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Understanding Teachers' Knowledge: A Case Study in Brazil

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Abstract

The main objective of this exploratory study was to verify how high school teachers acquire and use knowledge in the classroom context. The methodological approach was qualitative. The techniques used to collect data were semi-structured individual interview and participant observation. The participants of the study were three high school teachers from a public school at Curitiba, Paraná, Brazil. Findings showed that although teachers emphasize the importance of their professional development, they face two serious problems related to the acquisition of knowledge. The first is related to financial conditions. They affirm that the courses are very expensive and their salaries are very low. The other is directly related to the nature of the teachers´work itself and the school organization. The school is not structured to provide a continuing education based on teachers' interests and needs. The pedagogical content knowledge is very important for them, but they use a very traditional conception of teaching and learning, that is; transfer of information through lectures, trying to teach students the most important concepts of their subject matter.

Keywords: High school teachers, Pedagogical content knowledge, Personal practical knowledge, Subject content knowledge, Qualitative research methodology

1. Introduction

The research on teachers' knowledge in Brazil became an important area, in the extent that it investigates which is the professional knowledge (knowledge, competences, abilities, etc.) that teachers need to develop the teaching/learning process. However, there is a shortage of empirical studies in Brazil that allow a better understanding of how teachers acquire and use knowledge in classroom. In this sense, it is necessary to conduct more research in this area in order to understand the process by which teachers integrate knowledge of different sources in their conceptual model that guides their practical actions.

What kinds of knowledge do teachers need to have in order to facilitate the teaching/learning process? What teachers need to know about the subject matter they teach? What kinds of experience do teachers need to have in order to develop these kinds of knowledge? Several versions of these questions have long interested practitioners, policymakers, and researchers alike.

This study is part of a project which started in 2003 sponsored by Conselho Nacional de Desenvolvimento Cient fico e Tecnol ógico (CNPq) (Note 1), on the acquisition and use of teachers' professional knowledge in the public high schools in Curitiba, Paran á - Brazil. Besides largely corroborating the results obtained in previous studies (see Moreira, 2006a, 2006b), it advances other important issues in this area of research. Therefore, the main objective of the present study is to verify how high school teachers acquire and use knowledge in the classroom context.

2. The nature of teachers' work and knowledge

Teachers' work is complex and composed of several activities not very visible socially. According to Vasconcelos (2002, p.310), the experience constitutes the expression of professional learning and, through the daily contact with students and colleagues, teachers acquire professional competences that are translated into teacher's profile.

In Tardif's opinion (2002, p.123-125), to teach is to pursue ends, purposes, that is; to use certain means to reach certain purposes. Teachers work with human beings in schools and the objectives of teaching are ambiguous, general and ambitious, heterogeneous and in long term.

The nature of the object of teachers' work is the human being, the individual and the social. This human being is active and capable of offering resistance, it has an indetermination portion and self-determination (freedom), it is complex (cannot be analyzed nor can be reduced to its functional components). The nature and the typical components of the teachers' relationship with the object are multidimensional, professional, personal, juridical, emotional and normative. The teacher needs the collaboration of the object, and can never be totally in control of it (Tardif, 2002).

Thus, to understand the work developed by teachers in the classroom it is useful to think about the complexity of this work and in the diversity of knowledge necessary to conduct it. Perrenoud (1993, p.46) emphasizes that the teacher is always under certain tension, because to encourage a group of children or adolescents during 20 or 30 hours weekly brings two

concerns: a) not to " lose time, to advance the annual program, and to maintain the order, and b) to assure the functioning of the group favorable to communication and work ".

According to Bransford, Darling-Hammond and LePage (2005, p.1) "on a daily basis, teachers confront complex decisions that rely on many different kinds of knowledge and judgment and that can involve high-stakes outcomes for students´ future".

Several researchers pointed out the diversity of this knowledge through classifications and typologies (Connely, Clandinin and Fang He, 1997, Clandinin, 2000; Elbaz, 1983; Perrenoud et al., 2001; Pimenta, 1996; Shulman, 1986, 1987; Tardif, 2000 and 2002, among others). Although each study is unique, almost all studies include some version of the following domains of knowledge: a) Pedagogical Knowledge, b) Subject Content Knowledge, c) Curricular Knowledge, d) Pedagogical Content Knowledge, and d) Practical Knowledge.

Although the precise distinction among these kinds of knowledge is somehow arbitrary, the distinction was and still is of great usefulness for the research in the area. To discuss this issue we will briefly present the typology developed by the authors previously mentioned.

Shulman (1987, p.8) and colleagues developed an intense research, identifying teachers' knowledge as: a) general pedagogical knowledge, with special reference to those broad principles and strategies of classroom management and organization that appear to transcend subject matter, b) knowledge of learners and their characteristics, c) knowledge of educational contexts, ranging from workings of the group or classroom, the governance and financing of schools, to the character of communities and cultures, d) knowledge of educational ends, purposes, values, and their philosophical and historical grounds, e) subject content knowledge, c) curriculum knowledge, with particular grasp of the materials and programs that serve as "tools of the trade" for teachers, and g) pedagogical content knowledge, that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding. Such knowledge differs from knowledge of generic teaching skills, because it is content specific.

Monteiro (2001, p.136) notes that Shulman does not work with the concept of practical knowledge, but that dimension is object of his concern in two ways: a) when he affirms that the pedagogical content knowledge is a particular form of knowledge of the contents that include aspects more adapted for his teaching and b) how he refers to the practical knowledge, through the classification for the necessary knowledge for teachers, created by the experience.

Shulman (1986) argued that, for a long time, the research in teaching and in teachers' education had ignored issues which specifically dealt with the pedagogical content knowledge. In his opinion, the importance of such issues goes beyond the conclusion that the subject matter knowledge influences the use of text books or representations by the teachers, and presents a strong argument for the content pedagogical knowledge as a specific form of knowledge for teaching that refers to the transformation of the subject knowledge content to the context of students' understanding.

For Shulman (1986), teachers need the pedagogical content knowledge to structure the

content of their classes, to choose or to develop representations or specific analogies, to understand and to advance specific previous conceptions or difficulties of their students' learning and so on. His studies of pedagogical nature have consolidated the current of knowledge base, in an understanding perspective of cognition and of educational actions, related to the development of projects, activities, implicit and explicit theories that they use in their work, conceptions of the discipline, curriculum and programs. The dimensions of knowledge developed by Shulman are a reference for many studies and a basis for several investigators.

There is, however, another dimension of the knowledge that other authors consider: the knowledge of self. Even so, while some tend to ignore that kind of knowledge, others attribute to it an extreme importance. It is the case of Elbaz (1983) that considers the knowledge of self as one of the five categories of the content of the teachers' practical knowledge. To Elbaz, the image that teachers have of themselves as professionals, the way they see their place in the classroom and in the school, the kind of authority and responsibility that they assume, their personal and objective values, influence considerably the way they use knowledge.

Knowledge of the context of teaching (knowledge of the milieu of teaching) is still recognized by Elbaz (1983) as a practical knowledge of the teacher. This dimension reflects the way teacher faces, not only the classroom, but also the school (the relationships with other teachers, and with the administration) and the political context of teaching.

Connelly, Clandinin and Fang He (1997) understand teachers' knowledge "as derived from personal experience, and that knowledge is not something objective and independent of the teachers to be learned and transmitted but, rather, it is the sum total of teachers' experiences". In their opinion, "personal practical knowledge is a term designated to capture the idea of the experience in a way that allows us to talk about teachers as knowledgeable and knowing persons" (p.29).

Clandinin (2000) suggests that a more promising approach is to explore teachers' knowledge that she describes as a knowledge that "...comes from the experience, is learned in the context, and it is expressed in the practice [...] it is a form of knowledge embedded in teachers' life, acquired throughout life and expressed in the context " (p.29).

Teacher's personal practical knowledge is in the teachers' past experience, in the teachers' present mind and body, and in the future plans and actions. It is, for any teacher, a particular way of reconstructing the past and the intentions for the future to deal with the exigencies demands of a present situation (Connely, Clandinin and Fang He, 1997, p.670).

When approaching the issue of teachers' professional knowledge in relation to the problem of teachers' professionalization, Tardif (2000, p.5) argues that teachers' professional knowledge is characterized as plural and heterogeneous (it comes from several sources, does not form an unified repertoire of knowledge and try to reach different types of objectives); is personalized and located (appropriated knowledge, incorporated, knowledge hardly dissociated of people, of their experience and work situation); knowledge that carries the human being marks with

two important consequences in relation to the teachers' professional practice.

The first is related to the phenomenon of the individuality that is in the core of teachers' work, because, although they work with students' groups, they should reach individuals that compose it, because are the individuals that learn. The teachers should acquire the sensibility to work with the students' differences and, this demands a long period of continuous investment. The second consequence, due to the first, rests on the fact that teachers´ professional knowledge always has an ethical and emotional component.

Tardif and Raymond (2000, p.215) classify teachers' professional knowledge as knowledge that comes from previous schooling, knowledge coming from the professional teaching education, knowledge coming from the programs and didactic books used in the work, and knowledge coming of its own experience in the profession, in the classroom and in the school.

The different approaches about teachers' professional knowledge analyzed so far puts value on the theoretical and pedagogical perspective of the teacher for the constitution of their knowledge base and emphasize the formative and collective character of teachers' experience. Another aspect that characterizes the authors' approaches is the construction of typologies that allow the classification of knowledge according to its characterization.

In Tardif and Raymond (2000, p. 215) opinion, the proliferation of those typologies simply moves the problem and it turns impossible a more comprehensible view of knowledge as whole. Perrenoud et al. (2001, p.191-192) argues that this knowledge should be understood in direct relationship with the conditions that structure teachers´work. What he is trying to say is that the work of teaching requests, as every specialized human work does, a certain specific knowledge that are not shared by everybody and that allow teachers' group to rest their activity on a certain knowledge base typical of the occupation.

In Perrenoud et al. (2001) point of view, teachers' knowledge depends largely on the social and historical conditions in which they exercise their occupation and, more concretely, on the conditions that structure their own work in a certain social place.

These authors agree that teachers need a versatile knowledge that embrace several contexts: the system (in its own syntactic, ideological structures and organization), the problems that give origin to knowledge construction, the pedagogy in general, the methodological-curricular, the contextual, the subject of the education, and a knowledge that all learning is culturally mediated, that is; it arises from cultural activity.

Although we agree with the authors analyzed here in relation to teachers' theoretical orientation and the importance of the personal practical knowledge as a form of acquisition and mobilization of knowledge, this study has as main objective to understand the acquisition process of knowledge and how teachers use it in practice, without the concern of linking it with typologies and classifications. With this in mind, we tried to understand better how three teachers of a public high school acquire knowledge and use it in the classroom context.

3. Methodology

The methodological approach was qualitative. The participants of the study were three high school teachers: Mary a mathematics teacher (mid-career stage), Albert a chemistry teacher (late career stage), and Anthony a physics teacher (late career stage). The strategy used to select the sample was the purposive criteria sampling. The criteria were based on participants' individual characteristics, their subject matter (mathematics, physics and chemistry), the teachers' school representativeness, career stage (mid-career and late-career stages) and based on reputation for excellence in teaching as defined by school principals.

Data were collected through semi-structured individual interviews and participant observation. Each teacher was contacted personally, and received a presentation letter with all the objectives of the study. None of the selected teachers refused to participate in the study, and as soon as the teachers agreed to participate in the study, they signed a letter of informed consent.

The data was collected in three phases. In the first phase, exploratory interviews were conducted with each one of the participants of the study. The interviews lasted 45 to 60 minutes, were recorded and transcribed literally. The objective of the interviews was to explore in a general way teachers' education, the meaning of being a teacher and their conceptions about the necessary knowledge to teach, reminding that the object of the investigation was not the subject matter that they taught, but how those teachers acquired and used the knowledge in the classroom. In the second phase, after the analysis of the exploratory interviews, 21 observations were conducted in common agreement with participants (seven observations for each teacher), during a three months period. The observations were recorded on a diary. The objective of this phase was to observe how teachers used and integrated the different kinds of knowledge in their classroom.

In the third phase, in-depth interviews were conducted, based on the first set of interviews and classroom observations. The interviews in this phase lasted 60 to 80 minutes, and were also recorded and transcribed literally. The objective of this phase was to deepen teachers' view about the ways to acquire and use knowledge in the classroom context. The decision to use the combination of those techniques was made according to the problem to be researched, the circumstances, and the advantages that the use of two techniques offers in terms of data triangulation.

3.1 Site selection

The school selected to conduct the study was a public high school in the city of Curitiba, Brazil. The school consists of 1200 students and 55 teachers. The mission of the school is a) to give education in a democratic way for the appropriation of knowledge that emancipates, and b) to work towards teachers' and students' improvement, through conscious and critical freedom, based on mutual respect.

Although the school is located in one of the most valued neighborhoods of the city of Curitiba, the students enrolled on it belong to middle and low class families. In the period that the research was conducted, the school building was being painted and externally presented a

good aspect. However, it presented quite precarious internal conditions. The connecting corridors that separate the classrooms were with damaged walls. Many doors and windows were broken and did not function properly to separate the classrooms and to isolate the noise coming from other classrooms.

Another important aspect to be emphasized is that the school does not have math, physics and chemistry laboratories. The material resources were scarce and the only available resource to the teacher is the blackboard. Actually, the school as whole has two television sets and two video cassettes that most of the time did not work properly.

3.2 Analysis and interpretation of the data

To analyze the data, it was used the constant comparative method that is compatible with the methodological approach. The constant comparative method associates the combination of categories inductively with a simultaneous comparison of all the obtained units of meaning (Glaser and Strauss, 1967). As soon as each new unit of meaning is selected, it is compared with all the other units of meanings and subsequently grouped (classified or coded) with similar units of meaning. In this process, there was space for the continuous improvement of the categories, that is, they could be modified, incorporated or omitted, and still new categories could be generated and other relationships were discovered.

The categories presented bellow emerged from the interviews and of the observations and the attempt was to portray, more faithfully possible, how these three high school teachers acquire and use knowledge in the classroom context.

3.2.1 Conceptions of professional knowledge

Mary argued that for her, all knowledge is social and historically originated; even so, the way it is transmitted should be humanized. For her, to be professionals, teachers have to develop several competences, and not only the theoretical knowledge (subject content knowledge). In her opinion, teachers need the practical knowledge, in terms of techniques and teaching strategies. More than knowledge teachers have to know how to manage all kinds of situations in the classroom, not only delivering their subject matter content, but observing also the students as thinking human beings which have their limitations, characteristics, and realities that influence the teaching/learning process.

In addition to the subject matter knowledge, the teacher should see the students as historical and social subjects that participate in the process. In relation to that issue she further commented:

It will be worthless if the teacher sees the reality and do not understand it, to see the student and do not understand him. To be a good teacher one has to understand a little about human behavior, a little bit of everything.

In Mary's opinion teachers' knowledge is also reflected in the curriculum, but the curriculum it is something that comes from top to bottom, because the teachers do not participate and do not get involved in its elaboration.

To Anthony, all knowledge has its foundation in reading, all that teacher reads increases his knowledge. In his opinion a person that does not read does not acquire knowledge. Then, he considers that the main source of knowledge for the teacher is reading, a lot of reading. In his opinion, the most important knowledge for the teacher is the domain of the subject matter content. The teacher has to know his subject matter, because the students will soon notice if the teacher knows or not his subject matter content. He complements this opinion affirming that: "in my discipline (physics) the knowledge has to be specific and technical, and that can be obtained through the internet, When I have doubts in a content I quickly go to the internet and find a range of issues, but I do not have time to read everything, because there are a lot of information in the internet".

Anthony briefly referred to the practical knowledge, because he notices that the knowledge accumulated along the years helps a lot, but in his opinion what indeed helps teacher is to work with interested students that pay attention in the class. With a lot of grief he revealed that this is not the case nowadays in the schools. In his opinion, good students are those that demand from teacher, they are the ones that bring more challenges, because they are the best students. When the teacher is challenged by students, he will search for something different to learn, because it is the way that the teacher grows and improves his teaching.

For Albert the subject matter knowledge is very important and he categorically suggested that teachers have to make fewer mistakes as possible in front of the students. He believes that to be a chemistry teacher, one has to dominate the content very well, that is, to know chemistry. In his opinion, teachers only get respect from their students if they demonstrate knowledge of the subject matter content. However, to argue that teachers need to know the subject matter they teach seems almost tautological, for how can we teach if we do not understand our subject matter? Yet the links between content knowledge and teaching performance are not all that easy to document (Grossman, Schoenfeld and Lee, 2005, p.205)

He also argued that knowledge in chemistry is technological and dynamic, because somebody is always producing something new. He believes that in each class teachers have to have a way to work the content, because the knowledge taught in chemistry classes is formal and technological, but teachers have to be prepared to work this with a lot of correction.

He believes that the pedagogical content knowledge is also very important, because it influences too much teachers' attitudes inside the classroom. For him teachers use a lot common sense when it comes to pedagogical and didactic issues and few people in the area knows it very well, that is; very few understand about the classroom's reality. In this sense, he added: to supply that flaw the teacher has to be creative. To be creative the teacher has to have basic notion of the laws that govern the pedagogy and how he teaches in the classroom.

For Albert teacher/student relationship is fundamental (knowledge of learners and their characteristics). In his understanding, it will be worthless if teachers know their subject matter and how to transmit it, if they do not relate well with student. In relation to that issue he argues that: "you have to have empathy, and to live together with the students is very good".

Mary, by her turns, has a wide notion of the several dimensions of knowledge (subject matter, pedagogical, practical and curricular), proposed by Shulman (1986, 1987). Anthony does not possess the same notion of knowledge, reducing teachers' professional knowledge to subject matter knowledge, just accomplished through reading, that is, to stay up-to-date with the knowledge progress in his area. Albert also emphasizes that for him the subject matter knowledge is the most important, although he also values the pedagogical content knowledge to enhance teachers' creativity.

3.2.2 Knowledge acquisition

Mary is a teacher that always liked to participate in extension courses, workshops and seminars to stay up-to-date. She confessed that nowadays she is not participating on extension courses in her area due to the lack of offer and financial conditions. In her opinion, the teacher has to have money available to get a better professional development, but even though having money, a lot of times the nature of the teachers' work and the organization of the school do not facilitate participation in extension courses, seminars or congresses outside school. In previous years she has participated in several national and local congresses in mathematics, presenting papers produced during her post-graduate program.

For Mary, schools in Brazil offer fewer opportunities to participate in extension courses in her area. This actually happens not because the school does not want, but because of school's omission. She summarized this issue with the following opinion: "when the school is omitted in relation to teachers' professional development, you do not know if it allows or not teachers' participation ".

Anthony also confirmed that the school gives fewer opportunities for the teacher to get new knowledge. To participate in extension courses teachers have to have free time and it has to be something that pleases him. A lot of times to participate in extension courses, teachers need all days of the week and if he doesn't have that time he will not do. He participates because he likes, but the school does not motivate him and gives no incentives. He also believes that the main problem is how much he earns (salary) and how much has to spend to participate in certain kinds of workshops. He already thought of doing a master degree, but when he saw the price of the monthly fee of these programs in Private Universities, because in the public ones the access is very restricted, he gave up and presented the following argument:

You are going to spend a lot of money monthly, plus that for two years you have to have time to study. But, if you stay teaching and doing the master degree, you will be doing a poor course, and you won't want this. Then, to do a master program, you have to get an incentive from the school and be devoted to this, in this way you will learn and brings plenty of knowledge to the school.

He stated that he will not invest in his career anymore, because is quite sure that he will not have return, and everybody looks for something to have return, and he added: " I did a post-graduate program in education in 1997, in the last few years I did not take extension courses, but what interest most is reading, therefore, the didactic is learned basically in a

daily basis". With that talk Anthony summarizes how he searches the pedagogical content knowledge and the importance that he gives to the practical knowledge.

Albert declared that have, throughout his career, participated in several workshops, seminars and congresses, and after that, he took a master degree in Education and Sciences. Related to the scientific knowledge he searches it inside of the classroom when he is developing the subject matter content.

When talking about teachers' professional development he also commented that high school teachers should be studying with the best researchers in the country. He risked suggesting that teachers should meet each half year with researchers' groups in chemistry, physics, mathematics and biology in order to verify what these researchers are doing. Although he affirms that has participated in several extension courses, it is possible to notice that the acquisition of the pedagogical content knowledge comes through reading didactic books. He makes this clear in the following extract, "I research in the area of education how to work chemistry's contents, the methodology to use and how to conduct teaching practice. The specific knowledge (subject matter knowledge) is normal, because, I improve it in the classroom, I mean; teaching my chemistry classes". With this comment the teacher demonstrated that, to acquire the pedagogical content knowledge it is enough to consult didactic books, and in relationship to the subject content knowledge, the improvement comes with the perseverance in working with the students in the classroom. For him, teachers continue to learn about content through the practice of teaching.

All three teachers invested enough time and effort to acquire professional knowledge in the beginning of their careers, but at the moment they presented the same difficulties for its acquisition (lack of money, nature of the teaching work and the lack of incentive from the school). What differentiates them, however, is that while one of them (Anthony) no longer invests in his professional development; the other two teachers just invest in the purchase of books to acquire the knowledge that they consider necessary to teach.

This situation, imposed by the nature of the teachers´ work and by teachers' personal interests, continues to show a chronic problem of continuing education. Everybody speaks about the importance of acquiring different kinds of knowledge to teach, but in fact, in a daily basis the most valued knowledge, and more sought by the participants of this study is the subject content knowledge

3.2.4 Sharing knowledge

Mary stated that it is very difficult to share knowledge with her colleagues for two reasons. First, because there is no common place at school so that teachers can share their ideas, experiences, and knowledge. Second, there is an enormous difficulty to exchange new ideas with colleagues. When she tries to debate an issue, it seems that she is trying to impose her way of thinking on colleagues. Her opinion is that a space should be created in schools that allows for the communication among the teachers at least on pedagogical issues.

Related to collaborative work she commented that the school could become a better place to work if it provides opportunities for teachers' collaboration, but what happens is that

colleagues of the same subject matter are not open to exchange experiences. She told that even in teachers meetings which are organized with the purpose of planning what it will be the contents taught in the specific subject matter during the school year, teachers do not work collaboratively.

In her opinion it is not the personal practical knowledge alone that makes a good teacher, because if the teacher is always making the same thing, he becomes repetitive. Teachers need to study and to have a space for debate, in other words, to exchange new ideas with other colleagues. Only in this way they will be good teachers. She always thought that we also learn with the colleagues, as well as with students, as she learned with other teachers that collaborated with her. For her, the experience helps, but it is not only the experience. The teacher has to know, he has to read and to study, because there is a lot of new things coming up in teaching.

When talking about the exchange of experiences with other colleagues in the school Anthony emphasized that nowadays it is difficult to share what he knows, but he already got tired of helping colleagues when they asked for help. He added that whenever he needs help in any issue, he is not constrained in seeking help from other colleagues. In his opinion, the teacher has time allocated to plan classes and to correct tests, and in this time teachers can exchange information when necessary on the pedagogical issues, but this hardly happens in the school.

Data shows that teachers' collaborative interaction tended to be dialogues when they meet in the halls, in the teachers' staff room and before the beginning and in the end of lessons. Anthony comments that: "here in the school nothing happens out of the planned meetings and this would have to be different. We only have the meetings for class advices in the end of the year and in the planning meetings in the beginning of the school year ".

Albert declared that the school does not give opportunity to exchange experience acquired in extension courses, seminars and other activities outside the school. He works 40 hours a week in the school, and this means 32 classes weekly. He thinks that if teachers have better salaries, then, the school would be a very good place to work. He is quite sure that works with a group of fantastic and competent colleagues, but they do not have breath to research, to write, to go on extension courses, seminars or congresses.

When he has an opportunity to participate in extension courses, he does it for his own initiative and has to pay for everything; the public school does not pay, because does not have financial resources. He does not have time to stop a little bit or to say to his colleagues, "I did this, "I saw that", "they are doing this or that", "they published that", and so on. He further argued that "nobody has time to do this, because it is normal that high school teachers work 40 hours a week. We do not have time to do anything less than teaching, absolutely nothing related to in-service training".

In the three teachers' talk it is possible to notice that there is no space and no time for sharing knowledge acquired in extension courses, seminars, workshops and congresses so much as the knowledge acquired with the day-to-day experiences in the classroom. The schools are

not concerned and not prepared to motivate the teacher to participate in extension courses for professional development and to improve students' learning. This situation puts more and more in evidence teachers' professional isolation.

Finally, the nature of the teachers' work and the practice of non-interference, do not allow teachers to share knowledge acquired in courses outside school and not even to share the day-to-day classroom experiences.

3.2.5 Knowledge use: principles and practices

Mary works the subject matter content depending on how the students behave themselves. For her, the method is applied according to the situation. In this sense, she uses strategies of action, that is; the way she lecture, how she communicate with the students and the way she conducts the activities. She creates the strategy according to the situation, and she does not go to the classroom with something ready. When she notices some difficulty to interact with students, tries to create strategies, but admits that she does not know if it is right or wrong, because never had a return from somebody about the way she is teaching.

As mentioned early on, Anthony did his post-graduate program in education thirteen years ago, but he believes that everything that learned to work in classroom is thanks to the practice developed every day.

Anthony stated that tries to deliver the subject matter content to the student, relating it to life activities, because he believes that a lot of things that the teacher can relate to day-to-day living with the subject matter so that the students have the knowledge of what should learn with life.

Although Anthony dominated very well the subject content knowledge and make efforts to teach it, he had a lot of difficulty to control classroom discipline. All the classes occurred in a disturbed climate, the class was interrupted several times to call the students' attention in order to continue explaining the content. Students interfered all the time asking questions that had nothing to do with the content that he was developing.

Despite the value that Anthony puts on the pedagogical content knowledge, the climate in his classroom demonstrates that the lack of the domain of this kind knowledge greatly contributed to students' indifference. This occurred due to fact that he always used the same teaching methodology. Most of the time was spent with the management of students' behavior than working the subject matter content.

Albert, by his turn, thinks to be possible to develop all the contents worked in chemistry, because for him chemistry is a central science and from it derives all the science branches. In his opinion, "chemistry has everything, but should be worked scientifically and in-depth, but the teacher has to analyze what is scientific for students". He also believes that the daily experiences in classroom are helping in his work, because these experiences are the base that the teacher needs to get the work done and to verify where the flaws are.

In his opinion teachers have to cheer up all the students, because the student has to come to school with happiness. The school has to be a cheerful place, he does not care if the teacher

has 30, 40 or 50 students in the classroom, the lessons have to be the same.

3.2.6 Difficulties in knowledge application

For Mary, the major difficulty she is facing now is the lack of students' interest. In her opinion many students are coming to school obliged, because the love for learning does not exist. They do not have interests to growth or the desire to grow in personnel and intellectual ways. Mary illustrated the nature of her concerns:

Teaching is only possible to the extent that students be willing to learn. In my opinion, the students do not see application in life of what they are learning in our schools, but not everything that the teacher teaches has practical application.

Many of the difficulties related to this issue were raised because teachers cannot establish a good relationship with student and if it that does not happen they cannot properly develop the subject matter content and, consequently, the student will not learn.

During the period of observations, I verified how difficult was to try to work with students that do not show interest in learning. Students arrive late in the classroom, they do not bring the proposed homework, no matter the interest and efforts put forward by the teacher.

Mary thinks that it is very difficult to establish or to point out only one reason for so much indifference. In her opinion there are several factors that collaborate for this situation such as the lack of the students' base in mathematics, the way how the content is developed (teaching methodology) and the lack of the students' perspective in life. She summarized this in the following comment:

Would be great if we had a pedagogical supervision team that could help us. We have pedagogical supervision and orientation here, every school has, but it did not work. There are a lot of students here in this school with disruptive behavior and learning difficulties that should be guided to a psychology professional, because the teacher cannot overcome all those difficulties alone.

Besides working with the difficulties imposed by the isolation promoted by the nature of teachers' work, they have to work with the lack of support of a pedagogical supervision team, whose main function would be giving support to teachers and students. Those difficulties frustrate the teacher, because besides having to manage all the inherent situations in the classroom, they have to manage some situations that are out of their control and knowledge.

Anthony finds several obstacles to work with students such as: a) the indifference for knowledge, b) students' indiscipline and c) the lack of material resources. In relation to the indifference, he declared that nowadays it is more difficult to work with high school students. The teacher has to impose himself to be able to do his job. In fact, the teacher tries to impose himself, just to get students' attention. In his opinion this situation did not happen four or five years ago, it was enough for the teacher to talk once with the students, but that is worsening each year. The students know that they are in the school to study and to learn, but this is not what happens. In relation to material resources, his opinion is that in public school the teacher has few resources. He exemplifies the problem in the following way:

suppose that the teacher needs a video, a DVD, or an overhead projector, just forget. This would be a good opportunity to help teachers to use technology, but this would happen if we had these resources available.

By his turn, Albert does not have problems in relation to students' indiscipline. However, he told that have difficulties with the work load, because if he had few classes a week could give better classes, with more quality and he could work better with students. Students' learning depends on their interest; if the students are not interested, they will not learn.

Although Albert stated that does not have problem with indiscipline, the students arrive late for his classes, they enter and leave classroom when they want. The only difference is that Albert maintains students' discipline and classroom control. The teacher justifies that situation affirming that:

I do what I have to do, I follow orders, but I do not get discouraged, because if you begin to put too much pressure on those kids they leave school. The problem is that they were never used to really study. Why? Because in previous grades, they had teachers that did not care for them. I do not do this, I give my class, I request them to do work in the classroom; I care for them.

Those difficulties mentioned by Albert occur due to the permissiveness of the school in relation to students' conduct. The period that I stayed in the school allowed me to observe that the school have written norms of conduct that are not followed by managers, teachers and much less by students.

4. Discussion of results and concluding remarks

The main objective of this article was to verify how three high school teachers acquire and use knowledge in the classroom. The three teachers interviewed and observed talked about several kinds of knowledge, abilities, and competences that they should dominate to teach, corroborating some arguments of the authors used in the literature review.

They talked, for example, of subject matter knowledge and pedagogical content knowledge. They referred equally to practical knowledge, emphasizing its values and usefulness, and pointed out several abilities and attitudes such as the love to work with young people, to be able to manage students' group (emphasizing the importance of having a good relationship with students), to play its part in a professional way, and to be able to reflect on their own practice. Finally they highlighted their experiences (personal practical knowledge) as one source of competence, although, they understand that their trust in practical knowledge is not enough for teaching.

Their answers in the interviews and my observations brought some evidences that these teachers know and dominate very well their respective subject matters, and they believe that subject content knowledge is what enhances teachers' identity. The first evidence from the accounts of those teachers is that they trust and they value, what Shulman (1987) termed "wisdom of the practice", that is, the process of learning by doing. Although they affirm that the pedagogical content knowledge is very important, most of the time they use a very

traditional (Note 2) conception of teaching and learning, that is; transfer of information through lectures, trying to teach students the most important concepts of their subject matter.

The classes were restricted to the following: a) presentation of the content, previously selected by the teacher, b) resolution of one or more exercises, and c) proposition of a series of exercises for students to solve in classroom and at home. They exposed the content and asked to students: "Do you have any doubt?" The students were not always willing to present their doubts, because they knew, from previous experiences, that this question was mere formality.

A second evidence brought by the results of this study is the importance that these three teachers give to classroom management and to decision-making during the class. They admit the need to have more and better strategies to manage the classroom, and also that they need help to plan better the learning experiences for their students.

Although the participants of the study emphasized the importance of their professional development, they face two serious problems related to the acquisition of knowledge. The first is related to financial conditions. They affirm that courses are very expensive and their salaries are very low. The other is directly related to the nature of the teachers ´work and the school organization. In fact, the school is not structured to provide a continuing education based on teachers' interests and needs. In this sense, all three teachers suggested that one way to solve this difficulty is to bring continuing education to school ś grounds.

When teachers have opportunities to participate in extension courses, seminars or congresses, they do not have the opportunity to share new knowledge with colleagues from the same subject matter, and much less with colleagues of other subject matters. Clearly, this situation happens for three main reasons: the) there is no proper space to do this in the school, b) there is no collective time for such sharing and c) the prevalence of the culture of the non-interference among teachers, that is; there is collaboration only when teachers ask for it, otherwise it is considered an interference. Although, meaningful collaboration was rare, teachers perceive in-school collaboration as a potentially rich source of contextually relevant knowledge affecting several professional activities.

In Bransford, Darling-Hammond e LePage (2005, p.13) opinion, "teachers must be able to function as members of a community of practitioners who share knowledge and commitments, who work together to create coherent curriculum and systems that support students, and collaborate in ways that advance their combined understanding and skill".

The research did not intend to approach the difficulties found by teachers to work with students, but the results showed desolator scenery. The teachers are quite committed, and work with care and dedication. However, the majority of the students have no interest to learn for several reasons such as the lack of knowledge obtained in previous grades, that is; the students are being promoted from one grade to another without dominating the basic contents taught, and of course, this increases the difficulty to learn new contents. The other reason is the lack of students' future perspective. The big question that they ask is: What do I do when finish high school?

The most valued knowledge by the three teachers was without any doubt the subject matter knowledge. Very auspiciously they also value the pedagogical content knowledge, but the search for this knowledge occur just reading didactic books. The other kind knowledge that they value is the personal practical knowledge, perhaps the most used knowledge in classroom.

However, personal practical knowledge needs somehow to become public, but in order to do this, knowledge has to become represented in such way that can be accumulated and shared with colleagues, and it also needs to be verified continually to be improved. In this sense, the collaboration is an important process for the success of any teachers' professional development program (see Moreira, 2006b), because it assures that what is discovered will be communicated in teachers' context.

The acquisition of knowledge is a teacher decision, because the government does not have a defined proposal for continuing education that assists teachers' real needs. When professional development is left to teachers' decision, it is neglected to a certain point, due to teachers' financial conditions and to the nature of teachers´work. The school, by its turn, does not motivate and do not have ways to better promote continuing education.

The results of this study bring some implications for teacher education programs that are not far from what is being suggested thoroughly by the educational research in Brazil. Teacher preparation should provide progressive field experiences and defined opportunities for student interaction with different educators that use a variety of methodologies. In teachers' education programs, prospective teachers need to see the methodologies used by their own teachers as well as to try these methodologies in the school context. When combining these observations and experiences with theory, teachers can help the prospective teachers to interpret and to integrate new knowledge with the previous experiences.

In relation to in-service training it is also necessary to think in school-centered in-service in order to offer options related to time for the teacher to be devoted to its professional development as, for example, a) identification of teachers' real needs, b) strategies that promote teacher reflection, c) opportunities to participate in action-research, and d) strategies on distance-learning to enlarge the exchange with other schools and teachers.

However, future research will be necessary to verify this with teachers of different subject matters. Additional information is also necessary in relation to teachers' knowledge base in different teaching levels and different contexts.

Although teachers value the pedagogical content knowledge, it is clear that the most important kinds of knowledge for them are the subject content knowledge and the personal practical knowledge. The study indicates that, in these three teachers view, subject content knowledge is put upon to the pedagogical content knowledge. Based on that, it is possible to say that some of the problems of the classroom such as students' indiscipline, indifference, lack of motivation, etc, which appear so frequently in the three participants' comments is likely to be occurring due to: a) lack of knowledge of learners and their characteristics, b) knowledge of educational context, and particularly due to the domain of pedagogical content

knowledge. It seems that these three teachers consider that a "good teacher" is characterized by the domain of the subject matter knowledge, and this is almost sufficient for them, although the reality observed in this school insists on proving the opposite.

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References

Bransford, J., Darling-Hammond, L. and LePage, P. (2005). Introduction. In L. Darling-Hammond, and J. Bransford (Eds.), *Preparing teachers for a changing world: what teachers should learn and be able to do* (pp.1-39). San Francisco, Jossey –Bass.

Conelly, M., Clandinin, J. and Fang He, M. (1997). Teachers' personal practical knowledge on the professional knowledge landscape. *Teaching and Teacher Education*, v.13, n.7, 665-674. http://dx.doi.org/10.1016/50742-51X(97)00014-0

Glaser, B., Strauss, A. (1967). *The discovery of grounded theory*. Chicago: Aldine.

Monteiro, A. M. F.C. (2001). Professores: entre saberes e práticas. *Educação & Sociedade*, v.22, n.74, 121-142. Retrieved from: http://www.scielo.br/pdf/es/v22n74/a08v2274.pdf. ISSN 0101-7330.

Moreira, H. (2006b). A contribuição da escola e o desenvolvimento profissional do professor. *Revista Comunicações*, Unimep, ano 13, n.2, 132-149, novembro. Retrieved from: www.revistadafaeeba.uned.br.

Moreira, H. e Caleffe, L. G.. (2008). *Metodologia da pesquisa para o professor pesquisador*. Rio de Janeiro: Lamparina.

Moreira, H. Ribas, G., Soavinsky, E. R., Fortes, R., Wiese, M. C., e Fisher, E. (2006a). A concepção de conhecimento profissional e sua aquisição por professores do ensino médio. *Revista da FAEEBA - Educação e Contemporaneidade*, Salvador, v.15, n.25, 227-238, ja./jun. Retrieved from: www.unimep.br/fe/revcomunicações.

Novak, J. D. (1998). *Conocimiento y aprendizaje. Los mapas conceptuales como herramientas facilitadoras para escuelas y empresas*. Madrid: Alianza.

Perrenoud, P. (1993). *Práticas pedagógicas, profissão docente e formação*: perspectivas sociológicas. Lisboa: Portugal: Dom Quixote.

Pimenta, S. G. (1996). Formação de professores: saberes da docência e identidade do professor. *Revista da Faculdade de Educação*, v.22, n.2, 72-89. Retrieved from http://educa.fcc.org.br/scielo.php?script=sci_arttext&pid=S0102-25551996000200004&lng=pt&nrm=iso. ISSN 0102-2555.

Pimenta, Selma Garrido, E. Ghedin (Orgs.). *Professor reflexivo no Brasil*: gênese e crítica de

um conceito. São Paulo: Cortez.

Shulman, L. S. (1986). Paradigms and research programs in the study of teaching: a contemporary perspective. In: M. C. Wittrock. (ed.) *Handbook of research on teaching*. (3a ed). (pp.3-36). New York: Mac Millan.

Shulman, L. S. (1987). Knowledge and teaching: foundations of the new reform. *Harvard Educational Review*, v. 57, n. 1, 1-23, February. ISSN 0017-8055.

Tardif, M. e Raymond, D. (2000). Saberes, tempo e aprendizagem do trabalho no magistério. *Educ. Soc.* v.21, n.73, 09-244. Retrieved from http://www.scielo.br/pdf/es/v21n73/4214.pdf. ISSN 0101-7330.

TARDIF, M. (2000). Saberes profissionais dos professores e conhecimentos universitários: elementos para uma epistemologia da prática profissional dos professores e suas conseqüências em relação à formação para o magistério. *Revista Brasileira de Educação*, n.13, 5-24. Retrieved from http://educa.fcc.org.br/scielo.php?script=sci_arttext&pid=S1413-24782000000100002&lng=pt&nrm=iso. ISSN 1413-2478.

Tardif, M. (2003). *Saberes docentes e formação profissional*. (3a ed.). Petrópolis: Vozes.

Vasconcelos, C. (2002). *Construção do conhecimento em sala de aula*. (12a ed.) São Paulo: Libertad, , Cadernos Pedagógicos do Libertad; 2.

Notes

Note 1. The Conselho Nacional de Desenvolvimento Científico e Tecnológico (National Council of Scientific and Technological Development; CNPq) is an organization of the Brazilian federal government under the Ministry of Science and Technology, dedicated to the promotion of scientific and technological research and to the formation of human resources for research in the country.

Note 2. Traditional teaching is concerned with the teacher being the controller of the learning environment. Power and responsibility are held by the teacher and they play the role of instructor (in the form of lectures) and decision maker (in regards to curriculum content and specific outcomes). They regard students as empty vessels and it is their job to fill them with knowledge. In short, the traditional teacher views that it is the teacher that causes learning to occur (Novak, 1998).

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