Oral communication in maths class in the regulation of students’ learning

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Abstract
In this investigation, I will study, in a context of collaborative work among teachers, oral communication in maths class as a factor of regulation and self-regulation of students’ learning. Methodologically, I will adopt an interpretive approach and study three mathematics teachers, who will constitute as cases. Data collection include: classroom observation and collaborative work sessions (with audio recording); interviews with participating teachers (with audio recording) and the documentary collection of written products (produced either by the teacher-cases, either by students) as well as a logbook written by me as researcher. Concerning the procedures for data analysis, I will define categories of analysis of cases, taking into account the theoretical framework and the research questions.

Research Problem and Questions
In this study, I will try to understand, in a context of collaborative work among teachers, how and under what conditions oral communication in the mathematics classroom contributes to the regulation and particularly to the self-regulation of students’ learning. To address this problem will be considered the following questions, for guiding the study:

- What are the characteristics of oral communication with potential in the regulation, and especially on self-assessment, of mathematical learning of students?
  - What is the role played by the teacher and by the students in this communication?
  - How do these roles evolve throughout the collaborative work?
  - How do the characteristics of oral communication vary, depending on the learning contexts?
  - Is there learning environment more conducive to the achievement of an oral communication with potential in the regulation of learning? Why?

- How does the oral communication with potential in the regulation of learning contribute to the development of students’ self-assessment skill of mathematical learning?

- What are the constraints associated with the adoption of an oral communication with potential in the regulation of learning, and how can these constraints be minimized in the context of collaborative work among teachers?

Theoretical Framework
Currently, assessment is understood as a social construction (Hadjji, 1994), which is sensitive to the values, beliefs and claims of the various actors involved, requires their active participation and is not merely to measure or describe, but seeks to intervene to improve (Lincoln & Guba, 1989; Pinto & Santos, 2006). It is an interactive assessment (Santos, 2008) focusing on students' cognitive processes and associated to feedback (Black & William, 1998a; Stiggins, 2004), to regulation and self-regulation of learning (Fernandes, 2006; Santos, 2008). Therefore, it requires an intentional, systematic and individualized adaptation of the teaching situations and actions, both by the teacher and the pupil, to improve learning (Nunziati, 1990, Pinto & Santos, 2006). In this context, self-assessment becomes relevant because it allows the students to regulate their own thinking and their learning (Nunziati, 1990; Santos, 2002, 2008). In this study, self-assessment is seen as meta-cognition process, whereby the subject becomes aware of the different moments and aspects of his/her cognitive activity and exercises a conscious and critical self-control over his/her actions (Santos, 2002). It is an internal process to the subject which allows him/her to regulate his/her own thinking and learning (Nunziati, 1990). This process includes monitoring and action:
the student confronts what he/she did with what he/she was expected to do, acknowledging the differences between these two situations, and acts to reduce or eliminate them (Sadler, 1989; Santos, 2008). This form of assessment is associated with a better understanding of the learning objectives by students (Black & William, 1998b; Sadler, 1989) and leads to significant improvements in their performance (Cassidy, 2006; Fontana & Fernandes, 1994, Irving et al., 2003). The improvement of students’ self-assessment skill requires a learning process and the promotion, by the teacher, of conditions appropriated to such improvement (Nunziatti, 1990).

Oral communication plays a crucial role in the teaching and learning (NCTM, 2000; Voigt, 1995). Depending on how the teachers manage the discussions, question, listen, and respond to their students, the oral interactions can be grouped into categories, ranging from those strongly associated with the transmission of knowledge, in an one-way communication, to the most probing, that promote the explanation, the justification and the assessment by the students and also the construction and the negotiation of meanings (Brendefur & Frykholm, 2000; Voigt, 1995). In mathematics’ discussions, in particular, should be taken into account the specific aspects of mathematical activity of students, the socio-mathematical norms, such as the understanding of what is an acceptable mathematical justification. The teacher has a central role in establishing a classroom environment with mathematics’ quality, which involves the negotiation of these rules, through a process of communication, which is expected to result in learning opportunities for students and teacher (Yackel & Cobb, 1996).

The oral questioning is a privileged way to encourage and support an oral communication with potential for regulation of learning (Santos, 2008). However, often this practice is not planned or conducted in order to contribute to learning, since the teacher does not give enough time for the student to think about the question or make direct and closed questions that tend to promote surface and thoughtless responses (Black & Wiliam, 1998a, Black et al., 2003, Gipps, 1999). So that an interaction effectively contributes to the regulation and self-regulation of students’ learning must: be intentional and participated by students and teacher; considers the error as natural and without distinctive status; privileges and respects different ways of thinking; and recognizes the group as a legitimate field for validation or correction (Santos, 2008). Also, must give priority to the open questions, which contribute to the development of students’ understanding, and provides a suitable wait time for students to make a reflected contribution in a process of bilateral communication (Black et al. 2003). The task of putting good questions in class is, therefore, complex (Gipps, 1999) and demands, for the teacher, changes in classroom management and increasing the need for a thorough knowledge both in science education, both on the process learning (Moyer & Milewicz, 2002).

The theoretical study will, therefore, include two fields. The first regards the assessment for learning, and particularly the students’ self-assessment, and the second field regards oral communication in mathematics classroom. Teaching practices in mathematics will also be considered, including the discussion of different types of tasks and working methods.

Methodology
The study will follow an interpretive paradigm and a qualitative approach, since: (i) the natural environment will be the direct source of data and I am, as researcher, the main tool for collecting them; (ii) the study will concern itself primarily with processes and dynamics and will be based on a "thick description"; (iii) data will be analyzed inductively, and (iv) for understanding the research problem, it will be fundamental to understand the meaning that participants attribute to their actions (Merriam, 1988; Bogdan & Biklen, 1994). As to the study’s design I will chose the case study, selecting three teachers-cases. I will be concerned, primarily, with questions of "how" and "why" and take advantage of multiple sources of evidence. Besides that, I don’t want to have control over events and it won’t be possible or desirable to manipulate the potential causes of the behaviour of participants (Yin, 2002). The number of cases will seek to respond to the diversity of factors that relate to the school environment. As selection criteria will be taken into account:

i) teachers who teach 3rd cycle of basic education (12 – 15 years old);
ii) work experience (teachers with different professional experience, both in terms of initial and continuous training, both in terms of years of service);

iii) teachers who show capacity for reflection on their teaching, and their profile fits an attitude of self-questioning training.

For reasons of ethics, I will inform participating teachers about the objectives of the study and the procedures to be used. Furthermore, in order to protect them, as well as their identity, I will recur to anonymity, by using pseudonyms, and give them to know the final content of the study before it is published. Being aware of the risk of making judgments of value about the subject of study, I will also monitor the attitudes that are more conducive to its implementation.

Also, it will be participating in the study students in a class of 3rd cycle (of each teacher-case). The study will try to understand what is the role played by the students in oral communication and how an oral communication with potential in the regulation of learning contributes to the development of students’ self-assessment skill of mathematical learning. Each of the teachers, along with me, will select four students as informants. This choice should include a variety of parameters (the self-assessment, the student’s performance, especially at the level of oral communication, strategies for solving tasks...).

It is intended that the study takes place in three phases, between October 2009 and September 2012. In the first phase, which lasts until September 2010, I have been doing the work of bibliographical research and drafting of relevant theoretical framework of the study. In a second phase, especially dedicated to data collection, between September 2010 and June 2011, I will accompany the three teachers-cases (the collaborative group consists of me and four other teachers, although only three will constitute as cases) in a context of collaborative work, bearing in mind the potential and the problems associated with a work of this nature (Boavida & Ponte, 2002). The monitoring will focus on maths classes in a class of 3rd cycle of basic education for each teacher-case and on the weekly sessions of collaborative work, between me and the teachers. These sessions will include the stages of planning, discussion and assessment of work and practices adopted. During these sessions, we should also proceed to the reading, discussion and reflection of articles and other documents (e.g., curriculum documents) to address the problem of assessment for learning and oral communication in the classroom, especially in mathematics class. The work sessions already started on the first phase of the study, contributing to the knowledge and characterization of the different perspectives of teachers on teaching and learning of mathematics and on themes in study (the first meeting with the four teachers and the first individual interview to each teacher happened in May). Throughout the sessions of collaborative work, I will advocate the adoption of practices of teaching and learning, which promotes mathematics learning, particularly with regard to interactions and oral questioning in the classroom.

In this investigation, I will use several sources of information: teachers, classes, sessions of collaborative work and written productions, what is appropriate on a case-study method (Yin, 2002). As methods for collecting data I will use: participant observation of classes and sessions of collaborative work, recorded in audio; the semi-structured interview (two for each teacher, one early and one at the end of the study), also with audio recording; and the documentary collection of reflections / written materials produced by teachers-cases (e.g., lesson plans, tasks, reports or reflections), productions / reflections of students and the logbook, written by me as researcher. The observation of classes will be hold throughout the academic year 2010/2011 (I already observed, during the month of May, a first class of each teacher, to have a first contact with the class and teachers' practices). This observation must meet either the needs to collect data to answer research questions, but also the demands of collaborative work. These lessons to observe should be diversified, especially for the type of work to be taken (individual work, pairs, small groups, group-class, ...) as well as the nature of mathematical tasks proposed to students (problem solving, exploration, investigations, ...), trying to understand how the learning contexts affect oral communication in mathematics classroom and its effects on students’ self-assessment. Collection methods chosen are, in fact, the most widely used in interpretative research and, in particular, in the case studies (Bogdan & Biklen, 1994). I will seek to combine information sources, data collection
methods and instruments of different types in order to obtain several information allowing me to clarify meanings and understand in-depth the problem of study. In parallel with data collection, I will try to develop their analysis, in an iterative process, based on the problem and the theoretical framework of the study. Its implementation is complex, but more efficient and effective, allowing adjustments, if relevant (Bogdan & Biklen, 1994). This first phase of data analysis will be based on a grid of analysis of oral feedback, proposed by Santos and Pinto (2008), and a grid of analysis of the self-assessment (to be determined later based on the literature and the data collected). The use of these grids can also help teachers to analyse and reflect about their practices, especially concerning the promotion of oral communication and self-evaluation of students.

In the third and last phase, between July 2011 and September 2012, I will continue the reviewing process, defining the categories of analysis and the structure for organization of cases, to enable understanding and analysing each case and comparing them.
References


