive development of reforms, by making researchers’ voices heard and understood;
– to encourage the whole research community to accept that doing research related to education is not only a socially committed activity, particularly for research
that refers both to teachers and students, and to their immediate environment, but also that it is a political process because it involves promoting changes that will affect others;

- to accept, deal with and make explicit the limitations and constraints of doing research in socially and culturally complex contexts; and

- to find alternative methods and approaches that, while still being acceptable within the research community, are fully respectful of the social and cultural idiosyncrasies of the persons and their situations.

After just a few months working on the project we were already conscious of how difficult, if not impossible, it would be to change the beliefs of the educational administration about the mathematics learning of immigrant minorities. In order to seek acceptance of the ideas emanating from the project by the educational politicians we had to convince them that our project would be of benefit to all the students and not only to those belonging to minority groups. Based on the evidence from the project, the research team strongly believes that an inclusive approach to both content and methodology in mathematics classroom, will be beneficial not only to children who are ‘culturally different’ but also to the children of the Catalan communities because, in particular, it will make them aware of learning in a non-ethnocentric context, which has respect for other cultures and which also enlarges their understanding of mathematics as a cultural product. However, what was so clear to us from our research, seemed to be hard for the educational politicians to understand.

At a certain point we realised that, if we wanted to convince them of the importance of the project, and of its development, we would have to ‘sell’ it to them by, on the one hand, basing our discourse on what they considered to be ‘important issues’, and on the other hand, by ‘proving’ that what we were saying was applicable to all classrooms. Therefore, our first argument with them was based on their priority of developing in youngsters the value of respecting diversity, including cultural diversity. Since attaining ‘interculturality’ is a goal for the Catalan educational administration —even if the meaning they gave to that word could be debated— we argued with them that mathematics teaching could help in the process towards ‘interculturality’ only if it was first acknowledged that mathematics ‘also’ has cultural roots. Therefore, we ‘showed’ them, through many examples coming from our data, that mathematics is a cultural product.

As a second step, we had to ‘prove’ to them that any classroom could be considered as being ‘culturally diverse’, even if all children belonged to Catalan families. To do that, we showed them the many examples that we had as a result of experimenting with the same teaching strategies and learning activities both in schools with a large number of immigrant students and in ‘normal’ schools. That way we ‘proved’ to them that socio-cultural diversity was a reality in all mathematics classrooms and that it was the source of conflicts that interfere with the learning processes. The only difference was that in ‘normal’ classes the diversity and the conflicts were less visible, as has already been mentioned.

In order to spread the outcomes of our efforts, we are disseminating our results and analyses through journals and in summer schools for teachers. Both in the
publications, and in the in-service courses, we present our work with two goals. Our first goal is to make the teachers aware of the fact that the basic assumptions of our project are real issues in every classroom, and that taking them into account can contribute to making mathematics learning become a possibility for all students. Our second goal is to spread the idea that cultural and social diversity, far from being a problem, can be a source of richness if the teachers can take the advantage of it. However, since most of the teachers feel they have little knowledge about how to develop teaching strategies, create materials or adapt curricular content on the basis of socio-cultural diversity, we have also published and presented the processes of working within the group.

Our experience of working groups with in-service teachers and of summer schools is based on the idea we offered, as a research team, to the educational administration to develop in-service programs that would work from the actual needs of teachers facing multicultural groups. These programs would help the teachers find more appropriate teaching strategies, based on our strong belief that if we want any educational act to be positive both for the individuals and their communities, it would be helpful to begin to consider the perceived differences associated with different socio-cultural contexts as a source of richness, rather than problems, in the educational context. The first stage of doing this is likely to include making the differences explicit to everybody in the teaching/learning process. Therefore, the basic goal of our programs is to give tools to the teachers to help the ‘differences’ to be made explicit, and to use them as starting points for building rich teaching and learning resources.

However, being conscious of how difficult it is to change the administration, and that often trying to change the system only from ‘top-down’ fails, our efforts are also directed to encourage the involvement of school principals and inspectors that have among their responsibilities the schools with immigrant students. Very often, they see the ideas underlying our project as a threat to the well-established tradition. Socio-cultural diversity and the learning conflicts arising from it are not a ‘priority’ for them, but rather conflict is understood as a ‘disruption of’ or a ‘transgression from’ the norms. It is often forgotten that the meanings of the norms are usually implicit, and that the teacher’ interpretation of the norm and that of the student can be different. Even if we are conscious that not all the ‘disruptions’ and ‘transgressions’ can be justified by, or explained through, different interpretations of the norms, we believe that some of them could be minimised through making explicit, and negotiating, the norms with the students. It is our plan, to base our discourse with school principals and inspectors on the importance of this perspective to convince them of the benefits of supporting our project and facilitating its development.

Finally despite all the obstacles, the tensions and the challenges we have had to face in developing our project, after five years’ work we are convinced of the importance of continuing and spreading it, and involving in it as many practitioners as possible, as well as seeking a full appropriation of it by the representatives of the different levels of the educational system. It will certainly be a long and difficult process, but we are convinced it is worth the effort.
REFERENCES


