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DEVELOPMENT OF REFLECTION ABILITY IN PFCM

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In this research report we present some results pertaining to the reflection upon practice of three teachers in the context of the program for Continuous Training in Mathematics (PFCM). From this study it is possible to determine that the participation of teachers Aida, Dora e Sara in PFCM has contributed to the development of reflection. However, although they all attribute it a degree of importance, they show diverse preferences for forms of reflection undertaken and divergences in the depth and content of the written reflections achieved.

INTRODUCTION

Professional development is considered to be a permanent, continuous and intentional process aiming at improving professional knowledge, teaching practice and reflection thereupon and, in consequence, contribute to student's improvement in learning Mathematics (Guskey, 2002; Sowder, 2007). Participation in training programs is pointed as a tool for professional development (Borko & Putnam, 1995; Guskey, 2002; Santos & Ponte; 1998; Zaslavsky, Chapman & Leikin, 2003; Wu, 1999). In particular, the Program in Continuous Training in Mathematics (PFCM) presets specific and innovative traits such as the kind of sessions considered, including group training sessions and classroom supervision sessions with the presence of the supervisor, group planning and subsequent task implementation, emphasis on practice, the importance of collaborative work and the elaboration of a portfolio by the trainee, comprising three written reflections (Serrazina *et al.*, 2006).

In this context we wish to present some results pertaining to the question of evaluation: In what way does the teacher's ability to reflect evolve throughout the PFCM training program?

BRIEF THEORETICAL OVERVIEW

Reflection presents itself as a connecting link between knowledge and practice (Krainer, 1996; Schön, 1983). It is one of the most quoted activities aiming at the teacher's professional development, since it can be presented as an appropriate tool to face new situations and to improve classroom activities (Lieberman, 1994; Schön, 1983; Zeichner, 1993). Reflection could be considered as a mental process to structure or restructure an experience, a problem, existing knowledge or *insights* (Korthagen, 2001), leading to its understanding (Hatton & Smith, 1995). It is constituted as a continuous process of analysis and perfecting of the practice (Cole & Knowles, 2000).

It is fundamental for reflection to be envisaged as a deliberate, systematic and structured process, its beginning and end being located in action (Dewey, 1933; Rodgers, 2002). The recursive character and cyclical nature (Lee, 2005) briefly define the way it is processed.

“Although all teachers think informally about their experiences within the classroom, to foster habitudes of considered and systematic reflection may be the key both to improve their teaching as to scaffold their professional development throughout life” (Stein & Smith, 2009, p. 22). It is not only important to state that the teacher reflects, it matters that the teacher is aware that he is so doing, what must be considered within the process and of the intention underneath it. To that purpose several strategies may be adopted such as the intervention of a person stimulating it (mentor, tutor, supervisor, critical friend), reflections sharing within collaboration works or the use of written reflection (Sowder, 2007).

The existence of levels of reflection, which can range from the description of one aspect of a class to the consideration of ethical, social and political implications of the teaching practice (van Manen, 1977), leads to the consideration, apart from its content, of the depth it should reach.

INVESTIGATION METHODOLOGY

This investigation has followed an interpretative paradigm (Stake, 2009), with recourse to case study (Yin, 2009). Participants were three 1st cycle teachers (students aged 6 to 9), Aida, Dora and Sara (fictional names), who voluntarily enrolled in PFCM. Selection criteria used were number of teaching years and academic training. To conduct data gathering semi-structured interviews to the three teachers were used, as well as observant participation of work sessions and documental gathering. The following categories for the analysis of information relating to reflection were used: (i) importance given to reflection; (ii) forms of reflection used in PFCM; (iii) content of written reflection; and (iv) depth of written reflection.

Aida has always related well to all areas of knowledge and has always felt a taste for learning. To Dora, Mathematics has always been felt as a problem area. She was not successful as a student and claims not to like mathematics. Sara has consistently shown an interest for scientific areas mathematics having been as a student, her favourite subject.

The teaching experience of these teachers is likewise distinct. Aida and Sara have over twenty years teaching experience the former having meanwhile completed a master's degree and the latter an educational complement. Dora has less than ten years teaching experience. A taste for collaborative work has developed quite clearly in Aida and Sara counter to the idea stated by themselves at the beginning of the study.

PRESENTATION OF RESULTS

Importance attributed to reflection within PFCM

Aida acknowledges that “reflection is one of the most important parts” of PFCM, “perhaps the one we undertook the less in our daily practices” [intermediate interview]. She feels the “obligation” of, within PFCM undertaking a “profound reflection”, written, on the experienced tasks is a positive aspect. She justifies it stating: “I think that the most remarkable aspect this training gave me was that realisation. I can reflect, draw conclusions, and afterwards improve” [final interview].

Dora emphasizes that her participation in PFCM has allowed her to learn how to reflect, having been able to write on the tasks experienced:

I don't like writing. However, in this training I don't know where I get so many words from (...) I do it with pleasure, gladly, because I feel that all I write is not enough. I have a feeling to write more, (...) there is always an idea. I have to say what I felt. [final interview]

For Sara, during her participation in PFCM, reflection was the aspect which pleased her the most and she started integrating points that she had not considered to be important in a reflection, namely students' leanings:

I didn't even know how to undertake a reflection. (...) But I did not know what to record concerning students' acquisitions. Have they learned operations?! Of course, they already know that! There, I had some initial doubts, because that would not have been something to reflect upon. But their own work reflects what we did. [final interview]

Forms of reflection within PFCM

All three teacher recognized salience to the forms of reflection undertaken within PFCM – written, undertaken individually, post-observation with the supervisor and joint reflection (undertaken in the training group) – albeit presenting different preferences.

Aida has shown a preference for written reflection undertaken individually, on the basis of her own personal characteristics, namely her fondness for writing:

I would rather have the opportunity to think, I enjoy having that space to think about what has happened. Reflecting a bit on my own (...) I think I reflect better when I'm writing, but this is a personal issue. I just think better about things when I'm writing. So I value written reflection the most. [final interview]

Dora has set her preference on post-observation reflection with the supervisor, fundamentally for the chance to have someone correcting her, thus constituting an improvement to her teaching practice:

You helped me ... you were careful to tell me when I was not going that well (...) you guided me, gave me your opinion, which was for me, as a matter of fact, one of the fundamental things, for me to improve (...) If I don't have someone to judge my action how can I know where I went wrong? It is possible that they all [the different kinds of

reflection] are important, but the one done with you helped me a lot because I felt protected and corrected. [final interview]

Sara has pointed joint reflection as her favorite for the opportunity provided to change views with her colleagues and the implications of this to her teaching practice:

I think group sharing was important. I had more interest in listening to other people, to see their strong and weak points, the strategies they used. This is a personal view, I paid more attention to others in order to understand what they did, what strategies they used. [final interview]

Content of the written reflection

The reflection script given within PFCM considered the following points: (i) planning and evaluating the task; (ii) evaluating what the students might have learned with the task undertaken; (iii) importance the task had for the teacher, and (iv) the teacher's future perspectives concerning mathematics.

In Aida's case the script was followed to the letter and presents the same subcategories in all the points it comprises. For instance, in the item *Planning and evaluating the task*, for every task she justifies the kind of task to undertake, as can be seen in the second reflection submitted:

As in the course of the group training session we dealt with the subject Mathematical Investigation and their application in the classroom, and this idea excited me a lot. I decided to choose this theme as my second supervised class. From that point on I decide to create a plan to an *activity of mathematical investigation with the multiplying tables*. Between the possibility of working just one table or all of them, I opted for the second one, which seemed to me to open more possibilities for the students to make discoveries. [portfolio 2nd reflection]

In Dora's case the use of the script depended on the task under experimentation. Only in the second reflection does she follow all the points considered in the script. It is in this reflection that Dora highlights the importance that the completion of the task has had for her professionally: "It was a class that made me grow up a lot and which constituted a landmark in my professional and personal career. I had never had such an experience, in which at the beginning of the task I had gotten so few answers from the students" [portfolio, 2nd reflection] and she manages to put forward some perspectives about her future practices, showing the will to accept challenges again, valuing preparation of tasks, namely mathematical investigations:

Anyway, next time, I will again accept a new challenge, but never without having considered several possibilities of solving the questions, having always tried to know more about the issue at hand (...) It is difficult to plan investigation activities. I needed a lot of coaching from the supervisor. Preparation is an important phase. [portfolio, 2nd reflection]

One can also find in Dora some differences from one reflection to the other concerning the sub contents of each item. For instances, in the Topic *Planning and Evaluating the Task*, the fulfillment of the task involves the first and third reflections. Thus in the second reflection she states:

The fact that I haven't thought all I had planned was my option, because, as I already stated, the students had perfectly understood the solution mechanism. Thus, to continue would only be good for them to apply the already mechanized process. [portfolio 1st reflection]

In the third reflection she evaluates the fulfillment of the planning: "Planning was accomplished with most of the class, however slower-paced students finished the self-Evaluation sheet after the break" [portfolio, 2nd reflection].

Sara, although following the script, has balanced in a more definite way the sub-contents presented in each reflection, as a result, mostly, of the specificity of the tasks upon which she reflects. For instances, in the reflection on the second task, involving the organization of students in work-groups, she makes clear her opinion about advantages and disadvantages of group work:

In my opinion group work has advantages and disadvantages. The disadvantage is that it makes them lazy, even lazier, because we have those who commit themselves and work, and those we just sit back and copy the results. The advantage is that it advances collaborative work, thus contributing, no matter how little, for the social and personal development and making learning a moment of sharing. [portfolio, 2nd reflection]

Depth of written reflection

For the analysis of the depth of the written reflection the following were considered as categories: (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?) (Lee, 2005).

In the three reflections undertaken, Aida e Sara considers all levels contemplated (description, interpretation, problematizing, and reconstruction). In Aida's Case, apart from the first two levels, reflection goes through the level of problematizing when she questions her actions, and simultaneously proposes alternatives to situations arising in the course of the class: "However, I should have insisted a little more with student Raul who presented a lot of difficulties in the task" [portfolio, 1st reflection]. The level of reconstruction is attained when she rethinks the organization of classroom work: "I think that a different way of conducting this type of class, in a group with this characteristics, and aiming at potentiating communication, could be work in groups" [portfolio, 1st reflection].

In Sara's Case, problematizing is undertaken when, for instances, she question the amount of time allotted to the individual solving phase, and consequent lack of time to the phase of communicating results:

I think I allotted too much time to individual problem solving, which didn't allow more children to go to the board and show their reasonings and to ascertain whether there were different results. [portfolio, 1st reflection]

Reconstruction is reached when she rethinks classroom practices when considering that particular class:

I think that in class one should pay more importance to problem solving, because it will help them develop reasoning and prepare them to use personal strategies more easily and progressively assume a critical attitude face the results. [portfolio, 1st reflection]

To Dora, the depth of reflection depends on the task undertaken. Only in the second task she problematized and rebuilt her practice. The level of problematizing is visible when she shows an awareness that the first part of the task has not developed according to her wishes and expectations: “Although I still think about the first part of the ask as something which has not taken place as I intended, From then on, yes, (...) the class took on another spirit” [portfolio, 2nd reflection]. The level of reconstruction is verified when she puts forward some perspectives about her future practices, showing her determination to face challenges, and showing a conscience of the need for an adequate preparation of the tasks:

Anyway, next time, I will again accept a new challenge, but never without having first considered several possibilities of solving the questions and having tried to know more about the issues dealt with. [portfolio, 2nd reflection]

FINAL CONSIDERATIONS

It is clear that reflection is a central issue in teacher training (Ponte, 1994; Schön, 1983, Zeichner, 1993), the development of the reflection of teachers Aida, Dora and Sara on the tasks experimented having been evident, within PFCM, as an outgrowth of the context in which they participated. Being a compulsory component of this training, reflecting activity was defined by an intentional and systematic nature (Dewey, 1933). It is however to be remarked that the starting points of the teachers considered was clearly different, which may account for differences in the results attained. Aida upholds the idea of *reflecting to improve her practices*, fundamentally when mediated by writhing, as, when writing, the teacher gains awareness of his own leaning process (Passos *et al*, 2006). On the other hand, as for Dora, who had a conflictive relationship with mathematics and showed a great deal of insecurity in her teaching, it is possible to detect the need to have the acknowledgement of the supervisor about her practices to improve her practices. She *thus favors reflection after action*. The reflection with the supervisor, intersecting with the concept of reflexive teaching put forward by Schön (1983), is essential to help her analyze planning, concretization and evaluation of teaching, in the sense of developing her ability of reflection upon her practice (e.g. Day, 2001; Hatton & Smith, 1995). To Sara, reflection needs to happen in community, in interaction with others (Rodgers, 2002). It is a *reflection involving collaboration*. In training programs, involvement in cooperation with other teacher can bestow (more) sense and meaning on formative or classroom experiences which, otherwise, would not have been so evident (Day, 2001; Hargreaves, 1994).

The script for reflection has served as a baseline for all reflections undertaken by the teachers, allowing them to attain a structured orientation. In connection with this

aspect is the depth of the written reflection. Reflections can cover from simple descriptions of thought about one only aspect of a class, to consideration of ethical, social and political implications of teaching practice (van Manen, 1977). Aida and Sara followed all the levels considered while, in Dora's case, the levels of reflection attained varied according to the tasks experimented. On this point we consider that in teacher training programs attention must be given not only to importance of "having" teachers reflect but also to the aspect such a reflection should contemplate and to its depth.

We consider, thus, that training programs, when valuing the teacher's reflection emphasize the importance of the teacher's practical theories (Zeichner, 1993). The teacher is no longer seen as someone who applies in his classroom theories generated elsewhere, he is envisaged as someone who produces his own theories. Likewise, the recognition of the active role of the teacher in his own professional development is emphasized. This idea is rooted in the fact that professional knowledge cannot be transferred, as it is actively constituted, individual and socially, through personal experiences with the environment and in interaction with others, involving reflection and adaptation (Zaslavsky, Chapman & Leikin, 2003).

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