

COMMUNICATION AS SOCIAL INTERACTION

PRIMARY SCHOOL TEACHER PRACTICES

António Guerreiro

School of Education, University of Algarve

Lurdes Serrazina

School of Education, Lisbon

Abstract. *This article reports the reflections of a primary school teacher on her communication practices in the classroom and the interaction between the students. It is part of a large research which intends to study the evolution of collaborative work among three teachers and the first co-author of this article, with regard to the knowledge of and development of processes of mathematical communication and interaction in the primary school classroom.*

Key-words: mathematical communication; collaborative work; teaching practices; professional knowledge; teacher education.

Communication as an instrument of the relationship between teacher and students has been the target of widespread dispute in the field of education, given its relevance in the teaching and learning process. The greater value given to the role of dialogue and the sharing of information is opposed to a more traditional form of communication based on a one-way discourse, undertaken by the teacher (Brendefur & Frykholm, 2000).

From this point of view, the transference of information and codes (linguistic and others) is not approached nor studied in itself, but in its use, and communication is characterised as a process of social interaction. It is in this process of interaction that the subjects as well as society itself undergo their construction, through the negotiation of meaning between individuals (Yackel, 2000).

Founded on this desire to understand the role of communicational changes in the teaching and learning of mathematics, the first co-author of this article developed a collaborative research into mathematical communication with three primary school teachers, with the supervision of the second co-author.

This article proposes to explore the way in which the communicative practices of the teacher can raise the value of the communication among the students in the classroom. It results from the work undertaken with one of the teachers who participated in the study – Laura.

COMMUNICATION AS A PROCESS OF SOCIAL INTERACTION

From the point of view of communication as interaction, learning by the subjects arises from interactions between the individual and the culture (Sierpinska, 1998), including the interactions between students and the teacher.

Communication is characterized as a process of social interaction, which permits the subject to identify himself/herself with the other, and at the same time, express and affirm his/her singularity (Belchior, 2003), and has the function of creating and maintaining understanding between individuals.

Thus, teaching is understood as an interactive and reflective process, with a teacher continually engaged in differentiated and updated activities for his/her students. With these activities, meanings are formed in the process of interaction between the subjects, and not only in the transmission of a codified knowledge which is given beforehand (Cruz & Martínón, 1998; Godino & Llinares, 2000; Yackel, 2000).

It is assumed that mathematics teachers' knowledge is a specialized knowledge of and about mathematical (Ball, 2003), practical and personal knowledge (Chapman, 2004; Elbaz, 1983) that teachers develop through the process of reflection. Thus the collaborative work between teachers and researcher is a privileged way for knowing the teachers' professional practices (Boavida & Ponte, 2002).

METHODOLOGICAL OPTIONS

The background investigation for this article fits into a qualitative methodology (Bogdan & Biklen, 1994), which adopts the interpretative paradigm and follow the design of a case study (Stake, 1994; Yin, 1989). Three primary school teachers participated in this study, in a context of collaborative work with the researcher, regarding the reflection about their professional practices concerning mathematical communication.

The study has been conceived in two phases: the *characterization phase* in order to characterize the participants and interpret *the state of the art* (carried out during 2006/2007 academic year) and the *collaboration phase* in order to work together on mathematical communication in the process of teaching and learning (carried out during 2007/2008 academic year).

The data collection consisted of initial and final interviews (audio taped) with the teachers, description of the collaborative meetings (audio taped) between the researcher and the teachers (collectively and individually) and classroom reports (audio and/or video taped). The data were transcribed and reduced in expressive episodes.

In the *characterization phase* an interview was carried out with each teacher. The researcher attended two lessons of each one and carried out two meetings with them. In the *collaboration phase* there were two meetings with each teacher and five meetings of collaborative work. The researcher attended nine lessons of each teacher. The final interviews were carried out at the beginning of 2008/2009 school's year.

The collaborative work implicated theoretical framing discussion, elaboration of mathematical tasks for the classroom and the reflection based on the transcription of teachers' lessons and the video of teachers' and students' communication practices in the classroom.

The data analysis was organized in case studies. Each one with the characterization of the teacher and school context, namely the teacher's mathematical communication conceptions and practices. These were the reflections of the teachers about the facts and situations that gave added value to social interaction between students and mathematical learning.

INTERACTION IN THE CLASSROOM

This section shows how the interaction in Laura's classroom evolved from the beginning of the study and throughout the collaborative work.

The initial reflections (in the characterization phase) of Laura about the interaction among the students in the classroom, in the class group, seem to reflect conceptions associated with the notion of communication as transmission of information:

Normally explaining how they did things, the reasoning, the calculations, but also in relation to the problems. [Interview, December 2006]

This presentation of strategies and reasoning is conducted by the teacher, requiring sometimes the participation of the rest of the class. The students were presenting their productions of rectangular panels constructed with twelve paper squares. (Appendix 1):

Teacher: Which was the first one that you made together?

[The students in the group, up by the blackboard, point to one of their stuck-on designs]

Teacher: That one. How did you make this one here? [Points to the first rectangle]

Student: Four...

Teacher: Four.

Student: Four, four and four...

Teacher: Was it like that?

Another student: Four, three and three...

Teacher: And the second one?

Student: We made it two by two and four by four.

Teacher: Not four.

Student: One, two, three, four...five, six.

Teacher: Ah, and the last one, how was that one? You just said: "We have to make three, three, three...", I said, "no, you already have three, three, three...", "ah, of course there is. So we have to make four, four, four...", "but you already made that here", "Ah, of course that's right. So we have to make two", "but you already have that here". What did you say to me then?

Student: We can make it one by one. [First Year Class, June 2007]

The omnipresence of the teacher in the classroom, allied to the *monologue* of the students, appears to result in an understanding of communication as a way to put forward previously constructed ideas which have been validated by the teacher.

Interaction and Exploration of Error. The avoidance of error in the construction of mathematical knowledge seems to be one of the causes of this constant validation of

the activities of the student by the teacher. As Laura tells us, her main worry in relation to the work of her students was the attempt to avoid error, “*always to get the thing right*” [Collaborative Work, October 2007], given that “*we really love it when they get it right straightaway*” [Idem].

The reflection, in the collaborative group, on the role of off-the-cuff validation and of error, implied that teachers involved in the study made an effort to try to avoid validation of the activities of their students when group work was taking place.

Laura tried to get the students to interact among themselves, in spite of her very much present mediation. As Laura says, despite trying not to interfere so much, the students constantly need her approval, “*Mine look at me and wait for me to say something*”, while they are putting questions to each other [Collaborative Work, November 2007].

In the development of this strategy of communication among the students priority was given to presentation of the incomplete or wrong strategies of the students and consequently to the discussion of the mathematical aspects or other causes for the errors put forward.

In the problem of the River Crossing (Appendix 2), the teacher opted to begin the discussion with a solution that was incongruent with the conditions of the problem. The student Monica presented the solution of her group, writing:

Little Johnny takes the rabbit in the boat. Little Johnny takes the cabbage in his lap and the dog on one side, and they go on their way

While the student was writing on the board, some students were waiting with their hands up, as a sign that they wanted to question their colleague.

Teacher: There are hands up.

The teacher alerted Monica to the questions of her colleague and she ended her presentation and chose one of the other students to ask her a question. After an intervention directed towards the correct solution, one of the students who had identified the incongruency of the resolution with the statement of the problem explained:

Gonçalo: The group wrote “the cabbage in his lap and the dog on one side” but he can only take one animal.

Teacher: Where?

Gonçalo: In the boat.

Teacher: One thing. But three things went.

Gonçalo: Yes, but the cabbage can't go on Little Johnny's lap. There can only go the dog or the cabbage, only one thing. [Second Year Class, March 2008]

The teacher valued the interaction among the students and passed this conclusion on to the group which was at the blackboard, highlighting the impossibility of more than two *passengers* in the boat. Faced with this *rejection*, one of the members of this same group – Tiago – presented a new proposal for the solution, writing:

First goes the dog [the students become agitated because they consider what their colleagues wrote to be wrong]. Second goes the cabbage. And last goes the rabbit.

Gonçalo, observing the solution written by Tiago, says:

Gonçalo: I know what's wrong.

Teacher: So go up there Gonçalo. Go to the blackboard and say what's wrong.

Gonçalo went up to the blackboard and put his reasons to Tiago.

Teacher: Tiago, stay there to defend yourself.

Gonçalo: The dog can't go first, because if Little Johnny took the dog.... If Little Johnny crossed the river with the dog, then the rabbit would eat the cabbage [idem]

The comments of the teacher were intended to promote the interaction between the students – “*There are hands up*” – and to encourage the justification of student's reasons - “*stay there to defend yourself*”. This attitude of this teacher promoted a greater interaction between the students in the classroom.

Interaction and Teaching and Learning. Laura recognizes and values the students change in attitude towards communication by the students, emphasizing that they have also changed their attitude in the other subject areas:

I try to get them communicating among themselves, no matter what the subject is. [Meeting of the Teacher with the Researcher, April 2008]

This attitude of the students also appears to be related to a significant change of the teacher's attitude in the classroom, in particular with regard to her expectations about students:

I bide my time, I wait, listening more carefully, because at times what they say is important, although sometimes it isn't. [Idem]

This seems to have contributed to a greater autonomy of the students in the learning and construction of knowledge:

[The students] are more at ease, they have a different dynamism. They participate more.

They are more attentive to what they are doing. [Idem]

The development of communication and interaction among the students has changed the way of working in the classroom. As Laura says, “*we are working at a deeper level because there's more discussion*”. [Idem]

SOME FINAL CONSIDERATIONS

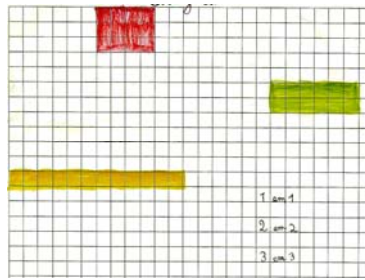
The teacher's practice in relation to the interaction among the students is initially associated with the valorisation of the attitude of exposition of their activities according to the role of the teacher in explaining mathematical concepts.

Teachers were involved in reflecting on their classroom practices in mathematics. With this reflection they began to give more importance to the role of error in mathematics learning, and to allowing students to interact with their peers. This led to increase the interaction among students, either mediated by teachers or not.

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Appendix 1



Appendix 2

River Crossing - The hunting dog, the rabbit and the cabbage

Little Johnny was crossing a dry, unshaded field on the way to his grandfather's house. He was taking with him a hunting dog to go with his grandfather on the hunt, a jack rabbit for his grandmother to put in her rabbit hutch with a pretty female rabbit and a nice cabbage for lunch.

All along the way, the dog wanted to eat the rabbit and the rabbit to eat the cabbage. Little Johnny had to be very careful as he walked along to avoid anything going wrong. After a while Johnny came to a river he had to cross.

In order to cross the river there was a small boat which he could use, but it was so small that he could only take with him one passenger at a time: the dog or the rabbit or the cabbage. He could never leave the dog alone with the rabbit, nor the rabbit alone with the cabbage, so how can he get all of them across without any problem? You are going to have to help to resolve this problem.