REFLECTION ON PRACTICE: CONTENT AND DEPTH

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ABSTRACT

This text is based upon an ongoing investigation with the main goal of studying the professional development of primary school teachers, specifically the ability to reflect, within a continuous training program.
This study follows a methodological approach of a qualitative type, comprising case study, with recourse to interviews, participant observation and documental analysis.
A first analysis of the written reflection of one of the participants, included in the reflection portfolio, points, in terms of content, towards less spreading of the themes approached, the ones considered the most significant being subsequently extracted and correlated. A greater depth in the reflection is also noted, with the teacher having concern to justify her statements, present a critical analysis of her role and rethink her practice.

Key-words: Professional development, mathematics' teacher, teacher training, reflection, practice

INTRODUCTION

Reflection is one of the activities most frequently considered to contribute to the professional development of teachers, since it may be presented as a means to improve classroom practices.

The Program for Continuous Training in Mathematics for Primary School Teachers, launched by the Board of Education and the Board for Science Technology and Higher Education, has been under development in Portugal since the academic year of 2005/2006. This program aims at an improvement in the teaching and learning of Mathematics as well as developing a more positive attitude towards this branch of knowledge. It involves conducting group training sessions, classroom supervision sessions and one final plenary meeting for a final appraisal of the program. Participant evaluation is undertaken through the elaboration of a portfolio, over the duration of the program. Contents of this program include the nature of the tasks, namely problem solving, and the use of physical resources, in which manipulative materials are included.

This paper is based in an ongoing investigation, whose goal is to study the professional development of primary school teachers through participation in the program. Specifically, we aim here to answer the following question: (i) In what way does the teacher's ability to reflect evolve throughout the training program?

THEORETICAL FRAMEWORK

"The professional development of teachers, both inside and outside the classroom, is the result of their reflection and participation in training opportunities which improve and increase their development and progress." (National Council of Teachers of Mathematics, 1994, p. 175). Reflection is an activity which may contribute towards the teacher's professional development. The term reflection is, however, polysemic. To Dewey (1933), in the field of education, the "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends, constitutes reflexive thought" (p.7), appearing as an activity thoughtfully and directly connected to practice. Zeichner (1993), although stressing that terms such as reflexive practitioner and reflexive teaching have become slogans for teaching reform and teacher training, attributes a strong personal angle to reflection, considering that there are no recipes to teach the teacher how to reflect. Schön (1983) also contributes in clarifying this concept, considering three kinds of reflection: in action; on action and upon reflection in action.

Addressing teacher training programs, Lee (2005) finds differences in the content and depth of the reflection undertaken by future teachers. Specifically he identifies the following as factors related to the depth of the reflection: personal context, professional experiences encountered and ways of communicating.

To Day (2001), just conceiving the existence of reflection as a means of learning does not demonstrate the depth, reach and goals of the process, as "good teachers are technically competent and reflect upon matters pertaining to the goals, the process, the content and results" (p. 72).

One of the contexts which may be supportive in producing reflection is the one involving portfolios. Written reflection is one of its basic components, particularly if one is examining documented teaching, and is focused on what the teacher and the student have learned (Santos, 2005; Wolf, 1996). Reflection is, thus, "the critical heart of the record" [contained in the portfolio] (Lyons, 2002).

Summing up, this study considers that reflection helps to looking backwards and rethinking one's own practices (Muñoz-Catalán *et al.*, 2007; Oliveira & Serrazina, 2002), although it is possible to find idiosyncratic differences in the process of reflection (Hospesova *et al.*, 2007). Moreover, reflection as analytical thought is above all associated with unsolved problems (Dewey, 1933), or rethinking meanings previously associated with educational situations.

INVESTIGATION METHODOLOGY

This work takes place in a natural environment, in which the researcher is also the leader of a working group made up of nine teachers. We have chosen to adopt a qualitative methodological approach (Bogdan & Biklen, 1994), undertaking three

case studies (Gall, Borg & Gall, 1996), with the help, in data gathering, of semi-structured interviews, participant observation and documental analysis.

Initial, intermediate and final interviews have as a main goal the gathering of data pertaining to the participant teachers, on the basis of the issues under consideration. Interviews, after each class has taken place, are related to points emerging from the experimental classroom activity. Group training sessions and classroom supervision sessions were observed. Interviews and observations undertaken were fully audio taped and transcribed. Documental analysis focused on the records included in the portfolios (planning, material used, student production and reflections), in the field notes about supervision sessions and in the reflections about group training sessions

In her portfolio, Sara, one of the participants, has included three reflections on tasks tried out in the classroom during the course of the program, although she was only compelled to include two. In this paper we present the analysis of the first reflection, which took place in December 2006, and of the third, in April 2007.

To address the presentation of written reflections to be included in the portfolio, guidelines, followed in the training program, were provided, consisting of the following points: 1. Activity goals; 2. Activity description; 3. Reflection on the activity, including four aspects: (i) activity planning; (ii) evaluation of what the students might have learned with the activity; (iii) importance of the activity for the teacher; and (iv) the teacher´s future perspectives regarding Mathematics.

Analysis of information gathered started after completion of the training program and consisted of organizing and interpreting data, considering the problem under investigation, theoretical framework and the empirical work which had taken place. Specifically, fields of analysis considered were content and depth (Lee, 2005). Regarding content, we have defined as categories for analysis the ones included in the guidelines. Regarding depth, we have considered: (i) Confrontation with one's own practice (identification and description of what one considers important or problematic); (ii) Interpretation (why does one perform the way one does?); (iii) Putting into perspective (confrontation of action with what one thinks and feels about it) and (iv) Reconstruction (what ought to be kept? What can be different? what can be changed, why?)

TEACHER SARA'S WRITTEN REFLECTION

Sara is around forty, and has twenty to twenty five years of professional experience. She has a Primary School Teacher's degree and the Scientific and Pedagogical Training Complement for Primary School Teachers, which bestows a license level degree.

Sara tells us she has always liked mathematics. Although she considers herself as having enough knowledge to teach she has invested time in keeping herself up to date through attendance at training sessions and programs.

Regarding the sort of tasks she planned and put into practice in the field of Mathematics, before attending the program, Sara said she *sometimes* uses problem solving. She states that she is aware of not using a lot of materials in the tasks she puts forward, relating this idea to the need to keep up with the program:

> I am, I am aware I don't use much. I think we are rather limited concerning time because we are always concerned with keeping up with the program and then we may get one day behind, which we may need later. [initial interview]

Specifically, regarding reflection upon practice, before attending the program Sara explains she did not reflect much and that she had never made a written reflection:

> Also, it is not that one completely overlooks it. But, when returning home, one puts school somewhat aside because we must also support our family a bit (:…) Perhaps, after several activities, I sit down and reflect a bit to myself. Not on paper, but to myself [initial interview]

The first reflection she presents in her portfolio is based on the students solving the following problem: Francisco raises chickens and rabbits. He has in all 16 heads and 48 legs. How many chickens and how many rabbits does Francisco own? The third one relates to constructing and identifying geometrical figures using the *Tangram*.

Sara has respected the guidelines in both reflections. Specifically, in point 3 – Reflection on the activity – of the written reflection that she produced, and related to the item – *activity planning* – she begins by making reference to what she considers essential to someone who solves a problem and stresses the difficulties to the one proposing it (speech 1). She presents, succinctly, the goals of the task she has put forward (speech 2):

> 1. Interest in the problem and its ownership by the one who solves it are essential. The hardest step for the one presenting it, might be to choose the problem or even to make it up.
>
> 2. When presenting the problem to the students I wished them to explore the context, gather data and find differences [Sara's portfolio 1st reflection]

The third reflection begins with her expectations in relation to the fulfillment of the task, regarding her previous knowledge of the class.:

> As I was aware that the tangram had already been used in the classroom, I was led to think that free activities and the relationships between the pieces had already been explored. So, I started the class aware it would be a noisy class, but that it would be easy to reach the projected goals within the time allotted. [Sara's portfolio 3rd reflection]

She mentions some flaws regarding planning, especially regarding the sequence of the proposed activities:

> In the course of the class I noticed that planning had some flaws, namely regarding the order of activities. I came to the conclusion that I should have started the class with a deeper exploration of the tangram.

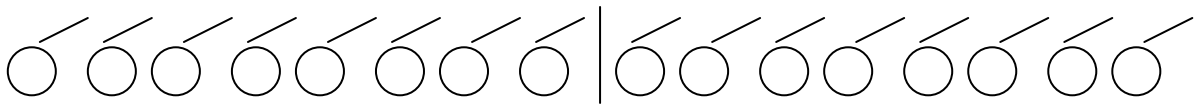
> Activity 2 should have taken place more towards the end of the class, because they were very worried about drawing, which caused it to last for a long time and some of them only managed it with help. [Sara's portfolio 3rd reflection]

Concerning the item – *evaluation of what the students might have learned with the activity* – in the first reflection she identifies what she considers to be the main concern of students during the activity and explains her reaction regarding that concern (speech 1) She also mentions the students' reactions regarding difficulties felt in the beginning of the task; she tries to account for them and explains her way of reacting in face of the situation (speech 2):

> 1. During the course of the class I noticed a huge concern of the students to place the data and perform an operation. I read the problem once more and showed them that the results were not dependent on adding or subtracting these figures.
>
> 2. I noticed they were having trouble with starting the task on paper. They asked a lot of questions such as "I did not understand this here", I guess to call for the teacher's attention, to see if they could get a little help. At first, the idea was not to interfere or help the students but due to the number of requests I finally decided to lend a little hand [Sara's portfolio 1st reflection]

As a matter of fact, at the beginning of the task, just after Sara had handed over the problem's instructions, some comments were heard: "I know the operation!", "It's too much!", and "I already know the problem!" While she read the problem aloud some students interrupted with questions: "What are heads?", "What are chickens?" Sara explained: "16 heads means 16 animals". And she asked: "How many legs does a chicken have? And a rabbit?" After the reading she informed them: "Each one of you does it as you want" The students tried to solve the problem individually, always requesting the assistance of the teacher and even of the researcher.

She noticed that that although the students remained restless and constantly requested the teacher's assistance they started designing their strategies. Sara moved about the room in order to see the work the students were performing. After some time Sara asked some students to explain their ways of solving the problem on the blackboard. One of the students made the following sketch:



He began by making 16 circles and made a dividing slash in the middle and counted the "number of chicken" and the "number of rabbits" making a jot over each circle and simultaneously explained his reasoning.

Another student made drawings. She started by drawing a child and two sets of eight animals some with two feet others with four. In the end she explained her reasoning to the colleagues. Another student drew an animal with four legs, another with two, and so forth, up to a total of 16 animals.

Only the students who had come up with the correct answer were asked to come up to the blackboard.

In the course of her reflection, besides identifying the solving procedure used by most students, she comments on it and stresses a strategy used by just one student:

> I realized that many students started by dividing the number 16 in two groups and then added the legs. I think that choosing this method is related to the 8 multiplication table, which we had studied recently and was on the board.
>
> I was sorry Cláudio couldn't go up on the blackboard to show the method he had used to solve the problem. He did not come up with 8 rabbits and 8 chickens because he got lost in counting but his representation was different and interesting. [Sara's portfolio 1st reflection]

Sara also mentions time management, specifically lack of time to communicate the different solving procedures used. "I think I gave too much time to individual solving, which did not allow the children to go up on the blackboard to explain their reasoning and to check for the existence of diverging results".

She mentions that "not many of the students managed to come up with valid reasoning to get to the result one wished for" and she points out, justifying this, that the students felt some difficulties in problem solving, although there was some development in competencies (speech 1). She also indicates the main learning outcomes the students achieved (speech 2):

> 1. I noticed the students felt some difficulties in solving these sorts of problems, perhaps because they were not used to them, even so, there was a development of competencies which led to the building up of personal strategies. Problem solving placed the students in an active learning attitude, both by giving them the possibility of constructing notions as an answer to the questions raised, and by urging them to use the acquisitions made and to test their efficacy.
>
> 2. They have learned to show curiosity and the taste for exploring and solving simple problems;
>
> To solve situations and daily problems using representations and schemes;
>
> They have learned to make simulations of real life events [Sara's portfolio 1st reflection]

In the third task, Sara began by giving some information about the origin and use of tangrams. The students listened attentively. Many of them said they had already worked with that material. After distributing the tangrams among the students, these at once started building free figures. Sara passed around a work sheet with the instructions for the task. Some students remained interested in figure building. Sara asked a student to read the introductory text about tangram and she read the first questions in the work sheet. "1.Which is the tangram's original shape? 2. In how many parts is it divided? and 3. Which geometrical shape does each component represent?" The students recorded their answers in their work sheets. Next, Sara

asked the students to perform the second task indicated in the sheet: “using all the elements, build and record the figures built: a) a square; b) a rectangle and c) a right triangle”.

Several students mention not understanding what they are supposed to do. Others say: “I can’t make it” and ask the teacher’s help. Others advance on their own and solve the problem. Some students also show difficulties in recording the results and concentrate on this point, failing to advance in building the various figures requested. Many appear seriously worried about not being able to perform the task and some give up. Several students find it difficult to know what a right triangle is.

In her reflection, and regarding this point, she correctly evaluates the mathematical output of students, indicating learning outcomes achieved:

> They rememorized geometrical figures and defined them regarding the number of sides;
>
> They learned that one of the seven elements of the tangram is called a parallelogram;
>
> They were able to find out that you can build squares out of the several elements of the tangram;
>
> They have learned that you can build a lot of figures with the tangram.
>
> There were also learning acquisitions in other areas such as Portuguese Language, because besides having to communicate they also had to read and write. And they also learned some trivia, for instance, that the Chinese tangram is not the only one [Sara’s portfolio 3rd reflection]

She identifies, justifying this, two particular cases of students which surprised her when performing the task:

> Two students surprised me, one for the better, one for the worse. Hélia surprised me for the worse because she has shown she is a participating student who likes to commit herself to solving the activities and in this particular class she needed a lot of help to solve the activities I put forward;
>
> Pedro surprised me for the better because he showed himself to be more committed in solving the activities, did not interrupt the class as often, and managed to solve what was asked of him [Sara’s portfolio 3rd reflection]

Regarding the item – *importance of the activity had for the teacher* – in her first reflection Sara only presents a brief remark:

> For me, as a teacher, it was an important class, as it allowed me to see that children felt a lot of difficulties in translating real and everyday language into Mathematical, symbolic language [Sara’s portfolio 1st reflection]

In her third reflection, she explains in a detailed way how important the activity had been for her, connecting it to the learning outcomes achieved by the students:

> One of the factors which either contributed to or made some students’ learning difficult was the fact that it was an individual task, as it became complex for me to provide

> answers to all requests as quickly as possible, which was what they wanted. Even so, this activity was very important for me, as I think I left the students motivated to work with the tangram, a material with which many mathematical themes or contents can be associated [Sara's portfolio 3rd reflection]

As a matter of fact, Sara was widely called on by students, either to help them build shapes or to draw them. She tried to answer all requests, by giving them some clues but, mostly, by reminding them that they had to try to build the shapes themselves. It was apparent that Sara experienced some difficulty in providing assistance to all the students, as, on one hand, the class was made up of over twenty students and, on the other, as she repeatedly mentioned during the activity, she wanted the students themselves to find out the answer.

Regarding the item – *the teacher's future perspectives regarding Mathematics* –, in her first reflection Sara presents future valuation of problem solving:

> I think that in this class one must pay more attention to problem solving because it will help them to develop reasoning and prepare them for a future where they can more easily develop personal problem solving strategies and to, step by step, assume a critical attitude in face of the results [Sara's portfolio 1st reflection]

In the third reflection, she presents future classroom work perspectives, showing a definite interest on resorting to the use of manipulative materials:

> Although it is a large and noisy class I would have no qualms about proposing a similar activity. I think it would be very useful for these children to work more with manipulative materials as they allow mathematical abilities to develop and to broaden knowledge in every area. They also allow imagination, reasoning and communicative skills to develop. [Sara's portfolio 3rd reflection]

Throughout the academic year, Sara has tried out problem solving more often, for instance using problems originating from the National Examinations.

Regarding this matter, in her final interview Sara stated there had been some changes in her teaching practice compared to the program's beginning and pointed out some aspects she had started placing more value on:

> There have been several changes from the beginning of the program because I started giving more value to verbal interactions and the nature of the tasks put forward, to value learning more and to value reflection much more [final interview]

Also, regarding the use of manipulative materials, after attending the training program she greatly stressed their use, namely with regard to awareness of their capabilities:

> I learned I can use known material such as the tangram and the geoboard, to teach concepts with I never formerly associated with them (…) We came into contact with new materials and with how to work with already known ones such as the tangram and the

geoboard but which were underused, which we had in the classroom but which we did not use as they could be used [final interview]

FINAL CONSIDERATIONS

Regarding the written reflections presented, although she always based herself upon the guidelines, Sara does not reason in both of them in the same way, either with regard to content or to depth.

With regard to content, there are some distinguishing aspects which naturally arise from each task's specificity, for instance: expectations regarding the noise to be naturally experienced while performing a task involving manipulative materials. However, in the first reflection, the diversity of themes approached within each category is very large. For instances, in item – *evaluation of what the students might have learned* – Sara highlights the students' main concern within the development of the task, identifying her own reaction and ways of handling the situation as well as the students' reactions. She also identifies solving procedures used by the students, difficulties felt and main learning outcomes of the students.

In her third reflection, there is a more restricted range of subjects approached. However, in general, she covers the main items of the guidelines and, essentially, focuses on her role in what she identifies as having developed below or against expectations. She specifies the aspects approached, directing them in a sustained way towards her students and towards more specific mathematical acquisitions. She tries to explain her statements in length.

Concerning the depth in her first reflection, there are contents which are only briefly touched upon (for instance, communication of the problem solving procedures), there are others in which she presents some justification for certain events (for instance, students' difficulties concerning problem solving). Thus, the first reflection is marked by confrontation with her own practice, some interpretation and very little putting into perspective, thus focusing on a retrospective dimension. In her third reflection, it seems possible to state that Sara has by now absorbed that which was fundamental to obtain from the activity undertaken, showing some distance from the specific items mentioned in the guidelines. She establishes connections among different items and always tries to account for her statements. She reflects upon the described points, showing her role in the development of the task and rethinking her future practice. She thus shows herself as having reached the level of appropriation and some approximation to the level of reconstruction, situating herself, in consequence, in a prospective dimension.

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