Preservice teacher's greater power to act in the classroom: analysis of the circumstances for professional development

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Introduction

This study is part of a much larger research programme[1] to reform teacher training in France. The specific aim of this study was to examine professional development of a preservice teacher in order to improve the organization and contents of this reform. The notion of professional development is currently undergoing a renewal of interest in the field of adult training (Borko 2004; Marcel 2009) for two likely reasons: training quality needs to improve to meet the expectations of the educational system and greater insight into how teachers learn to teach will enhance training programmes. In the broader research program, professional development is defined in relation to the processes by which preservice teachers learn professional actions. This entails identifying how they construct actions for thinking about their teaching activity and for acting efficiently in the classroom, as they interact with others. From this perspective, professional development is conceived as processes of internalisation (Matusov 1998) and social and cultural mediation (Bruner 1991) that contribute to transforming professional activity.

The social and cultural dimensions of preservice teachers' professional development are often illustrated in studies with reference to the work of Wenger (1998). The results of these studies describe how preservice teachers build professional knowledge by sharing common resources made up of the values, rules and expectations of the professional community (Fiene et al. 2009; Gorodetsky and Barak 2008; Richards 2010). From this perspective, professional development results from a transformation in the modalities of participation in a community of practice, with movement from the periphery to the center (Sim 2006; Vescio, Ross, and Adams 2008). Some of the results concern the changes of preservice teachers' beliefs and conceptions about teaching that favor the construction of professional identity (Lamote and Engels 2010). These findings generally point to the interest of considering the schools that host preservice teachers as "communities of practice" (Norman and Feiman-Nemser 2005; Sim 2006) that can stimulate and accompany professional development. Other studies have focused on professional development through improvement in reflexive practices (Avalos, 2011) using observational tools and video recordings of classroom activity (Koc, 2011).

[1] The research programme, Développement de l'activité, travail et identité des enseignants en formation (DATIEF; Development of Activity, Work, and Identity in Teachers in Training) has the goal of evaluating the effectiveness of training programs for developing the professional activity of preservice teachers.

These results notably point out that preservice teachers use video cases as a basis for reflection and discussion in relation to the difficulties they themselves encounter in the classroom. Comparison of the similarities and differences between the activity observed on the video and one's own activity encourages the building of new references for classroom action (Ria, 2010). Case analysis through video recordings can improve preservice teachers' motivation and empathy (Koc, 2011), but most importantly, it helps them to construct new interpretations and knowledge about teaching. Nevertheless, this type of research, although highly promising for the creation of new programmes for teacher training, provides little insight into the effects of the resources offered by the community on the development of professional activity of preservice teachers. It does not, for example, address the impact of the video recordings on the development of teaching skills in the classroom. In other words, the relationship between reflexive practice and classroom skills has been little documented, and many of the details about the nature of professional development remain obscure. The present study was designed to address these limitations and the objective was to identify the impact of the instructions addressed by various interlocutors (cooperating teacher, university supervisor, and another teacher) on the development of professional activity of preservice teachers.

A major focus of many of the studies on preservice teachers' professional development is whether and how classroom activity is transformed over the course of work placements. By analysing the processes of professional development through the steps of transformation in their practices (Goigoux, Ria, and Toczek-Capelle 2010), the dynamic construction of their identity as teachers (Lamote and Engels 2010; Sutherland, Howard, and Markauskaite 2010), and the trajectory of their integration into the teaching profession (Miller 2008), these works strive to move beyond the assumption of professional development as a product in order to concentrate on the process. From this perspective, the development of professional activity is not a linear movement, but rather is made up of revolutions, qualitative leaps forward, and functional reorganizations (Vygotsky 1997). Consequently, it can best be grasped by the observation of the transformations that occur over the course of the training process. Specifically, some researchers see the development of professional activity as depending on the joint activities of the cooperating teacher and the university supervisor (Cartaut and Bertone 2009) and the close collaboration of a variety of professionals: cooperating teacher, university supervisor, colleagues, school director and researcher (Moussay, Étienne, and Méard 2009). Within this framework, the quality of the partnership between school and university and the articulation between university training and classroom experience (Zeichner 2010) are assumed to favor professional development. In other terms, the resources

constructed within and by the training collective contribute to the construction of the professional knowledge of preservice teachers.

This vision of professional development is the focal point for this article. This case study of a preservice mathematics teacher thus closely followed the dynamics of her professional development. The objective was to identify the circumstances in which professional activity developed during and as a result of mentoring interactions and classroom teaching experience.

Theoretical framework

Our study was based on the concepts of historical-cultural psychology (Vygotsky 1978, 1997; Wertsch and Addison Stone 1985) and activity theory (Leontyev 1981) and the following four postulates.

(a) The first postulate borrows the principle of activity development through internalisation (Matusov 1998) of the cultural meaning of sign systems during the course of dialogic interactions from vygotskian theory. This process is considered as the source of the transformation of elementary psychical functions into higher functions. According to Vygotsky (1978), the emergence of higher psychical functions occurs through two processes: *external signs addressed by others* and the *self-addressing of these signs received from the others*. In this study, a preservice teacher received instructions about how to teach and how to work through her interactions with trainers (cooperating teacher, university supervisor) and other professionals (colleagues, peers, school director). These instructions are considered as *external signs* (Vygotsky 1978) addressed to preservice teachers in the course of their interactions. They become resources when preservice teachers are able to self-address them in order to use them as *psychological instruments* (Vygotsky 1978) for professional growth.

(b) The second postulate concerns the dialectic relationship between learning and development, and specifically the anteriority of the learning which opens the way for the development of activity. According to Vygotsky (1978), the internalisation of *external signs*, which marks the passage from the inter-psychic to the intrapsychic, favors the development of higher psychical functions. This postulate corresponds to the process by which preservice teachers internalise instructions given by their interlocutors and thus are able to modify their thinking and even the meaning of their experience. The new meanings that these teachers construct about their experience open the possibility of constructing new actions for acting in the classroom. The dynamics of preservice teachers' professional activity development is also in relation to their capacities to link the

instructions addressed to them by interlocutors during training situations to their experience and their ability to mobilise instructions to perceive the events that occur in the classroom from a broader perspective (Cartaut and Bertone 2009; Bertone et al. 2003).

(c) The third postulate is that "intrapsychic conflicts" (Vygotsky 1997) contribute to the development of professional activity. With reference to Vygotsky, "intrapsychic conflicts" are assumed to result from the tension between ''scientific concepts'' and ''spontaneous concepts.'' In this study, the preservice teacher's intrapsychic conflicts arose from the concurrence of and discordances between the instructions stated by the various interlocutors ("inter-psychic conflicts"). We considered that these inter-psychic and intrapsychic conflicts were basic processes in the professional development of preservice teachers.

(d) The last postulate concerns the clinical study of activity in France (Clot 2008). According to this author, professional activity develops in two directions: sense and efficiency. These two directions cut through the three levels of human activity: activity (motive), action (goal) and operation (condition) (Leontyev 1981). The dynamic relationships between activity, action and operation provide evidence of the development of professional activity. Researchers can explore this process by tracking the development of sense as preservice teachers move beyond their initial motives by the intervention of new goals for action and the development of efficiency by the creation of new operations to reach these goals.

Method

This study took advantage of the opportunity for thoroughness and the explanatory power of the case presentation to enrich the knowledge base in this field of investigation. It was therefore less focused on the generalisability or the reproducibility of the results (Smith, Harre, and Van Langenhove 1995; Yin 1994).

Context for the study and participants

In the global research programme, the professional activity of several preservice teachers, as well as that of their various interlocutors, was analysed over the course of a school year. The longitudinal perspective of this study—an entire school year—had two advantages: we were able to track the effects of instructions addressed to preservice teaches over a relatively long term and to follow the process of transformation of their professional activity for as long as possible. These preservice teachers were enrolled in their second year at the University

Institute of Teacher Training (UITT) and took part in an alternating programme of general and teaching-related studies at the university and professional training in a secondary school classroom. The specific work placement of this research programme requires that the preservice teachers take charge of several classes for the entire school year, which amounts to 8 to 12 hours of teaching weekly.

In this case study, we present the findings regarding the professional development of one of these preservice teachers, who will be called Ann. Ann was a preservice math teacher and was working for the first time in a high school in Lyon, France. She was working with a second-year class of 35 students from 15 to 17 years old. At the beginning of the school year, Ann had expressed the need to be accompanied in this first teaching experience. She agreed to participate in this study because she perceived that the researcher's presence would be a potential aid in better understanding her own classroom activity.

Three other participants were called upon: Ann's cooperating teacher, another math teacher, and the university supervisor. The cooperating teacher was an experienced math teacher (20 years of experience) and an expert cooperating teacher; she had been involved in the initial training and advising of preservice teachers for the past 12 years. The other math teacher was an experienced math teacher. These two participants, cooperating teacher and math teacher, had been working for 8 years in the high school where Ann had her placement. They were considered by Ann to be "privileged interlocutors" with whom she often discussed the national teaching programme and official texts concerning the subject of math. The researcher's objective was to make use of this relationship between the preservice teacher, the cooperating teacher, and the other colleague for professional discussions about their classroom activity. The university supervisor had been working for 20 years in the university and was in charge of work placements. She was expected to observe Ann three times in the school year, to evaluate her skill level, and to certify the successful completion of her work placement.

Research protocol

The research protocol (September 2007- June 2008) centered on a participant observation was carried out in three steps: the first step was a period of immersion in the life of the high school. Information was gathered about the functioning of the school and the characteristics of Ann's students, and a relationship of mutual trust with Ann, the cooperating teacher, and the other math teacher was sought through multiple conversations. The second step was to enter Ann's classroom and gain acceptance as an observer by both the students and Ann. In

the third step, audiovisual recording equipment was progressively brought into the classroom and semi-structured and self-confrontation interviews were held with Ann and the two other participants. The goal of these steps was to create the social conditions that would favor the participants' full involvement in the study.

Data collection

Three types of data were collected.

Data from the semi-structured interviews

The semi-structured interviews were conducted before the self-confrontation interviews. The data from this interview were recorded by dictaphone. The objective was to ask Ann to report all the instructions stated by her interlocutors. The questions (What do you think of the instruction of telling the students about the objective of the math lesson? Did you take this instruction into account in your last class?) were designed to encourage Ann to explain what she thought of the instructions addressed by her interlocutors, what she did about them, and what she thought she would do. Another objective was to pick up on any intrapsychic conflicts being experienced by Ann in order to discuss them during the self-confrontation interviews. Eight semi-structured interviews were held with Ann, each lasting of forty five minutes at one hour, between October and June.

Data from the audiovisual recordings of classroom activity

A digital camera set up in the back of Ann's classroom was used to collect the data on classroom activity. The objective was to construct traces of classroom activity that would serve as support for the self-confrontation interviews and the researcher's analyses. Fourteen one-hour recordings were made between October and June.

Data from the self-reflection interviews

These data were collected from video recordings of self-reflection interviews conducted by the researcher. During these self-reflection interviews, Ann viewed the recorded activity in her classroom. The researcher first asked her to explain what she had been doing in the class (What and How?) and for what reason (Why?). She then questioned Ann about what she had not done and what she might have done in class: "Why do you say that you shouldn't have started on inequalities in this class? Could you have done it differently to make the transition from the last class? What would you have liked to do before the bell rang?" The questions on what Ann had not done were designed to help her to imagine other possible actions and

operations. The researcher encouraged Ann to put these actions into relation with the instructions given by her interlocutors and with her classroom experience.

During the self-reflection interviews, the researcher confronted Ann with the same recordings of her classroom activity in the presence of another interlocutor (either the cooperating teacher or the other math teacher). Her questions were designed to focus on controversies and confrontations regarding their respective points of view on how to teach. This was done to encourage Ann not only to reflect on the actions used in the classroom but above all to discuss, compare, and evaluate the stated instructions in the light of her actual classroom experience. In other words, the objective of the self-reflection interviews was to make Ann's activity an object of analysis and discussion so that she could construct new actions for acting in class. Thirteen interviews were held, each lasting approximately one hour, between November and June.

Ethical conditions

Three ethical precautions were implemented before filming: the first concerned the authorization to use the recordings, which was obtained from all parents and students in order to guarantee our rights to use the images; this authorisation emphasised the researcher's obligation to use the recordings only for research and training purposes. The second precaution concerned the explanation of the research project to all participants: we explained that the recorded classroom activity would be used as a support for reflexive analysis and discussion with Ann. The third precaution concerned the contract of collaboration between the researcher and all participants (confidentiality of data, consent of data's transcriptions, anonymity of results and reciprocal advantage of the study).

Data processing

The data were analysed in three steps.

Step 1

After transcribing all the semi-structured and self-confrontation data, the corpus was broken down into units of analysis related to the study object and the theoretical framework. These units were defined from the preservice teacher's citing of an action associated with a motive in the form: [*Do this or do that… because, in order to*]. For some actions, it was possible to identify operations [*by doing this*]. A new unit was determined each time Ann cited a new action. This first step identified 152 actions on the whole material.

Step 2

The set of cited actions was then presented in a table in coded form that dissociated (a) actions and operations from (b) motives for action, following the coding method of Méard, Bertone and Flavier (2008) (Table 1).

Table 1. Coding the actions stated by the preservice teacher

Actions	
Action /Operation	Motive for action
" Do this" " Do it this way»	*"because" "so that"*

Step 3

Each unit of analysis was then inserted in a table with four columns: column 1 presented the unit of analysis, column 2 presented the verbatim transcription of the interview, column 3 presented the coded action stated by the preservice teacher (actions dissociated from the motives for action), and column 4 presented the coded instructions stated by interlocutors according to the modality described above (Table 2). The objective was to use the table to identify the links between the statement of an action from Ann and the statement of the instruction addressed to her by her interlocutors.

Table 2. Presentation of the unit of analysis in four columns

Column 1 UA	Column 2 **Transcription Excerpt 2** Interview of November 22, 2007	Column 3 Actions stated by preservice teacher	Column 4 Instructions stated by interlocutors
43	**Cooperating teacher (CT)**: You see, there, you're saying "OK, OK" and you repeat it and you still don't get that you have to make the students repeat it. The university supervisor made a point of it and you didn't do it. **Ann:** Yeah, you're right. I repeat what the student said but I don't think of the rule. When students ask a question or give an answer, I should make them repeat it (…). **Researcher (R):** But why do you have	***Intrapsychic conflict***	Cooperating teacher & University supervisor Action To have to make the students repeat

to make the students repeat it?		
Ann: Well, what I do when a student says something, I realize that not all the students have heard it because sometimes they don't really speak up and so I always repeat what they've just said. And it's true that the university supervisor told me that when I do it that way the students don't listen to the student who's talking because they know I will repeat everything. (…) So she (the university supervisor) told me that, so that I don't repeat everything myself, I should get another student to repeat it and that this would get the students used to speaking to the whole class, and not just to me (…) But all that before making them repeat it in order to have it repeated—well, now I understand it a little better.	***Ann evaluates the rule*** Action to repeat what students have just said Motive (because) students don't really speak up ***Ann understands rule's university supervisor***	University supervisor Action Not to repeat ***Negotiation from students*** Action to get student to repeat Motive (so that) the students used to speaking to the whole class
R: What do you mean? Can you tell me here why you have to make a student repeat it?	Action to have to make a student repeat	Cooperating teacher
Ann: So that they learn to speak up. **CT:** But it's also to involve several students in speaking, you question several students	Motive to teach students to speak up	Action to involve students in speaking Motive to question several student
Ann: To involve several students in speaking, to get them all involved is what she (the supervisor) said (…).	Action To involve students in speaking	University supervisor Action To get them all involved

Validity of the data processing

Three other researchers independently analysed about 55% of the data using the described procedure in order to validate the three steps of data processing. The analysis and interpretations were then discussed among the researchers until agreement was reached (Lincoln and Guba 1985), which was above 90%.

Results

The presentation of all the analysed data and results is beyond the scope of this article. For this reason, only three findings salient to this study are presented: the instructions stated by the interlocutors as the cause of intrapsychic conflict; the confrontation of instructions arising from the situation with the cooperating teacher and the constraints of classroom activity as a resource for the development of activity; and the testing of operations stated by the interlocutors as resources for changing the motives for action.

The instructions **stated by the interlocutors as the cause of intrapsychic conflict**

The results showed quite clearly that the instructions stated by the different interlocutors were the cause of intrapsychic conflict for Ann. This conflict came from by the discordance of the instructions and was characterised by the competition of several actions. This conflict was at times highly uncomfortable for her. During the semi-structured interviews, Ann said that she was worried about this concurrence of the instructions; she didn't know what to do, what instruction choose to teach. Continued discussion about these instructions was thus necessary for Ann to be able to transform them into instruments for developing her professional activity. Excerpt 1 illustrates this result. During a self-reflection interview (November 22, 2007) with the cooperating teacher, as they viewed a recording of Ann's classroom activity the cooperating teacher remarked that Ann had not applied an instruction that had been given to her by the university supervisor to "make the students repeat what was said". This remark forced Ann to talk about what she does in class and to express the intrapsychic conflict that is reflected in her teaching activity.

Excerpt 1 from the the self-reflection interview of November 22, 2007

> Cooperating teacher (CT): You see, there, you're saying "OK, OK" and you repeat it and you still don't get that you have to make the students repeat it. The university supervisor made a point of it and you didn't do it.
> Ann: Yeah, you're right. I repeat what the student said but I don't think of the rule. When students ask a question or give an answer, I should make them repeat it (…).
> Researcher (R): But why do you have to make the students repeat it?
> Ann: Well, what I do when a student says something, I realize that not all the students have heard it because sometimes they don't really speak up and so I always repeat what they've just said. And it's true that the university supervisor told me that when I do it that way the students don't listen to the student who's talking because they know I will repeat everything. (…) So she (the university supervisor) told me that, so that I don't repeat everything myself, I should get another student to repeat it and that this would get the students used to speaking to the whole class, and not just to me (…) But all that before making them repeat it in order to have it repeated—well, now I understand it a little better.

> R: What do you mean? Can you tell me here why you have to make a student repeat it?
> Ann: So that they learn to speak up.
> CT: But it's also to involve several students in speaking, you question several students
> Ann: To involve several students in speaking, to get them all involved is what she (the supervisor) said (…).

This excerpt shows that the action stated in October 2007 by the university supervisor to "make the students repeat it" had little impact on Ann's activity except when the cooperating teacher recalled it once again in this interview. This reminder first led Ann to express an intrapsychic conflict: she knows she has to have the students repeat what has been said but she doesn't remember to do it. She then explains that taking into account some of the classroom constraints: "that not all the students have heard it because sometimes they don't really speak up", has led her to follow another action. The instructions that undergo continual adjustment, reconstruction and amendment in response to the transactions between teacher and students in everyday classroom life (Kalthoff & Kelle, 2000; Kovalainen, 2005). Ann thereby relegats the instruction given by the supervisor to second place: she systematically repeats what the students say although the supervisor has advised her to get the students to repeat it. The preservice teacher thus finds herself "caught" between two concurrent actions. Then, during the interview, Ann reevaluates her own action based on the university supervisor's observation that "the students don't listen to the student who's talking because they know you will repeat everything". She puts this into relation with the supervisor's motive for her instruction: "get another student to repeat it *so that* the students will become used to speaking to the whole class, and not just to the teacher". The outcome of the confrontations and link-building between the university supervisor's stated instruction, which was recalled by the cooperating teacher, and the classroom constraints, was that Ann had a better understanding of the benefits of having the students do the repeating. This insight allowed her to overcome an intrapsychic conflict expressed through "make them repeat it to have it repeated." At the researcher's request, Ann modified the sense of the action: she said she wanted to "make the student repeat it (action) so that he or she would speak more loudly (motive)". The statement of this new motive marked the development of professional activity through sense. The cooperating teacher then recognized through Ann's statement of the new action a common concern expressed by another instruction: "call on several students (action) to ensure that they are involved (motive)." Ann thus understands that this instruction about making sure several students are participating, which is shared by the university supervisor and the cooperating teacher, illustrates one of the ways to be a teacher. This instruction that is

the object of consensus within the teaching community suggests that she might consider it as a new possibility for action. At this stage in the process of the transformation of Ann's professional activity, we note the potential development in the power to act that is being constructed through a new inter-psychic exchange that reveals the personal intrapsychic work.

The confrontation of instructions **arising from the situation with the cooperating teacher and the constraints of classroom activity as resources for the development of professional activity**

The data analysis showed that several times the instructions addressed by a cooperating teacher, university supervisor or colleague were not easily compatible with the constraints on activity in Ann's classroom. This confrontation between the actions and motives evoked in the mentoring situation and the actions and motives compatible with Ann's concerns in front of the class led her to state new actions for classroom activity. In other words, Ann's resistance to the stated instructions, her reservations about them, and her awareness of contradictory elements were the ways by which these instructions given by others were able to evolve. Excerpt 2 illustrates this process of professional development by the stating of new actions to be carried out and new motives for action in relation to the instructions given by another and the students' reactions. While viewing the recorded classroom activity (the self-reflection interview from April 11, 2008), the researcher asks Ann to explain the new meaning concerning "calling on several students in the classroom" that the university supervisor and the cooperating teacher had given her during the self-reflection interview (November 22, 2007) (Excerpt 1).

Excerpt 2 from the self-reflection of April 11, 2008

> *Researcher (R)*: So there, in this class, what are you doing so that it (speaking) will involve more students?
> *Ann*: Well, in the beginning I wasn't really aware of it, but then there, when I let the students speak I'm in fact asking them, well, to give me a result, to recall a property, and also I make them repeat it if I see that the student hasn't spoken up loudly enough for everyone to hear. I also pay attention because there's another thing that the cooperating teacher said, that you have to call on a lot of students, so it's not always the same ones who speak up. And it's true that before, I didn't think about all that, I always questioned the same ones, maybe, well, I'm the one who says it. But I had noticed that some of my students were really shy, for them it's really hard to speak up, so I had a tendency to question them less often but now you see that I'm trying to get them to participate, but I don't make them repeat what they say, I do it for them because there's no sense in hounding them.

This excerpt illustrates both the classroom use of an action stated by Ann in the earlier interview: “make them speak up if they are not speaking loudly enough” and the construction of new actions that are now possible thanks to the teacher’s capacity to analyse newly observed events in the classroom. Ann created links between what she was doing in the classroom and the instruction stated by her cooperating teacher: “make sure everyone speaks so that it’s not always the same ones”. This linking allowed her to realize the limits of her action: “it’s true that before, I didn’t think about all that, I always questioned the same ones.” Then she evoked another element based on the observation she had made of her students: “some of my students were really shy, for them it’s really hard to speak up.” Based on her teaching experience, she noted discordance between the action of calling on several students stated by the cooperating teacher and the observation that some students have a hard time speaking up. Ann had to call into the question the instruction given by the cooperating teacher and reevaluate it because of the characteristics of certain of her students. To resolve the tension caused by the conflict between the stated instruction and her own experience, Ann plans a new action: “don’t make the shy students repeat themselves”, associated with a new motive for action “so I don’t hound them.” By taking into account the shy students, Ann gives herself a new action, distinct from the one she received from her cooperating teacher. We note that Ann isn’t merely a “instruction-follower” because the analysis of Excerpt 2 shows that Ann is capable of choosing actions that do not conform to stated instructions. This suggests that there are often real skills that go unrecognized in the training situation and that these are constructed on the basis of a tension between instructions stated during training interactions and the actual classroom conditions. This tension should permit Ann to give new meanings about events of her classroom experience. Here we see that this has been at the heart of her professional development.

Testing the operations given by the interlocutors as a source for change in the motives for action

A major result emerged from the analysis of interactions between Ann and her interlocutors in the mentoring situation: when one of the trainers or the experienced colleague gave Ann operational instructions (instructions on “how to do it”) adapted to the constraints of her teaching activity, Ann tested them against her classroom experience. Once these operations were implemented, the motives for action could change, or, in other words, sense could develop successive to the development of efficiency. Excerpt 3 illustrates this. During a new interview on May 16, 2008, with the presence of the other math teacher, the researcher asked

Ann to talk again about the action of "calling on several students." Ann then specified that to do this, she had applied the operation given by her colleague: "call on one student per row."

Excerpt 3 of the self-reflection interview of May 16, 2008

Researcher (R): So the last time, you said that you had called on a lot of students and that you had asked the students to repeat themselves, right?
Ann: Uh, yes, in fact, I have a hard time sometimes working with a lot of noise, and I realized that calling on several students is also a good way to control the noise level. When you call on students, they have to listen, they especially have to listen to themselves; so yes, I think to do this now.
Colleague (C): But it's clear that things are running well in your class; they listen to each other but it wasn't always like this. You've seen my class, and I on the other hand, I tolerate a higher noise level because I know that if I took total control with this class it wouldn't work. So I too try to call on a variety of students because I think that too often we only call on the best (…). It's a good thing but it takes either a lot or a little energy, depending on whether or not the students are willing to listen to each other.
Ann: Yeah, in fact the thing of calling on one student per row, you change like that and it helps to control the noise. For me, I was able to get them talking this way.
C: No, but it's too easy.
R: Ann, who told you to call on one student per row?
C: The two of us were talking and it's true that in the end I told you that I did this with certain classes.
Ann: That's it, and I saw that it worked pretty well in my class.

Excerpt 3 helps us to understand clearly the process of developing professional activity from two sources of the regulation of activity: sense and efficiency. During the interview, Ann explained first that she was calling on a variety of students (action) in order to make sure the students were listening to each other (motive). Then she explained that she had received from her colleague an operation that consisted of calling on students (action) by calling on one student per row (operation). Ann thus is going to develop her professional activity by testing in the classroom the operation stated by her colleague. She then evaluated the efficiency of this operation in the class by noting that "it's working pretty well." This gain in efficiency encourages Ann to state a new motive: "calling on one student per row (…) is also a good way to control the noise level." Learning new operational rules allows Ann to state a new motive and consequently to modify the sense of her professional activity.

Discussion and conclusion

The results of this study clearly show the circumstances in which instructions given during interaction favor the development of professional development of a preservice teacher.

First, they shed light on the process by which the preservice teacher internalised and then transformed *cultural signs* (Vygotsky 1978) addressed by her interlocutors into objects for thought and into resources for re-elaborating her teaching activity. The internalisation of the stated instructions helped her to discover new possibilities for action beyond what she had already done and to modify her initial motives for action. Instructions given during the course of interaction become *psychological instruments* (Vygotsky 1978) for the preservice teacher when they contributed to modifying the motives for action and to constructing new operations for acting in the classroom.

Second, this study extends the conclusions of research on the resolution of teacher's intrapsychic conflicts caused by several competing instructions (Bertone et al. 2003). The results show that inter-psychic conflicts from the confrontation of instructions stated by several interlocutors augments the intrapsychic conflicts of preservice teacher. The process of developing professional activity appears to be tightly linked to the set of conflicts that push the preservice teacher to announce new actions for acting in the classroom.

Third, the results emphasise the process by which the preservice teacher tested the set of instructions against the reality of the classroom. By tying them to the characteristics of her classroom situation, Ann perceived the instructions given by her interlocutors as being able to improve her classroom activity. As we have seen, instructions were negotiated between Ann and her cooperating teacher and university supervisor. These negotiations were accentuated in the classroom where the students' reactions required her to nuance them. She created a link between what they had told her to do (stated instructions) and her concerns about her students in the classroom. From this confrontation between instructions and daily experience emerged the personal construction of new actions that went beyond the actions that the preservice teacher had followed up to this point. This result confirmed the theoretical assumption about the creative tension from the collision between a "scientific concept" and a "spontaneous concept" (Vygotsky 1997).

Last, the results emphasise the dynamic development of Ann's professional activity through the linkage between sense and efficiency, "by motives" and "by operations" with reference to Leontyev's activity model (1981). The development of the preservice teacher's power to act is thus seen through "biphasic development" (Clot 2008): first, the development of sense, which is reflected by displacing and going beyond initial motives through carrying out and going beyond action goals, and second, by the development of efficiency, which is reflected by the implementation of new operations to reach the new goals for action. From these analyses, we note that these two trajectories by sense and efficiency are mutually and reciprocally

supportive. Progressing to the steps of operational efficiency (learning new operations) is how Ann was able to set new motives for action and conversely the modification of these motives encouraged her to set other goals. This perspective, which sees the functional reorganization of activity around concepts of sense and efficiency, is helpful in understanding how training interactions have an impact the development of professional activity of preservice teacher.

This study examined the circumstances in which a preservice teacher's professional activity developed during interactions with trainers and colleague and in the classroom. The results show that the instructions stated by the cooperating teacher, university supervisor and an experienced math teacher were resources for this development when they allowed the preservice teacher to think about her teaching activity and construct more personal actions adapted to the characteristics of her classroom experience.

The work also underlines the interest of indirect research methods (Vygotsky 2003) based on audiovisual recordings of preservice teacher's classroom activity followed by self-reflection interviews (Clot 2008). From this study, we see that these interviews allow the preservice teacher to return to her past classroom activity and to think about it with the goal of finding other actions and to debate the instructions with a variety of interlocutors. Consequently, more than the interviews and questionnaires used in some research on teacher training, the self-reflection interviews show that they are methods for action that contribute to preservice teacher's construction of new meaning about classroom experiences. Genuinely professional dialogues occur during these interviews, which increases preservice teacher's power to act by encouraging her to think differently about her activity. A thought is reorganized and modified as it is transformed through langage: The thought is not expressed but it is actuated in words (Vygotsky 1997).

With regard to the goal of accompanying future teacher more efficiently as they learn to teach, the results point to the training situation organized around a collective of interlocutors. Within the context of the current reforms in France, it seems important to build training collectives that will encourage the circulation of competing instructions during interactions with preservice teacher and the confrontation of the different ways to teach. On this point, recent studies on training noted that the professional development of preservice teacher is favored by the collaboration of a variety of interlocutors in the mentoring situation (Chaliès et al. 2008; Goodnough et al. 2009; Whitehead and Fitzgerald 2007; Wilson 2006). The results of our study suggest that collaboration between a cooperating teacher, other teachers, and the university supervisor in a supportive school setting (Mule, 2006) provides the conditions for

encouraging and guiding the professional development of preservice teacher. This perspective is in line with the recent reforms on the mentoring of preservice teacher in the schools, considered as training spaces or "learning organizations" (Paquay 2005).

The results also suggest the need to consider the high impact of operational instructions on professional activity development. A study from Meard and Bruno (2009) showed that without operational instructions, preservice teachers find themselves facing a number of actions that they might have done but did not. The authors showed the tendency of trainers (cooperating teacher and university supervisor) to mask or hide the instructions. They found that saying nothing about "what should be done in the classroom and how to do it" in order to force preservice teachers to think for themselves in fact contributed to their difficulties and rendered fragile their construction of an identity as teachers. This observation suggests the importance of orienting the training of university supervisors and cooperating teachers from a dual perspective: developing their capacity to analyse teaching activity to identify the zones of potential development (Vygotsky 1978) and developing their capacity to help preservice teacher gain access to alternative operations for better efficiency.

The results thus show that following instructions is not enough to ensure that preservice teacher can do the work in classroom in conformity with these instructions. This observation requires a more complete understanding of the conditions of "co-construction of actions" in class and of modalities for bridges to be built between the university and schools (Zeichner 2010).

The results of this study open onto new fields of research, notably those that can document in detail a curtailment in the power to act; that is, the blunting or obstruction of the development of professional activity. The objective of these works would be to link the issue of professional development to issues concerning training situations wherein preservice teachers are deprived of the possibility of expanding their power to act by the lack of opportunities for interaction, collaborative mentoring, reflexive analysis of classroom work, and group and dialogic resources, and there is a lack of sense and efficiency in the stated instructions.

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