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EDUCATIONAL FORMS OF INITIATION IN MATHEMATICAL CULTURE

“Seule l’histoire peut nous débarrasser de l’histoire”

Pierre Bourdieu (1982), **Leçon sur la leçon** (p.9)

ABSTRACT. A review of literature shows that during the history of mathematics education at school the answer of what counts as ‘real mathematics’ varies. An argument will be given here that defines as ‘real mathematics’ any activity of participating in a mathematical practice. The acknowledgement of the discursive nature of school practices requires an in-depth analysis of the notion of classroom discourse. For a further analysis of this problem Bakhtin’s notion of speech genre is used. The genre particularly functions as a means for the interlocutors for evaluating utterances as a legitimate part of an ongoing mathematical discourse. The notion of speech genre brings a cultural historical dimension in the discourse that is supposed to be acted out by the teacher who demonstrates the tools, rules, and norms that are passed on by a mathematical community. This has several consequences for the role of the teacher. His or her mathematical attitude acts out tendencies emerging from the history of the mathematical community (like systemacy, non-contradiction etc.) that subsequently can be imitated and appropriated by pupils in a discourse. Mathematical attitude is the link between the cultural historical dimension of mathematical practices and individual *mathematical* thinking.

KEY WORDS: activity, tool, discourse, participation, genre, attitude

1. WHAT IS REALLY MATHEMATICAL?

‘Math’ is widely acknowledged as an undisputed part of the school curriculum. Over the past fifty years the classroom approach to mathematics has changed radically from a drill-and-practice affair to a more insight-based problem oriented approach. Every form of mathematics education makes assumptions about what the subject matter of mathematics really is, and – consequently – how the learning individual should relate to other members of the wider culture in order to appropriate this allegedly ‘real mathematics’, or to put it more directly, to appropriate what is taken to be mathematics in a given community. Part of a school’s responsibility is to induct students into communities of knowledge and the teaching of mathematics can be seen as a process of initiating students in the culture of the mathematical community. In fact, students are from the be-



gining of their life a member of a community that extensively employs embodiments of mathematical knowledge. The school focuses attention on these embodiments and their underlying insights, and by so doing draws young children into a new world of understanding, with new conventions, rules and tools. So, basically, here is a process of reacculturation in which a student is assisted to switch membership from one culture to another. Buffee's (1993) insightful analysis of this process describes reacculturation as mostly a complex and usually even painful process: "Reacculturation involves giving up, modifying, or renegotiating the language, values, knowledge, mores and so on that are constructed, established, and maintained by the community one is coming from, and becoming fluent instead in the language and so on of another community" (Buffee, 1993, p. 225).

Educational history teaches us that schools have tried to support this reacculturation process in a variety of ways. Underlying these approaches there are different assumptions concerning the nature of mathematics in the classroom, and concerning the way teachers should communicate with their pupils in the classroom. In this article I will try to apply Bakhtin's approach to the discourse in a mathematics classroom, especially focusing on the question of how the participants in this classroom are linked together and what common *background* is to be constructed in order to constitute a way of speaking and interacting that will be acknowledged as a *mathematical* discourse. The final aim is to find a way of describing some of the conditions that must be fulfilled in order to ascertain that the classroom's activity can really count as 'mathematical'. There is, however, no direct empirical way of achieving this just by observing a great number of existing classroom practices and describing the events in Bakhtinian terms. When we view the discipline of 'mathematics' as a "socially conventionalized discursive frame of understanding" (Steinbring, 1998, p. 364), we must also acknowledge – as Steinbring does – that not only factual technical mathematical operations are involved in mathematical activities in classrooms, but epistemological constraints and social conventions are also part of the process. The application of the Bakhtinian jargon requires that the hidden assumptions be brought into the open as they presumably co-determine the style and the course of the discursive process, and the authority and power relationships that are involved.

One of the values that are implicitly or explicitly applied in every mathematics classroom is an idea about what really counts as mathematical. On the basis of these notions mathematics education researchers, curriculum developers and teachers decide what is relevant or even compulsory for taking into account in the mathematics classes and courses. On the basis of their mathematical epistemology, teachers make observations of pupils'

activities and select some actions as relevant or not, they value certain actions as 'good' or assess others as false or insignificant (van Oers, 2000b). Obviously, there is some normative idea at stake here about what mathematics really is, or – more modestly formulated – a norm that helps in deciding whether a particular action or utterance may count as 'mathematical' or not: one teacher focuses on number and numerals, another one on structures, while a third may stress the importance of problem solving. Introducing children in one way or another into the world of mathematics and its according speech genre probably implies teaching them the presumptions for identifying what is really mathematical and what isn't.

The idea of what mathematics really is, is of course not just an educational problem. Much of the engagement of the philosophy of mathematics is based on this very same query (see for example Rotman, 1988). Although there is probably often a relationship between the epistemological positions that can be taken with respect to mathematics as an intellectual discipline and one's view on mathematics education, I will directly focus here on the ideas about mathematics in education (school, curriculum).

As Bourdieu (1982) has already argued, education has a very important role to play in the institutionalization of a discipline through implicitly (hidden in the routines or habits of a particular community) or explicitly signaled values that create distinctions between people, and consequently mark some of them as (say) mathematicians or not, mathematically educated or not, etc. In a similar vein I shall argue here that the notion of what is mathematical and what not is developed in education, and the mastery of this value marks significantly those who will be acknowledged as mathematically educated (e.g. who may pass the exams) and who can't. Hence it is essential to find out what kind of conception of mathematics is used, and what the implications are for the relationship between teacher and pupils, as well as for the organization of the classroom discourse in mathematics. Presumably this notion of what is really mathematical in the classroom is one of the basic values that constitutes the speech genre of the mathematical classroom.

2. VIEWS ON MATHEMATICS AS SUBJECT MATTER IN SCHOOLS

There exist a number of different conceptions about what the mathematical subject matter really is. The real mathematics manifests itself with different faces in the classroom, having different implications for the relationship between teacher (as a representative of culture) and pupils, and *a fortiori*, for the conception of communicating in the mathematics classroom.

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