

RECONSTRUCTING NORMS¹

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Starting from the constructs ‘cultural scripts’ and ‘social representations’, and on the basis of the empirical research we have been developing until now, we revisit the construct norms from a sociocultural perspective. Norms, both sociomathematical norms and norms of the mathematical practice, as cultural scripts influenced by social representations, mediate the learning of mathematics in multicultural classrooms. When taking into account the particular circumstances in which mediation occurs, there is a need for a move from a cultural perspective to a broader sociocultural one.

THE SCENE

Because of the important recent waves of migration into Spain, our educational system must face the needs of a society where the plurality of cultures and languages is, and will be, a reality. However, the Spanish school system has a limited understanding of the sociocultural and linguistic aspects linked to teaching mathematics in multicultural situations. In general, mathematics teachers are not prepared to teach in multiethnic classrooms, the mathematics curriculum is intended for the ‘native’ groups and, at most, language, understood as everyday language, is the only ‘problem to be solved’ in multiethnic mathematics classrooms.

For more than six years now, we have been researching multiethnic mathematics classrooms in an effort to understand their complexity. The beginning of our project was the result of a request from the Catalan Ministry of Education. Its aims were a result of an initial negotiation with the educational administration, and they included, among others:

- a) to know more about the knowledge that immigrant students bring with them to school and how this knowledge can be linked with the curriculum and its development in the mathematics classroom;
- b) to uncover the values and expectations immigrant students associate with school, and out-of-school, mathematics and determine how these could help or interfere with the teaching and learning of mathematics, and
- c) to develop both proposals and practical examples of how to adapt the school curriculum and the classroom organisation to the multiethnic classroom.

Since the very beginning, we have studied the interactions taking place in multiethnic mathematics classrooms while the students were working on problem solving. The

¹ The empirical study that sustains this theoretical research report has been documented in Planas & Gorgorió (2005)

mathematics classrooms under study were those of teachers that had volunteered to work collaboratively with us and had shown a sensitivity towards issues of equity and inclusiveness. Classroom observation and interviewing teachers and students had the purpose of uncovering and understanding the different social and cultural elements affecting the social and mathematical interactions taking place.

IN SEARCH OF THEORETICAL LENSES

When studying the interactions within the mathematics classroom, the idea of norm becomes an essential construct. When beginning our research (Planas & Gorgorió, 2001; Gorgorió et al., 2002), we used the construct norms as they had been established by Cobb and his colleagues. Cobb, Yackel and Wood (1992) introduced the idea of social norms as social constructs that involve a taken-as-shared idea of what constitutes an appropriate contribution to a discussion. The term sociomathematical norm was coined by Yackel and Cobb (1996) and has been widely used since. Sociomathematical norms have to do with the actual process by which students and teacher contribute to a discussion. They designate the classroom social constructs specific to mathematics that individuals negotiate in discussions to develop their personal understandings (Hershkowitz & Schwarz, 1999, p. 150), and are the result of legitimating explanations and justifications. Sociomathematical norms are also understood upon a taken-as-shared basis (Yackel & Cobb, op.cit.). In the different works by Cobb and his colleagues that we have been able to trace, social norms and sociomathematical norms are seen as different aspects of the classroom microculture. Social norms are used to interpret the classroom participation structure and are not specific to the mathematics classroom; sociomathematical norms deal with normative aspects of classroom action and interaction that are specific to mathematics (Cobb & Liao Hodge, 2002).

However, with the development of our study of immigrant students' transition processes (Gorgorió et al., 2002), it became apparent that the construct of norms did not fully allow us to interpret what we were observing: different understandings of the same norm within a mathematics classroom were difficult to reconcile, and could certainly not be taken as shared. In our study, as in the one reported in Cobb (1999), the norms and practices within the classroom were in conflict with those of the students' immediate contexts. The immigrant students in our classrooms had a different way –different from that of the local students and teachers– of understanding, valuing and using mathematics, differences that gave rise to cultural distances and cultural conflicts (Gorgorió & Planas, in press).

Norms refer to regularities of the practice and of the social interaction that are established by the individual and group interpretations of what is perceived as acceptable or desirable. In the multiethnic classrooms we studied, there were different perceptions of a particular contribution as 'being acceptable or desirable', a fact that was causing obstacles to communicative processes. The main issue was not to reach consensus on, for instance, what constitutes mathematical evidence, a good

hypothesis, or a good explanation. In the classrooms of our study, where immigrant children from different parts of the world were expected to work together with local children, there were other more basic, or prior, issues, also related to mathematics learning, on which agreement was needed. The meanings and values associated with mathematical knowledge and who is mathematically knowledgeable, the expected role of a mathematics teacher, the working organisation within the mathematics classroom, or the idea of learning mathematics in itself, were at the basis of the difficulties in the interaction processes and were not in the least ‘taken-as-shared’.

The issue then, for us, was that the meaning of the word *social* in the social norms and sociomathematical norms needed to be revisited. From a sociocultural perspective the learning of mathematics is affected by what takes place within the classroom and in their nearest contexts. We could not understand anymore the word social as simply ‘being conjointly constructed by the different participants in the classroom’, without considering that all participants were, in turn, social individuals, with their own social and cultural experiences and expectations. Could we then still regard norms upon a ‘taken-as-shared’ basis?

RECONSTRUCTING NORMS

How do the different and multiple cultural and social histories of the individuals become apparent when they (are supposed to) work together in the mathematics classroom? It is widely recognized that different cultural artefacts, like different algorithms or number symbols, mediate the students’ learning processes. It is our claim that the different ways of understanding the teaching and learning of mathematics itself and how it has to take place, or the value attributed to having or not having mathematical knowledge, are also cultural factors that shape how individuals act and interact within the mathematics classroom. The issues then are: ‘How are norms established?’, ‘How can they be agreed on, negotiated or changed?’, ‘How is the ‘desirable’ or ‘acceptable’ established?’.

Our reconstruction of the concept norms is based in two well established constructs: those of ‘cultural scripts’ and ‘social representations’. Cultural schemas (D’Andrade, 1990) make up the meaning system characteristic of any cultural group. Cultural schemas ‘portray not only the world of physical objects and events, but also more abstract worlds of social interaction, discourse, and even word meaning’ (D’Andrade, op. cit., p. 93). According to Cole (1996) ‘a script is an event schema that specifies the people who appropriately participate in an event, the social rules they play, the objects they use, and the sequence of action and causal relations that applies’ (p. 126). Scripts are to be treated as dual entities, one side of which is a mental representation, the other side of which is embodied in talk and action (Cole, op. cit., p. 129).

The idea of ‘social representations’ (Moscovici, 1983) also plays a significant role in our reconstruction of the concept norms. We understand social representations to be particular types of knowledge that allow people to organise their reality, both social

and physical, and to relate with other people and groups. They are reconstructions of reality, arising from communication between individuals; reconstructions which, in practice, regulate behaviour between and within groups. Social representations focus on, select and retain certain relevant facts of reality, according to the interests of the individual as inserted within a group. Selected aspects of the object of the social representation develop into an implicit theory that allows individuals to explain and assess their contexts. They constitute an operational guide to understanding complex or difficult situations, to facing problems and conflicts, to coping with unexpected realities, to justifying actions and to maintaining differences between groups when these differences seem to be fading. To our understanding, social representations are neither directly based on scientific knowledge, nor necessarily verified by means of empirical facts.

Our reconstruction of norms focusses on their social weight. The group's social valorisations shape the values, expectations, emotions and beliefs of the individuals who identify themselves with it. When the teacher calls on a certain norm, and the students tackle it, they all bring to the process their own interpretation of a social understanding about mathematical knowledge and mathematical knowledge ownership, and a social valorisation of mathematical practices. Broader social structures, like the educational system, impact on the classroom interactions through implicit messages about what are the legitimate norms within the classroom. In our reconstruction of norms we refer to sociomathematical norms and to norms of the mathematical practice as regulating actions and interactions within the mathematics classroom: the first when taking into account the individuals' and groups' social understanding and valuing of mathematical knowledge; the second when considering the individuals socially interacting with specific mathematical knowledge.

We refer to sociomathematical norms as the explicit or implicit regulations that influence participation within the mathematics classroom and the interactive structure of the development of the mathematical practice. They have to do with how the different participants value mathematical knowledge, and value and position themselves, the others and their group(s) with regard to mathematical practice(s) and knowledge. They arise from the individual's and group's interpretations of cultural scripts influenced by social representations of mathematical knowledge in relation to people having and using it. A sociomathematical norm explicitly stated by a teacher could be, for instance, 'In this class we work collaboratively and people must help each other'. When stating it, the teacher resorts to his/her understanding of an appropriate way of working in the mathematics classroom, which may come, for instance, from the collective image of a particular school culture. When putting into action this norm, the teacher has to take decisions about how to organise the students in small groups, and in doing so, s/he is borrowing meanings and values from the cultural scripts and social representations of a particular group. S/he may decide, a-priori, that a gypsy student does not need help when doing arithmetic. S/he may not know the student very well, but 'it is common knowledge' among mathematics

teachers that gypsy students are ‘not so bad’ at mental arithmetic. On the other hand, the gypsy student also has to tackle this norm. S/he is to agree or disagree, explicitly or silently, with the grouping suggested by the teacher. Her/his agreement will be built on the basis of how much help s/he feels that s/he needs. Her/his feeling about needing help is intimately linked to the identity that s/he is developing as a mathematics learner, which is also shaped through her/his understanding of how society values her/his cultural group as doers of mathematics.

Another sociomathematical norm could be ‘In this classroom everybody may contribute with ideas’. Again, the sociomathematical norm is linked to the cultural script of the institution. The immigrant student, when deciding whether s/he contributes with a different solution to a problem, may feel conditioned because of previous experiences that tell her/him that the contribution will not be accepted, since s/he has not been recognised as a valid mathematics interlocutor on other occasions. Too often, the fact that a student identifies her/himself with the community of mathematical practice, or the fact that the group accepts her/him within it, has little to do with his real mathematical abilities, but with the others’ interpretation of the social representations of his group in relation to mathematical practices.

Note that we consider as sociomathematical norms some of the norms that in Cobb’s system would be regarded as social norms. We agree with Cobb and Liao Hodge (2002) that mathematics teachers, as well as history teachers and science teachers, may want students’ participation. However, norms about participation in the mathematics class have other meanings and consequences than the same norms in history or science classes. The way teachers conceptualise the learning of mathematics constrains the prevalence of one norm over another. When establishing, for instance, ‘who needs to work with whom’ or ‘who can benefit from a particular participation structure’, mathematics teachers base their decisions on their conceptualisations of what teaching and learning mathematics is about. Their conceptualisations are unavoidably shaped by cultural scripts, social representations and valorisations of mathematical practices and of social groups in relation to mathematics.

We regard norms of the mathematical practice to be the norms that legitimate the mathematical activity, strategies, processes and certain ways of thinking within the classroom. They have to do with the rules and ways of doing of mathematics as a scientific discipline, and with how teachers and students interpret mathematics as a school subject. When teachers decide whether a content, procedure, task or strategy is appropriate as school mathematics, they borrow their meanings from the culture of the groups they are part of, be it an innovative association of teachers of mathematics, or a group of mathematicians educated in a certain way. They also borrow their meanings from the culture of the educational system and from their particular school cultures. The official intended curriculum, the syllabus and the textbook also convey to teachers cultural scripts of what constitutes school mathematics. Students interpret what mathematics is about through the lens of the culture(s) they have participated in

throughout their lives, be it the classroom(s) culture(s), the school(s) culture(s) or, at large, their home culture.

A norm of the mathematical practice explicitly stated by a teacher could be, for instance, 'In this classroom, a visual strategy is also a proper strategy to solve a problem' The teacher may have a particular understanding of mathematics, while her students may think that visual strategies are not 'proper mathematics' because they have never seen such a strategy used before. Another teacher may prefer an approximate solution while her students believe that 'exact' answers are more 'real mathematics', because this is part of their cultural scripts of what counts as mathematics, scripts brought from home or from their previous school history. Again, note that we would consider as norms of the mathematical practice those relating to what constitutes mathematical evidence, a good hypothesis, or a good explanation, norms which according to other authors would be regarded as sociomathematical norms. We would also like to make clear that, although in the examples that we have presented it is the teacher who explicitly states the norms, very often norms are established in implicit and less clear ways.

NORMS AS CULTURAL ARTEFACTS MEDIATING CLASSROOM INTERACTION

We understand norms as being secondary cultural artefacts as defined by Cole (1996). Sociomathematical norms are shaped by cultural schemas, representations and valorisations of mathematical knowledge and its ownership. They regulate and legitimise interactions and communication processes of mathematical practice. Norms of mathematical practice, as interpretations of cultural schemas about what mathematics in schools is/should be about, regulate the content of practice as legitimised within the classroom.

We consider a mediator to be an agent interposed in a process of change that can affect its path, either facilitating or hindering it. In Gorgorió and Planas (2005) we present our interpretation of how norms, shaped by social representations, act as mediators. Classroom practice and interactions, seen from the perspective of the individual, borrow their meanings from the social. Norms contribute to give shape to the way a person or a group makes sense of the mathematical practice, interactions and communication acts. Social valorisations of mathematical practices and groups shape the value individuals attribute to one another and to the knowledge they exhibit. Like Abreu and Elbers (2005), we view social mediation as an active process that occurs when individuals or groups are influenced (e.g., in their thinking, acting, feeling or identifying) by cultural tools, or individuals or groups resort to cultural tools to influence one another (e.g., when communicating or orchestrating interactions). The analysis of the mediational role of norms addresses issues around who (appropriately) participates, whose participation is (not) welcomed, and the different roles played by individuals within the mathematics conversation. The

mediation takes place in a multilayered way. It is not only the norms that shape the action, but the unique re-interpretation made of them by individuals.

In our reconstruction of the idea of norms, it is important to consider the interplay between cultural scripts and social representations. We agree with Cole (1996) that ‘while culture is a source of tools for action, the individual must still engage in a good deal of interpretation in figuring out which schemas apply in what circumstances and how to implement them effectively’ (p. 130), and that ‘in order to give an account of culturally mediated thinking it is necessary to specify not only the artifacts through which behaviour is mediated but also the circumstances in which the thinking occurs’ (p. 131). It is when taking into account these circumstances that we have to resort to the idea of social representations. The global scenario of our research is that of immigration in a country where, until recently, the only shared meaning for ‘foreigner’ was that of a tourist. When foreigners are no longer only tourists, and local people feel their rights and privileges at risk, having no scripts to orient action and interaction in the new multicultural situations, it is only through social representations that individuals can make meaning of those situations.

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, in-transition students and their practices are more prone to be valued negatively due to a-priori assumptions socially constructed and this valuing interferes with the orchestration of the norms that should facilitate, or at least allow, their participation. The difficulties that immigrant students encounter when they are to understand and use ‘new’ norms may not lie only in their novelty, but also in the fact that norms are not neutral. To what extent do norms, as cultural artefacts of the dominant group(s), have as a possibly unintended effect the continuing of the culture and the social positioning?

FINAL REMARKS

Norms, being elements that regulate classroom action and interaction, are at the very basis of classroom discourse (see, for instance, Cobb & Liao Hodge, 2002, for a theoretical argument; and Planas & Gorgorió, 2004, for an empirical analysis). Understanding norms as constituent elements of discourse, they become valuable constructs in our empirical work to analyse the complexity of the multiethnic mathematics classroom from the complementarity of a cultural and social perspective. However, up to what point is it valid to change the interpretation of a theoretical construct, such as norms, without changing the word that represents it? Cobb (1999) already suggested the need to complement the ‘classic view’ about norms with a sociocultural perspective that places the classroom in its social context. More recently, Cobb and Liao Hodge (op. cit.) referred to their interpretive perspective ‘as provisional and eminently revisable, particularly in response to empirical analyses’ (p. 278).

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