

TEACHER EDUCATION AND CULTURE: UNDERSTANDING AND ASKING FOR CHANGES

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The purpose of this research lies in displacing the issue that was brought up - with much seriousness - about the (mathematics) teacher education in a perspective centered almost only in the formative process of the teachers while social/intellectual subject of his/her actions for a perspective allied to the culture that each student brings inside of him/herself. In this sense, the formation of teachers herein reflected - from an ethnomathematics perspective - can be recognized as a way to generate a structural change in the scope of the formation of teachers - or, at the least, to denounce that the student has not been completely out of the proposals of teacher education, but neither is quite on the target.

INTRODUCTION

The school will treat all equally. However they ARE NOT ALIKE. Because of this, for some it will be enough what the school gives them; for others it will not. Some will triumph others will fail. This triumph will confirm those to whom society supplied the means to triumph. And the failure will usually confirm the disdain toward those society conditioned as inferior. (Nidelcoff, 1978, p. 25)

This text presents partial results of the research[1] on the subject of “Teacher education and culture: understanding and asking for changes” carried out in the period of 2004-2006. The research questions were born from an almost personal feeling of dissatisfaction and perplexity.

It is well known that a teacher’s experience of a teacher education is a confluence of what happens in the teacher’s individual/professional life and in his/her life in a group, that involves all the school community, the formers of curriculum, among others. However, when a reflection is directed upon teacher education from the point of view of ethnomathematics, the second aspect of the confluence - the “others” that constitute the group – acquires special value and the educator's contextualized knowledge becomes more intensely the central focus.

In this perspective, the research developed here has as central pre-occupation – the students’ knowledge in relation teachers’ transformation –, in the formation of teachers while line of research in (mathematics) education. In truth, the purpose here intended is that one of contemplate and reflect, in teachers educational processes, the students’ and the teachers’ socio-cultural vision, bringing them to reflect upon cultural diversity. In other words, the teachers’ vision does not need uniquely to be constructed from the academic intellectual culture, from the dominant culture.

FOCUS OF INTEREST: TEACHER EDUCATION

The focus of interest of this paper is in what regards the teacher education from the perspective of ethnomathematics. And, specially, it wants to call the researchers attention to the fact that in the immense volume of inquiries in this field of studies “the student is not completely aside of the proposals of teacher education, but neither is he/she within.” (Domite, 2000, p. 44).

Various models have been proposed - sufficiently consistent and well constituted in terms of teacher transformation -, amongst some are not directly addressed to the teacher education as the social subject of his/her action and, therefore, still characterize the transmission type that leads, somewhat, to an impositive attitude; others are especially centred in the teacher as a constituted subject, centred in the types of transformation processes and in the formative dynamics itself (Cooney, 1999; Fiorentini, 1998; LLinares, 1995; Ponte, 1994; Schön, 1987; Shulman, 1986; Zeichner, 1993).

One of the axial themes that has guided the most current discussions is that of the reflective professor. The original ideas of the reflective practice come from Schön, since the 80s, who has discussed ways of operationalizing the reflection in action and the reflection on action. In some way, the movement appeared in the opposite direction of the idea that a teacher educator transmits amounts of information pre-established and began to reorient, in terms of world, the scholars’ discussions of education reform and teacher education. The conceptions that guide the reflective formation of the teachers emphasize that the teacher education must have as a main goal the reflective self-development of the teacher, that is, to form teachers who learn to form themselves when facing affective-intellectuals problems of the pedagogical practice and of the educators reasoning.

As mentioned, looking in a specific way at the orientations proposed by teacher educators, there is very little concern in addressing it to a connection with students’ knowledge. Certainly, these educational designers consider that the knowledge of the students must be in the formation proposals, but it is not clear how they have made it explicit.

Anyway, it is worthy pointing out here that some initiatives have been developed joined to the students’ knowledge. The study group called “to grant reason to the student”, formed by a sub-group of educators involved with reflective formation (Schön, 1992), studies the teachers who investigate the reasons that make the students say and express certain things. The vision of teaching and knowledge of the educator who “grants reason to the student” indicates that the student’s knowledge has been part of formation proposals – it has been emphasized that the teacher should recognize and value the intuitive, experimental, daily knowledge of the pupil, as for example, looking to understand how a student “knows to change money, but does not know how to add numbers” (Schön, 1992).

Further, on mathematics educators directed toward teacher education focussing the student's information and his/her learning processes, it is worthwhile to highlight the reflections of Beatriz D'Ambrosio (1996). When emphasizing some characteristics to be incorporated by the mathematics teachers in face of the current curricular reforms, D'Ambrosio accentuates that one of helping "our students to establish a positive relationship with mathematics". In order to do this, she gives value to turning attention toward the previous knowledge of the student claiming that:

The main ingredient of the teacher's decision regarding the direction of the classes and the student's learning is the discovery, by the teacher, of the student's knowledge. The student comes to the educational process with a wealth of experiences. The teaching of mathematics (and, in fact, of most of the school disciplines) is not based any longer on the structure of the discipline, but on the contrary, it is based on the student's knowledge. For that the teacher needs to organize the work in the classroom in a way that elicits the student's knowledge so that this knowledge can be analyzed. It is also important to create activities that will lead the student to seek in his/her experiences knowledge already formed" (D'Ambrosio, B., 1996).

In truth, rare are the inquiries that take into account the student's knowledge in teachers' transformation processes. It seems that everything happens as if a large parcel of the teacher educators were attentive and concordant with this issue, but the configuration of the majority of the proposals developed by them does not disclose direct incidence in terms of this orientation.

About teacher education in terms of the student's knowledge and ethnomathematics, we situated in Brazil educational history two projects on teacher education that have as central focus the student - the proposals by Freire and D'Ambrosio - that have not only called the teacher's attention to the worth and role of culture in the learning and teaching processes but have also sustained the idea that the students can not be developed in an isolated way, deprived of cultural identity.

The great search by Freire was, on one hand, to bring the teacher "to take as reference for learning the reality itself of the people", with the concern in seeing such reality related to in 'generating words' and represented in the 'coding' that is analyzed and discussed with this people (Freire, 1980). On the other hand, he tried to make the teacher turns him/herself toward his/her students and, through dialogue, tries to learn with them.

D'Ambrosio, in turn, has brought the teachers to realize that one of the biggest historical distortions has been to identify mathematics only with the European thinking, in particular in its origins, with the Greek thinking and, then, to situate the several contributions of diverse cultures to the formation of the contemporary mathematical thinking. It is here, in this appeal of D'Ambrosio, the germ of Ethnomathematics, study field worldly inaugurated by him.

In any event here is being brought up a question that can be taken as generating the discussion in general: “Can teacher education, as a practice of recovering the student’s culture, transform/reduce the segregating function of the school education?”

JUSTIFICATION

The research in question is justified by the fact that the lack of reference about the dialogue with the students (previous) knowledge in classroom - to a large extent of the studies on Teacher education - can make the teachers lose the possibility of: (a) activating focuses of dignity and self-esteem in those they want to call for (school) knowledge and, (b) activating interactive forces for classroom situations.

In truth, it seems to be reproduced in the scope of teacher education the tendency of the so-called traditional school in treating the students as if they were all equal, to consider that they know and are developed in the same way.

However, it may be recognized, on one hand, that the great majority of those who are involved with teacher education have clear that the critique that the school treats uniformly all the pupils as equal stands there for a long time, a consideration of socio-political-economic order, linked to the problematic of education and power, education and ideology and education and culture (Nidelcoff, 1978). On the other hand, when it is proposed to consider the limits and the interfaces among mathematical education, culture and teacher education, it may be easily noticed how difficult it is to place at one side teacher education and at another cultural issues - as well as it is not easy to provoke the deconstruction of the students evaluative neutrality.

This research paper is also justified by the fact of going after the theoretician-methodological option of the research in ethnomathematics, based on the ethnographic experience, trying to perceive the “other group”, from the angle of its logic, searching to understand it in its own rationality and terms. In general, in the scope of the research in ethnomathematics, the researcher experiments some estrangement and tension process since the quantitative and spatial relations observed in the investigated group – as long as it is not centered any longer exclusively in the explanations of the researcher’s society group - reveal many times, to him/her, disarticulated and, in general, a process of re-signification and analysis of the same ones calls for the creation of categories that involve articulation between mathematics and other areas of the knowledge as history, myths, economy, among others. Truly, such relations ask for articulation in a non-disciplinary dimension of knowledge, but rather in a transdisciplinary one.

This work results upon the approach of reflectiveness – from Giddens *point of view* – connected to the understanding of the influence of the etnomathematics movement. According to Giddens, any political principle or methodological purpose, even that ones filled with good intentions and contents, might tend to fail if there are not concrete subjects to proceed to the analysis and to the reflections upon them.

Moreover, these subjects are responsible for verifying the possibilities of such principles or purposes of becoming concrete, suggesting adaptations, allowing a new vigor in the fulfillment of new objectives. In other words, the balance between the theory and the fragmented practices has to be reflected upon, so that, in its continuous joining and confrontations of them, new alternatives be created.

In terms of learning-teaching, in turn, we could say that ethnomathematics suggests to the teacher to bring forth ways of reasoning, measuring, counting, drawing conclusions from the students, as well as searching to understand how culture is developed and reinforces the learning issues.

In fact, when the concern of an ethnomathematics study is the pedagogy of the mathematics, the attention has been situated around legitimizing the knowledge and information of the students born from experiences constructed in their own environments and to study possibilities to deal with the learning that comes from outside the school and from the school. In this sense, with the discussion of ethnomathematics, what is intended is to help the teacher “to establish cultural models of belief, thought and behavior” (Fasheh, 1997, p. 98), in the sense of not only reflecting upon the potential of pedagogical work that takes into account the knowing of the students but also the learning, by the school, more significant and that would give more power and dominion to the student over his/her own learning.

From the exposed, one may say that the central question of this research can thus be delineated: is it possible to recognize the interfaces between mathematical education, culture and teacher education in order to better understand the connections between ethnomathematics and teacher education?

METHOD

Several can be the reasons for the justification of the chosen path and method employed in an academic educational research, but the research question, in general, determines the most adequate way. In this sense, the research of the qualitative type is justified here because the procedures that are involved in such style can lead, in some way, to the recognition of mini-processes of thought by the mathematics teachers in the sense of acknowledging students' previous knowledge, as well as the relations that involve teacher and students.

In truth, when regarding an inquiry that tries to understand the “other” through his/her practice, in special in the educational scope, it is more consensual among the researchers that the entanglement with which everything is developed turns the isolation of the involved variables difficult – the treatment characteristic of the quantitative methods - and, mainly, a more clear, objective indication of those ones responsible for determined effect.

The great desire with this research is to take as groundings the principles of the participant research, characteristic form of the Popular Educational movements

(Brandão, 1986; Freire, 1980) - an action resulting from an integrative process involving the individual, the school and the social context, actualized in a critical and transforming way. Thus, the attention will be wholly directed toward the subjects of research, the social conditions, the more or less intuitive “explanations” and the personal interpretations, loaded with emotion and the researcher’s own elaboration.

In general, both in terms of gathering facts and analysis, the intention is to take into account at least two basic aspects: (a) the teachers will be not positioned in a null stage of reality knowledge – on the contrary, the starting point comes from the already existing conditions, that is, of a prior practice of the researcher and theirs, in a way to understand the need for change and, (b) when analyzing the facts, it will be attempted to establish the mediations and contradictions of the questions that constitute the investigated problematic matters, in order to overcome the ingenuous analysis of its first and previous impressions.

OBJECTIVE

These are the main objectives of the research in question:

- to bring the teachers to appreciate and to legitimize the (previous) knowledge and information of the students;
- to bring the teachers to understand always more the advantages in taking into account the student's culture in the process of teaching and learning mathematics;
- to understand grasp the possible connections between Ethnomathematics and the movement of Teacher Education while research areas and,
- to better understand what the ethnomathematics scholars would like to see in the movement of teacher education.

THE RESEARCH: IT’S DESCRIPTION

From the considered, regarding to the research progress it may be noticed an approximation to the studies of Paulo Freire, who was chosen as a central theoretician to answer the questionings here formulated, especially because his reflections have been dedicated to the exploration and the legitimating of the knowledge of the “other” and of the student who, in general, is formed and conformed within determinate relations of power. The greater intention is to activate the perception of teacher educators and teachers on their own unfamiliarity about who are their students, what do they know and how they know about these students, in order to propitiate one another speech, another way of seeing and of being teacher educators, in order to create opportunities of educators’ transformation.

It is worth to highlight here that, in this search to incorporate the knowledge of the students in order to operate the dynamics of teacher education, it is present the expectation of always recognizing the student’s needs and not on the opposite way. In other words, the dialogue between the need to develop the teacher education “with”

the students and the theoretical-practical instruments of the school system must constitute a dialectical process – none of the poles of this tension must dominate the other.

With these concerns and since one of the basic presuppositions of ethnomathematics is in focusing, identifying and legitimizing the quantitative and spatial relations based on the knowledge of the “other”, the research proposal in the scope of teacher education consists of: a) recognizing how much teachers are aware of the movement and literature on Teachers education in the educational field; b) searching an understanding of the conceptions of the teachers and researchers on (school) education and culture and, c) to problematizing processes that emerge in the social reality of a classroom, in which the knowledge of the pupil becomes (by force of circumstances) the axis of the teacher’s concern.

To direct a systematic analysis on the concern of teachers in taking into account the (cultural) knowledge of the students - as well as of the other items mentioned - this research tries to collect information on the basis of two proposals. The first proposal was constituted of interviewing mathematics teachers, in service and postgraduates, supported by questions about teacher education and the main characteristics that, we teachers, need to have and develop when we decide to place as the centre of the teaching-learning process the feelings, attitudes, opinions, culture and previous knowledge of our students. The second proposal, and here is the focus of this research, was to **request the manifestation of the investigated individuals, based on the confrontation with a situation that is distinct from those of regular standards. The prepared script is as follows:**

- How would you go forward and continue the lessons like these that were presented to teacher Mário and teacher Janaína (two real cases). That is, in a first moment you are the teacher Mário and in a second the teacher Janaína, teachers who offered “to start the lesson with the speech of the students”...

First case: The teacher (Mário) begins, in one of his 5th grades, a conversation with his students on the calculating division, by asking:

Teacher: How do you calculate 125 divided by 8?

José, student who sells bubblegum at the traffic sign downtown, starts speaking:

José: We are more or less 10 “guys”, almost all day long, some boys and some girls. Then, we divide like this: more for the girls, who are more responsible than the boys, more for the taller ones than the smaller ones”.

Teacher: Give us an example, José. For example, how was the partition yesterday or the day before?

José: Ah! Like this ... there were 4 girls, one of which is small; 6 were tall boys and 2 more or less small. Then we were 12 and the gums were 60. Then, it

was given half and half, a little more for the girls. The small girl ended up with 3 and the others with 6 or 7, I do not remember well... The boys...

Now you[2]:

Second case: the teacher (Janaina) asks to the group of pupils of 4° semester of the course of education of adults:

Teacher: What do you know about percentage? How do you do the calculation of a percentage?

Luiz[3]: Even today I needed to make a calculation... 35% of 195 and I did like this... $19 + 19 + 19$ and then plus 9,5. It's 30 plus 27 ... more or less 10.

Teacher: How did you get 19? Tell us a little about your way of calculating.

Luiz: Ah! I do not know why I did it like this... every time that percentage appears I divide by ten because somebody taught me this way, and I add the times that it appears... like this... 30% I add three times, 40% I add four times.

Teacher: And how did you get 9,5? Tell me the way you thought to do this.

Luiz: I know that one has to divide by two when it is 25% or 35% or 45%, but I do not know why I do this

Now you[4]:

FROM THE ANALYSIS

In a general way, in the context of traditional formation of the mathematics teacher, as in his or her material and cultural conditions of work, it is usual to emphasize an evaluative regulation, certification and standardization of teaching behavior processes. According to Giroux, these processes occur “in spite of the creation of conditions for the sensitive, ethical and political roles that they are supposed to play/act, as public intellectuals enrolled/involved in tasks of bringing up students for a responsible and critical citizenship” (1985, p. 85).

So far, it was analysed some of the questions related to the second moment of the research - referring to the emergent situations in the classroom – with the examination of 25 answers. Surely, such examination, as a reflexive reading, was accomplished in a serious and reflective manner, but not so profoundly as it would be desirable to do in order to more deeply understand the different cultural, social and pedagogical points of view of the different mathematics teachers. Further insights can be gained from the analysis of the data.

Among the 25 in-service mathematics teachers, 14 are public school teachers with more than 10 years of experience, 6 with less than 10 years (3 of them also in private schools) and the last 5 are also postgraduates, 3 of them effective teachers in public education.

When sketching a theoretical picture for analytical purposes, it was possible to perceive that the recognition of the teachers, regarding themselves, as teachers in such presented lessons, happens in three axis: (a) the first axis refers to the teacher's desire of transforming the real situation into an exercise or mathematical problem (he/she is looking towards the teaching of mathematical content); (b) the second contemplates the reflective and interrogative teacher, and, (c) the third is represented by beliefs, values and power relations allied to pedagogical practice.

In general, the analysis of the pedagogical-practical situations brought some evidences on the types and kinds of attitudes that teachers seem to have incorporated and some subsidies to understand what they need in order to become people who recognize and legitimize the students' (cultural) knowledge.

It was possible to observe that, on one hand, teachers acquire identity in one determined school grade as active participant subjects of a part of knowing. This seems to occur after some years of teaching mathematics in different schools or in the same school, in different grades. Nothing changes, everyone teaches similarly the same things, little is obtained significantly in terms of conquests and innovations in the courses. It seems that the teacher does some kind of appropriating of a way of being professional in service, capable of contributing to education in terms of (mathematical) content with increasing worth and power, but almost nothing in terms of more open proposals that allow educators to formulate questions, to develop their own projects, to reflect on themselves as thinkers.

On the other hand, teachers seem to become more easily sensitive with discussions on key-notions for the "new" mathematics teacher that is always in construction: an individual who reflects on his/her reality with critical and constructive spirit, searching for solutions, betting on the collective reflection as renewals sources. In other words, the teacher revealed him/herself as capable of innovating and producing knowledge, taking the education of mathematics as objective, and occupies the position of one who can propose innovations, question mathematics teaching practices and suggest new paths.

In a very abridged way thus, some considerations from this first attempt of analysis can be highlighted:

- the mathematics teacher's education allied to the knowledge of the students is not incompatible with their formation on how to teach mathematics to children, teenagers and adults; on the contrary, it may be one of the aspects that can involve them;
- the mathematics teacher education allied to the knowledge of the students can help teachers on realizing that what we teach, or what we don't teach, is much more than a day in our students' lives; it is something that lasts forever in their lives and in the lives of those they interact with.

Finally, it could be said that, on one hand, a first look at these questions shows that there is a lot of work to be done and that their consideration can both inform our

research techniques and also lead us to criticize our practice in teacher education. On the other hand, we can affirm that the national discussions in education can interpret the actions of the students and teachers, but they cannot significantly understand their social and cultural identities... in order to incorporate them in a national curriculum.

NOTES

1. Developed by first author. The second author has taken part in a section of data analysis in this research.
2. In this moment, the participant of the research should begin speaking, and the data of research were collected.
3. The student.
4. In this moment, the participant of the research should begin speaking, and the data of research were collected.

REFERENCES

- Brandão, C. R. (1987). *Repensando a Pesquisa Participante*. São Paulo: Editora Brasiliense.
- Cooney, T. J. (1999). Conceptualizing teachers' ways of knowing. *Educational Studies in Mathematics*, 38(1-3), 163-187.
- D'Ambrosio, U. (1990). *Etnomatemática*. São Paulo: Editora Ática.
- D'Ambrosio, B. (1996). *Mudanças no papel do professor de matemática diante de reformas de ensino. Paper presented at Actas ProfMat 96*. Lisboa, APM.
- Domite, M.C.S. (2000). *Notas sobre a formação de professores e professoras numa perspectiva da etnomatemática. Paper presented at Primeiro Congresso Brasileiro de Etnomatemática-CBEm1*. São Paulo, pp. 41-48.
- Fasheh, M. (1997). Matemática, Cultura e Poder. *Zetetiké* 6(9), 9 –30.
- Freire, P. (1980). Quatro cartas aos animadores de Círculos de Cultura de São Tomé e Príncipe. In Brandão, C. R. (Org.) *A questão política da educação popular* (pp. 136-196). São Paulo: Editora Brasiliense.
- Freire, P. (1987). *A Pedagogia do oprimido*. 17^a ed. São Paulo: Editora Paz e Terra.
- Fiorentini, D., Souza Jr., A. J. & Melo, G.F.A. (1998). Saberes docentes: um desafio para acadêmicos e práticos (pp. 307-335). In Geraldí, C. M. G., Fiorentini, D. & Pereira, E.M. A. (orgs.) *Cartografias do Trabalho Docente professor(a)/pesquisador(a)*. Campinas: Editoras Mercado das Letras e Associação de Leitura do Brasil.
- Giroux, H. A. (1995). Praticando estudos culturais nas faculdades de Educação. Coleção estudos culturais em educação (pp. 85-103). In Silva T. T. (org.) *Alienígenas na sala de aula*. Petrópolis: Vozes.

- LLinares, S. (1995). Del conocimiento sobre la enseñanza para el profesor, al conocimiento del profesor sobre la enseñanza. Implicaciones en la formación de profesores de matemáticas (pp. 13-17). In Blanco y Mellado (coord.). *La formación del profesorado de Ciencias y Matemáticas en España y Portugal*. DDCEDM: Badajoz, España.
- Nidelcoff, M. T. (1978). *Uma escola para o povo São Paulo*: Editora Brasiliense.
- Ponte, J.P. (1994). Mathematics teachers' professional knowledge (pp. 195-209). *Paper presented at PME XVIII*. Lisbon, vol. I.
- Schön, D. (1987). *Educating a reflexive practitioner. toward a new design for teaching and learning in the professions*. São Francisco: Jossey Bass.
- Schön, D. (1992). Formar professores como profissionais reflexivos (pp. 77-92). In Nóvoa, A. (edit.) *Os professores e a sua profissão*. Lisboa: Don Quixote.
- Shulman, L.S. (1986). *Those who understand: knowledge growth in teaching*. *Educational Researcher*, 15(2), 4-14.
- Vergani, T. (2000). *Educação etnomatemática: o que é?* Lisboa: Pandora Edições.
- Zeichner, K. M. (1993). *Formação reflexiva de professores idéias e práticas*. Lisboa: Educa.