Norms, social representations and discourse

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The concept of cultural difference allows for many interpretations. On the basis of 'cultural differences' one may argue that immigrant students in mainstream schools should be taught different mathematics –or any other school subject– because they learn mathematics in a different way. Socio-mathematical norms, social representations and discourse have to do with how people behave and interact within the mathematics classroom, as well as with how their behaviour and interactions are conformed. We exemplify how the transformation of norms into practice allocates some immigrant students within different categories from those in which local students are placed.

Introduction

Any interpretation of cultural difference includes that of social difference. Distinguishing between cultural difference and social difference may seem somewhat artificial since the cultural and the social dimensions of classroom life are closely intertwined. However, in our work we find it useful to make such a distinction. We use the adjective cultural when we refer to the diversity of practices and meanings of the mathematics classroom discourse. We use the adjective social when we refer to the different values and valorizations associated with these practices and meanings as well as those who sustain them.

The classroom discourse provides the conditions through which cultural and social dimensions come to sight and are expressed. Discourse helps to construct the relationships between the participants in the classroom and their ways of acting and experiencing. Any exercise in either theorising the notion of discourse, or interpreting classroom discourses, involves attention to social processes and practices that reflect cultural and social differences. However, all of the different theorisations of discourse emphasize particular features of these social processes and suggest some particular relationships between them. There is a strong connection between the different theories of discourse and the contexts and social realities in which they arose and are applied. In our context, the reality of our multiethnic classrooms, and the social and political struggles that characterize our society, suggest that we should look at the effect of social differences on the cultural practices within the multicultural mathematics classroom.

In this paper, we focus on social differences that appear in the discourse of a classroom where immigrant and local students are together. We show that the classroom discourse can be used as the space where certain participants and practices of the mathematics classroom are legitimized while others are

not. Elsewhere (Planas & Gorgorió, 2004) we have developed an extended analysis of the data that we use here to exemplify our arguments. We reproduce here part of the analysis in order to start a discussion about the need to reinterpret the construct of classroom norms and other associated notions. In Gorgorió & Planas (2005) we provided data and discussed how social representations influence the orchestration of classroom norms in practice. Here we explore the significance of social representations when interpreting certain collective preferred modes of acting, interacting and learning as permanent and legitimate norms.

Theoretical framework
The theoretical framework that informs our research comes from the field of socio-cultural theories (Moll, 1992; Zevenbergen, 2003), and is centered on the study of the notion of discourse. By re-elaborating Potter's (1996) definition, we understand discourse as a set of actions and interactions that take place in a context of social practices and affect the construction of both personal and social meanings. From this perspective, classroom discourse is constituted by communicative practices that generate the production and transaction of intentions and meanings in socially and culturally situated interactions. The classroom is then a culture with shared models for the interpretation of norms, actions and expectations that are (re)constructed by discourse through social practices.

Classroom discourse has to do with sharing meanings and ways of interpreting how to behave at each moment. But it has also to do with social roles such as who is supposed to ask for advice, who is supposed to ask for or give suggestions, who must be at the disposal of whom, who needs to ask for permission, who gives it and who can refuse it, who says what someone is (not) obliged to do, who determines when an apology is needed, or who expresses what someone is (un)able to do. By answering all of these questions, the culture of the classroom is constructed as an accumulation of social situations where specific contents are in play. Participants are not always agents when contributing to these social situations. When participants discursively establish who must be at the disposal of whom, they are not necessarily aware of all the implications of their actions. They may be denying that their actions contribute to inequalities and, at the same time, they may be asking indirectly for other participants to be at their disposal in a non-reciprocal way.

To develop a definition of discourse requires us to consider both conceptual and methodological issues. When conceptualising classroom discourse as a social practice, its analysis becomes the analysis of the actions and intentions of the participants. Actions and intentions form the process of

discourse through which participants determine what they say and how they say it in their interaction with others. When doing so, participants act not only as teachers or students, but also as members of many other social groups (a teacher born into a poor family, a slow student, a good soccer player, an immigrant student, a student whose parents are teachers of mathematics, etc.). The analysis of the classroom discourse, therefore, needs to be interpreted taking into account many other simultaneous discourses. Those who give permission outside the classroom, for instance, are more prone to be categorised as those who give permission within it.

In the case of the mathematics classroom, discourse models what mathematical knowledge and doing mathematics are about, as well as the students' identities as mathematical learners (Klein, 2002). Students position themselves in relation to social and academic roles in the mathematics classroom as a reaction to the ways that the teacher and their classmates position them. They may be seen as good at arithmetic, smart, lazy, persistent when solving problems, etc. and they may behave by reacting to or fulfilling others' expectations. In one classroom, for instance, being good at geometry may not have the same importance as being good at arithmetic. Some students may then tend to hide their geometrical abilities and try hard to solve most problems by using arithmetical reasoning, even when they could apply geometrical reasoning. They are identified as not good at arithmetic instead of being identified as good at geometry. By making public their meanings and reconstructing others' meanings, students show parts of their intended identities as mathematical learners, their (mathematical) knowledge, and their system of values.

Method
The research was conducted in an urban high school in Barcelona, Spain. We collected data in one mathematics classroom with a total of nine students, most of whom were immigrants or born into immigrant families, between the ages of 15 and 16 years old. Enrolment in this school was lower than usual due to the very low socio-economic backgrounds of the students. All the immigrant students in the class had sufficient competence in the official languages of Catalan and Spanish, as none of them was a newly arrived immigrant. Three students, two girls (Kholoud, Ramia) and one boy (Mourad) were from Morocco; one boy (Aftab) was from Pakistan; and five students, three boys (Eduard, Albert, and Roger) and two girls (Maria and Cristina) were local, one of them a gypsy (Maria).

We observed and videotaped the first five days of class. Sessions were transcribed and the transcriptions were supplemented with field notes taken by the first author during the sessions or immediately after them. The

transcripts were discussed by the teacher and the two authors at regular meetings. Long term analyses, based on detailed observations of the videos, helped to distinguish well established routines that shape the students' identities as mathematical learners. The analysis of local episodes, in turn, highlighted the creation of some of these routines. The analysis of the episodes was informed by Gee (1999) and Wood and Kroger (2000).

Using Gee's terminology, we concentrated on narratives concerning attitudes, values, ways of feeling, ways of knowing and believing, as well as ways of acting and interacting; and narratives concerning issues of valorisation, status, and power, coming from the macro-context. The connections between the data obtained from the application of these narratives to one piece of transcript facilitated assumptions about how certain norms, values and valorisations influence the construction of students' identities as mathematical learners. We isolated several episodes as the basis for our analysis of the classroom social interactions. We focused on fragments of transcripts where different interpretations and uses of classroom norms, both general social norms and specific socio-mathematical norms, were in play. Within each fragment of transcript, we outlined and identified narratives concerning the mentioned narratives, and wrote down actions and gestures that we saw in the videos.

In this paper, we only present the final stage of the analysis of one episode. In Planas (2004), a detailed description of the methodology used and a justification for the analytic tools selected is provided. The next section presents one partial example of the analysis. At the end of the section, we discuss similarities among all the episodes that have been analysed.

An example of classroom discourse
The following sketch is part of the dialogue in a whole group discussion. The dialogue took place on the second day of a new school year in a regular mathematics classroom with fifteen and sixteen-year-old students, both local and immigrant students. Students knew each other, but they had only just got to know the teacher. During the first part of the lesson, they were organized in groups of three and were given a worksheet with a problem. The problem provided the ingredients and quantities for cooking an apple cake for three people, and asked the students to work out the quantities needed for ten people.

The teacher had just reminded his students that there was not much time left, since he wanted to finish the problem in that session, and he gave his students the opportunity to contribute:

Teacher: OK, let's start with the first approach.
Cristina: First, we've thought out the problem as if it was a real problem, as if we had been told to cook a real apple cake.
Ramia: I got the idea!
Teacher: As if it was a real problem?
Ramia: Yes, being careful with the decimal numbers.
Teacher: What does it mean here being careful?
Cristina: It means to avoid certain types of decimal numbers.
Ramia: It means not to make errors.
Teacher: Ummm... if you both want to speak, we'd better organize ourselves. You *(to R.)* explain step by step what you've done, give us the result for each ingredient, without making errors, and then you *(to C.)* tell us in detail why you've done it in this or that way. All right?
Ramia: All right.

In this exchange, Cristina and Ramia were asked to explain their mathematical practices. However, Ramia, an immigrant student from Morocco, was not recognized as a legitimate speaker. The teacher facilitated her pedagogical participation –she was allowed to engage in the discussion– but, all the same, he obstructed her mathematical participation –she was not allowed to talk about certain mathematical practices. She was not asked to explain her idea, but only her algorithmic process, "step by step" and "without making errors".

The fact that Ramia showed her intention to participate and to explain her strategy could have been a clue for her teacher to let him know that she perceived herself as an agent in her mathematical learning process ("I got the idea!"). But the teacher only asked her to enumerate a series of numerical solutions ("give us the result for each ingredient"). On the contrary, Cristina, a local student, was asked to make her reasoning public ("You tell us in detail why you've done it in this or that way"). This way of handing out tasks –Ramia is to enumerate and Cristina is to discuss and argue–, with such a different level of mathematical requirement, places the two students very differently as mathematical learners. Asking Ramia to only enumerate her results may suggest that she was either not prepared enough to cope with more sophisticated mathematical tasks or, at least, that she was less prepared than Cristina.

The teacher, who felt that there was not much time left, entrusted Cristina to explain her strategies and her reasons for them. In this way, he was showing his confidence in Cristina's mathematical proficiency. On her side, Cristina seemed to have developed a highly positive self concept ("I've made no errors!", she said in a previous episode). However, while working in small groups, Cristina had to turn to the calculator in many

situations when mental arithmetic was much more appropriate. She also required Ramia's help. Ramia was given a rather passive role in the whole group discussion, despite she being an active member of her small group. There is no evidence of these facts in the transcript extract above, but the analysis of the videotaping of this session provides the information.

How explanations and argumentations are to be used is differently interpreted through the classroom discourse depending on which students are involved. In this episode, discourse helps to distinguish between the students who can –and must– explain their reasoning and argue about their mathematical practices, and the students who are not expected to do so even though they are left some room to participate. It is through discourse that different categories of students are established.

Participants conform their contributions and adjust their engagement according to the expectations established by the categories suggested by the distinctions. Cristina trusted in her possibilities and acted as others would have expected. Ramia, however, neither insisted on wanting to explain her strategies, nor did she nominate herself to discuss others' ideas. Both students seemed to become resigned to perfom the tasks they were assigned. In particular, Ramia agreed to simply enumerate the numerical solutions, while one of her peers exceled in a more sophisticated task, for which she had initially volunteered.

Different students are expected to learn to interpret norms, such as those regarding participation, in different ways. Although teachers' expectations concerning students' knowledge and abilities have only a tentative character, they guide the students in their learning of who is who in the classroom. What it means 'to be a good student' –or what is expected from them if they are to be considered good students– is not the same for Ramia and Cristina. In general, looking at the whole session, local students were expected to discuss and explain their strategies. On the contrary, immigrant students' efforts to contribute to explanations and argumentations were systematically refused in more or less subtle ways. They were taught to listen to other students' explanations and not to discuss their own ideas. They were also encouraged to use real contexts but not to the extent of fully relating them to their mathematical practices.

All the classroom episodes that have been analysed show different ways of interpreting the use of classroom norms and different ways in which different students are expected to learn them. The model for being a good student is not the same for all of the nine students in the classroom. Immigrant students and local students were expected to learn classroom

norms very differently and their obligations as mathematical learners were understood very differently. The difference affects the interpretation and use of both classroom social norms (e.g., the role of those who help/are helped) and specific norms of the mathematical practice (e.g., the role of errors in the mathematics classroom).

In several sessions, students worked on problems with statements somehow linked to real life situations. In all of these sessions, local students were expected to discuss and explain their strategies for solving the problems through the use of academic contexts. They were listened to, they were openly asked to participate, and they were encouraged to introduce references to 'similar problems'. However, the impact of the classroom discursive practices on the participation of some immigrant students was rather negative. Immigrant students had to face multiple learning obstacles coming from the values and valorisations expressed by other participants.

The following sketch from the same session shows again the different learning opportunities available to local and immigrant students. Classroom discourse establishes two categories concerning the use of two types of contexts, academic and real:

Teacher: Tell us something else about these similar problems.
Eduard: Once the former teacher made us think out a problem with ingredients and quantities. But you only had to multiply and all numbers were exact.
Teacher: That's good *(to Eduard)*. To remember similar problems may help understand this one. *(to Aftab)* Have you also helped to cook an apple cake at home?
Aftab: No.
Teacher: You've never cooked an apple cake?
Aftab: No.
Teacher: And what do you do when you're at home?
Albert: *(laughing)* He's never at home!
Teacher: And you *(to Albert)*? Has it been very difficult for you to think out the problem? Did you solve similar problems last year?

Classroom norms are often regarded as impartial standards that transcend the different cultural and social values. But it is not clear whether there can be common values and principles that are acceptable to (and are accepted by) all groups within the multiethnic mathematics classroom culture. Even if some cultural differences are admitted and respected, conflicts between groups and between individuals can easily appear. In particular, the prevalence of certain classroom norms is a potential source for conflicts

since they suggest the disadvantaged position of those holding meanings and values differing from those promoted by the prevalent norms.

Exploring the role of social representations
The understanding of classroom norms and, in particular, the understanding of how norms are dealt with in practice, requires exploring their social components. It is not clear to what extent current research into norms in the mathematics classroom has addressed social questions. However, norms have profound social implications that also need to be taken into account.

Norms not only include definitions of what is acceptable, but also encompass values and valorizations within the classroom. Norms give shape to the way a person or a group makes sense of the mathematical practices, interactions and communication acts. How students adjust their meanings and behaviour to the legitimate interpretations of classroom norms has an influence on which and how personal values and social valorizations are expressed. Values and valorizations are part of the social component of norms. Values and valorizations are, in turn, expressions of wider social constructions. Social representations give meaning to values and valorizations and help to construct individual and collective ideas about how the mathematics classroom should work.

The few details from the classroom discourse that we have presented here do not prove that the differential responses to Raima and Cristina are due to the influence of social representations. However, during an informal conversation with the teacher at the end of the session, we told him that he had approached tasks with very different levels of mathematical requirement depending on which students were being addressed. His answer was: "I try to make students progress according to their individual possibilities". Despite the fact that he hardly had time to get to know his students in only two sessions, he talked about their individual possibilities.

Unfortunately, too often, 'students' individual possibilities' do not refer to a cognitive reality but to a social construction. Teachers construct each student's possibilities on the basis of certain social representations established by the macro-context. The teacher in our example shares with the dominant social groups social representations of immigrant students that question their mathematical potentialities. Social representations shape teachers' expectations of their students, affect the development of classroom practices, and limit the use of norms.

In our example, we interpret the two students' and their teacher's reactions as a reflection of an image of an educational community that views

immigrant students as lacking certain educational abilities or attitudes. When interpreting a classroom episode, the students, as well as the teacher, focus on some of its many facets, borrowing from social representations that are part of the collective image of their groups' culture.

Representations coming from the educational institution and from the whole society that host the minority groups shape norms. Immigrant students, most of them socially at risk, tend to be stereotyped as less competent and their mathematical abilities have traditionally been considered from a deficit model approach. Therefore, immigrant students and their practices are more prone to be valued negatively due to a-priori socially constructed assumptions and this valuing interferes with the orchestration of the norms that should allow their participation. We do not seek to generalize what happens in the multiethnic mathematics classroom from this particular episode, but to illustrate how the social macro-context and the classroom micro-context are mutually influenced. The subjective criteria used to assess some students affect their performance and increase their initial 'cultural distance' from the school culture.

The difficulties experienced by immigrant students when facing certain particular mathematical practices, instead of being interpreted in terms of 'lack of potentialities', may (should) be understood in terms of a lack of actions aimed at promoting these potentialities. From this point of view, the notion of social representations is of considerable significance, for it helps us to understand how teachers interpret students' identities as mathematical learners by taking into account their individual and socio-cultural identities.

The construct social representations also helps to dissociate *bad practices* from *bad teachers*. The teacher in our example described himself as having inclusive practices, though the practices we saw were not always inclusive. Teachers' practices do not necessarily reflect teachers' intentions, but rather mirror general social attitudes that lead to ways of administering classroom norms that may provoke learning obstacles and exclusion.

Social representations go far beyond a teacher's individual positioning. Teachers do not always have direct control over the emergence and acceptance of alternative discourse categories. Students' contributions are often responsible for maintaining certain dominant discourse categories. However, although classroom discourse and the social representations behind it are complex constructions built upon many factors, teachers have a privileged position when establishing roles –who needs help, who is supposed to help, who is to talk, or who is to listen. Nevertheless, they will

only be able to use this privilege properly when they are aware of the influence of social representations within the classroom.

There is still much research needed on the existence of differential treatment patterns within the mathematics classroom, and on how these patterns must be dealt with. However, when interpreting mathematics classroom situations where cultural difference is expressed through social differences in actions and expectations, social representations seem to be a key construct. Norms, social representations and discourse relate to how people behave and interact as well as to how their behaviour and interactions are formed and conformed. The above notions may help to explain how a particular mathematics classroom becomes the way it is and how the different learning opportunities and constraints are distributed.

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