Challenges of the ethnomathematical approach in adult education

Maria Cecilia de Castello Branco Fantinato
Universidade Federal Fluminense, Niterói, Brazil

mcfantinato@gmail.com

This paper aims to discuss the challenges of embracing ethnomathematical ideas as a theoretical background for the adult education field. This will be done by presenting two examples of incorporating ethnomathematical ideas to mathematics education, specifically in young and adult education contexts, in Rio de Janeiro's public school system. Firstly, we will reflect on the collective writing process of the document that became part of Rio de Janeiro's municipal district basic nucleo-curriculum, intended for Mathematics teachers involved with adult education, that had ethnomathematics as its theoretical and methodological background. Secondly, this paper will discuss the results of a case study which investigated a middle school maths teacher's practice from an ethnomathematical perspective when teaching a group of students from young and adult education. Finally, we will conclude that both experiences led us to continue investigating the contributions of ethnomathematical ideas to the field of adult education as a significant theoretical approach to any educational context that constantly deals with cultural diversity and/or many sorts of social exclusion.

Introduction

Discussing the challenges of embracing ethnomathematical ideas as a theoretical background to the field of adult education is the aim of this paper. This will be done by presenting two examples of incorporating ethnomathematical ideas into mathematics education, specifically in youth and adult education contexts, in Rio de Janeiro's public school system. Both were implemented by the author, together with other research partners, and have been presented separately on previous occasions (Fantinato & Vianna, 2006; Fantinato, 2008).

After a short literature review, focusing on how ethnomathematics can contribute to the field of adult education, we will reflect on the collective writing process of the document that became part of Rio de Janeiro's municipal district basic nucleo-curriculum (*Multieducação*), intended for Mathematics teachers involved in adult education, which had ethnomathematics as its theoretical and methodological background.

Next this paper will discuss the results of a case study which investigated a middle school maths teacher's practice from an ethnomathematical perspective when teaching a group of students from youth and adult education.

Finally, we will conclude that both experiences led us to continue investigating the contributions of ethnomathematical ideas to the field of adult education as a

significant theoretical approach to any educational context that constantly deals with cultural diversity and/or many kinds of social exclusion.

Ethnomathematics contributing to Youth and Adult Education

Ethnomathematics, as a branch in research and study within Mathematics Education (D´Ambrosio, 1997), has made valuable theoretical contributions to the understanding of the various ways of mathematical reasoning which different socio-cultural groups can develop. "Ethnomathematics may be defined as the cultural anthropology of mathematics and mathematics education" (Gerdes, 1997, p.332).

D´Ambrosio (2001) has pointed out an "educational dimension" for ethnomathematics. However, relations between ethnomathematics and the educational field have not been without conflict, as ethomatemathics welcomes multiple forms of quantitative and spatial representation of the world, and this concept clashes with the idea of a single, universal mathematics offered by the schools' homogenized curriculum. As a result, there are only very few practical indications towards an ethnomathematical pedagogical program (Santos, 2004). Working from an ethnomathematical perspective means to deal with contradictions between the homogenous academic mathematics and the diverse mathematical knowledge and skills present in the classroom.

Some studies have already approached teachers' education potentials from an ethnomathematical perspective (Domite, 2009; Monteiro, Orey & Domite, 2004). Teachers' education, under this perspective, should not merely take into consideration the didactic aspects of the student-teacher relationship nor adhere to the "technical reasoning model" (Fiorentini & Nacarato, 2005, p. 8), it should rest on the concept that students can only develop their potential when their cultural identity is acknowledged. Consequently, teacher education should place cultural diversity at the core of its awareness (Monteiro, Orey & Domite, 2004). This way it motivates teachers to throw themselves into students' ways of reasoning, into legitimating their knowledge built in different contexts and into the construction of pedagogical strategies which deal with learning processes that happen both inside and outside the school walls (Domite, 2004). Teacher education from an ethnomathematical perspective also "emphasizes the connection between mathematics and other areas" (Katsap & Silverman, 2008, p. 92).

Domite (2009) refers to the challenges a continuing education rooted in ethnomathematics can bring:

> It's expected that the educator develops his/her work from the reading of the indigenous teachers' world, the knowledge they bring in, the experienced know-how, and then, choose, together, the subjects and approaches to best meet their needs and support a critical and liberating education to their people. (Domite, 2009, p.187)

Continuing teachers' education, based on an ethnomathematics perspective, is a dialogical and continuous process of reflection on practice, and it should very much take into consideration not only teachers' experiences, but also their theoretical and practical knowledge and their principles (Monteiro, Orey & Domite, 2004). These authors also highlight the teacher's needs to improve his/her sense of solidarity and ethical commitment towards the community they work for.

Youth and adult education has been of growing interest to ethnomathematics researchers, due to the fruitfulness of both fields. The ethnomathematical perspective analyzes social and political determinants that make mathematical knowledge of underprivileged groups, such as young and adult students, *invisible* in our society (Fasheh, 1991) and takes into consideration the implicit power relations that place interlocutors in unbalanced positions from the start (Knijink, 2006). Research in ethnomathematics, specifically that aimed at investigating the mathematical knowledge and skills of young and adult learners, also have to deal with the challenge represented by the academic environment itself: it does not stimulate the students individual knowledge, it had rashly excluded them from its surroundings and had consequently undermined their self-esteem as learners (Fantinato, 2004).

In the youth and adult educational context, richness and culturally complex dymanics are found among the different and diverse types of knowledge. In previous research (Fantinato, 2003), it was observed that young and adult students used different calculation procedures to confirm a result. For example, only informal procedures were used for the confirmation of a mathematical result, because any other procedure, such as one of the academic type, could not guarantee the required accuracy. These peculiar systems of reasoning are barely noticed by outsiders as they are of an invisible character. They coexist with others and are considered, by these young/adult students, as more suitable to the educational environment in general, as these practices result from past or present experiences in educational surroundings. They are what Fonseca (2001) has named “reminisces of schooling mathematics”.

In the classroom, the mathematics teacher stands for the official mathematics image. This person holds a knowledge considered *superior* to students daily knowledge due to its privileged social position in our society. This uneven *status* position interferes in the relationships between different types of knowledge present in the classroom's cultural dynamics. However, when voicing students’ knowledge and skills, the dialogic attitude of the teacher entails an awareness of the mythical status of *his* mathematics and the depreciation of *other* mathematics as an effort to reverse this difference. Therefore, the area of ethnomathematics has a lot to contribute to the development of a sensitive approach towards the knowledge of the *other*. The two examples from adult education presented in this article faced the challenges inherent in pursuing this same goal.

Ethnomathematics and curriculum guidelines for Youth and Adult Education (EJA)

The Youth and Adult Education (EJA) Program of the Rio de Janeiro Municipal Board of Education (*PEJA/SME-RJ*) assists a significant number of students aged 14 and over who were excluded from school for many different reasons. This adult education system is marked by heterogenity of the population it backs, with differences in gender, color, geographic origin, religion, family constitution, parents schooling and different insertions and non-insertions into the labor market, which makes the creation of an educational policy that could address the different characteristics and expectations of these students challenging.

Trying to face the challenges imposed by this kind of work with socio-cultural diversity in schools, starting in 2002 the Youth and Adult Educational Program of the Municipal Board of Education has been constructing teacher education policies aimed

at youth and adult educators. This has been achieved by means of several complementary actions that contribute to the empowerment of professionals working with this school modality.

The creating texts for *Multieducação*[1] is part of this set of continuous education activities implemented by *PEJA/SME-RJ*. Groups of teachers from *PEJA*, from different areas of knowledge and different teaching levels, were brought together in 2004 and again in 2005 in a collective construction process for papers for the *Cadernos da Multieducação*, in an attempt to bring to these documents the specific expertise of pedagogical work in youth and adult education. The first part of this present article is based on the experience of the process in the group of Mathematics teachers from *PEJA II*.

We were invited, Márcio de A. Vianna and I, to coordinate a group of twelve teachers, in order to collect ideas, concepts and practices present in their talks, so as to bring together theoretical references that could underpin the concept of mathematics education for adult education in Rio de Janeiro. Our work resulted in the development of a theoretical and methodological reference for maths teachers who deal with this schooling mode, which lead to a document to be attached to the Núcleo Curricular Básico *Multieducação,* proposed by Rio de Janeiro's Municipal Education Bureau.

The collective development of this written material happened in five fundamental steps. While starting the process, there was no intention or previous planning to follow these steps, despite having outlined some fundamental questions, such as: "What is the outlook teachers have about working in *PEJA*?" and "Which practical and theoretical questions do teachers point out or which ones are mandatory for mathematics education with young and adult students?".

The first step in constructing the text was *brain storming* which helped participant teachers to raise questions about mathematics education. During this stage, teachers could express their concerns, difficulties and anguish about working with young people and adults.

After the teachers had raised questions about working in *PEJA*, we proposed to contemplate analysis and discussion of theories, tendencies and concepts of education, mainly of mathematics education, in search of a theoretical background for written material. The group acknowledged that ethnomathematics' theoretical and methodological referential was close both to a progressive conception of education and to anxieties they had experienced in their teaching activities in adult education classes. In a way, teachers could identify ethnomathematics with their daily work and with some of the presuppositions initially raised during *brainstorming*.

By the time this stage was finished, this identification could be clearly perceived in the evaluation process with participant teachers, as one teacher's response to our question about the most important themes focused on in the process shows:

> ..in my opinion it was the discussion about ethnomathematics. I believe that it is a Mathematics path not only in adult education, but also in the so called regular

[1] It is the Elementary Core Curriculum, called Multieducação.

> education. All mathematics groups of the municipal education system should face these discussions and the time has come for us to make a difference in *Multieducação*, we are not mainly to point its existence. The moment of crisis we experienced in municipal schools requires a solution and ethnomathematics should be presented as a way out. (T. Luciana)

Based on the previous reflections, along with the teachers, we raised questions we considered necessary for the elaboration of written material. We used *brainstorming* sessions again as a resource, this time grouped according to similar themes: the first one discussing a panoramic approach of work in adult education; the second one discussing and reviewing the teaching of mathematics to youths and adults; the third describing tendencies in mathematics education and explaining the identification of adult education with ethnomathematics; the fourth one discussing the exchange relationship, that is the dialogue that should be held in mathematics classes, claiming contextualization as a relevant teaching strategy; the fifth and last topic bringing up the technological resources available for teachers in their pedagogical action.

The initial texts had a more theoretical tone which pointed to teachers' beliefs based on ideas brought from their day-to-day life and from their classroom experiences. However, they were lacking in teachers' practical experiences, and we realized the texts should be written in an accessible, easy language, full of practical examples taken from teachers' and students' own experiences.

Considering these guidelines, we proposed the teachers should include reports of their experiences and some quotes that would add new dimensions to the way readers see the relationship between theory and practice. An example, which is part of the final document, is a teacher's report on a dialogue with a student, whose name was Cleonice:

> **What does it have to do with Maths?**
>
> During a class on angles, Cleonice, a skillful dressmaker, who could even sew brides' dresses, said:
>
> - Teacher, I should tell you something. I had to quit a dressmaking course because I didn't know how to handle this instrument [She was talking about the protractor].
>
> After the first measurements, Cleonice and the other students, who had never handled a protractor before, watched a video on it and discussed its usages and applications. At the end of the class, she states:
>
> - Now I can tell how foolish it is!!! It was very easy to learn after this single explanation. I could do many of these things using "my eyes". I have been doing it for a while already, but I could hardly tell it was a school thing as well!

This statement clearly shows how several of our students believe their knowledge and skills are not taken into consideration by the school. (Rio de Janeiro, 2007, p.26[2])

The unification process and document planning were achieved as a collective effort through constant reading and re-reading by the whole group. Changes, inclusions and

---

[2] Translation from the original in Portuguese.

exclusions were made according to each participant's observations, and accepted by the majority of the team, working as a community of practice (Wenger, 1998).

When the document reached its final stage, it was submitted for evaluation to ten mathematics teachers from the Rio de Janeiro adult education system, who had been named by the participant teachers. It was also evaluated by academic specialists working with ethnomathematics and/or adult education. The contributions made in the evaluation reports were relevant and contributed significantly to our review for necessary adjustments to the text.

In the next briefing, the ethnomathematics option was made clear in the *Multieducação* document:

> We consider ethnomathematics, along with other socio-cultural approaches, the closest to handling Mathematical Education in PEJA, mainly as its purposes is to bring its students life long experiences into the open, that is, within the four walls of a classroom, discuss and promote a Mathematics *drenched* in reality. (Rio de Janeiro, 2007, p. 17)

Considering the democratic process applied on the development of the document, written by teachers, in a collaborative group-adopted methodology, we felt we had achieved our pre-set goals, legitimating the adoption of ethnomathematics as the main theoretical referential, as well as its contributions as a study and research area for youth and adult education.

We noticed a real political and philosophical consolidation in the group during this work, in the interest of educating teachers on the specific needs of young and adult students, mainly the need for a critical educational stance which aims at encouraging both mathematical and life knowledge students bring to the classroom, and not at silencing them.

This document serves as a referential for a program of continuing education for teachers as well as other continuing education activities, such as the development of didactic materialsfor maths classes for PEJA II, where ethnomathematics also was an important theoretical reference (inspired by the *Multieducação* document and constructed by the same group of teachers).

The maths teacher who became the subject of the case study we will now describe took part in the writing of the document[3] mentioned above.

A study case in young and adult education classroom

This part of the article aims at delivering the results of a study called *Ethnomathematics and EJA teachers´ continuous education: construction of dialogical spaces between varied mathematical knowledge*, which looked into the role of the Mathematics teacher under the ethnomathematics perspective in a youth and adult education classroom[4]. To develop this piece of research further, we are going to

[3] RIO DE JANEIRO. Secretaria Municipal de Educação. *Multieducação*: PEJA II – Matemática. Rio de Janeiro, 2007. (Série A Multieducação na Sala de Aula)

[4] The research counted on the participation of a undergraduate research student, Rosana Kelly dos Santos, supported by CNPq (a Brazilian grant institution).

present the results of a case study based on a math teacher who deals with youth and adult education, who had been taking part in an ongoing teacher development program on the ethnomathematical approach. The choice of this methodology is due to the need to deepen comprehension of the cultural dialogue this teacher sets with his students - young and adult students - about the mathematical knowledge and skills found in these multicultural groups. It is also justified by the distinctiveness of this teacher who has been reviewing his practice on the basis of ethnomathematical studies.

The methodological procedures included interviews, conducted at different stages of the process, with the professionals chosen for this purpose. There were also interviews with some of the students from the selected group, participative observation of the math classes in youth and adult education groups and scrutiny of the logbook notes. We analyzed the teacher's pedagogical support documents, the written documents produced by the students of this teacher throughout the proposed math activities and the group meetings diary.

André Luiz Gils is a math teacher who has nearly twenty years of teaching experience in private and public middle and junior high schools. He is one of the founders of *UFF's Ethnomathematical Group* and he has been actively working in youth and adult education for six years; due to André's specific characteristics, he was chosen to be the subject of the study. His professional path and practice fulfilled the objectives of the exploration. Besides, he also offered unique and specific characteristics suitable for a case study (Stake, 1992).

The chosen group of students were André's and they belonged to the second UP[5] from Block I, in CIEP Anita Malfatti, a municipal school placed in Campo Grande, West Rio de Janeiro. We started the classroom observations during the second half of the year 2005. These classes took place every Monday night. The investigation data on André's pedagogical practice in the classroom were collected by the two researchers and recorded in logbooks. In the school there were also interviews with some students from the selected group, a few minutes before classes started, in the cafeteria or in their classroom.

Considering the teacher's ethnomathematical teaching practice, three aspects stood out: *dialogue disposition*, *ability to establish relations* and *the experience of autonomy*.

Dialogue disposition

An ethnomathematical attitude presupposes a disposition to dialogue, an attitude of respect for differences. The routine in André's classroom is built on a permanent dialogue with his students.

While spurring the group during on his dialogical exposition, André keeps walking around the room, trying to observe the students individual ways of handling questions, asking them to explain their argument. André's pedagogical practice attends some of

[5] UP stands for Progression Unit Groups.

Paulo Freire's (1974) *dialogical* ground characteristics, which he himself refers to as *an opening to the other, modesty, faith* in men and reciprocal *confidence*. His disposition to dialogue has also broadened his ability and capacity to understand his students. In his words:

> The chance to be teaching at EJA[6] is also the chance to learn. There, I learn a lot. I learn to make electrical wiring, the proper usage of paint, I learn how to use plaster, I learn how to make concrete. Things I never imagined I would possibly learn. I was not raised for that but I learned because I wanted to and because I realized these were all knowledges as well.

The teacher's ethnomathematical attitude seems to favor this availability to dialogue with knowledges different from his, not only to legitimize them, but also to learn with them, under the belief that these mathematical alternatives can change the way maths is conceived as well, as Barton (2004) points out. The multicultural mosaic conditions in EJA's classrooms (De Vargas, 2003) seem to contribute to this sort of sensibility of the dialogical teacher for other forms of mathematical representation of the world.

Ability to establish relations

Another characteristic of André's teaching practice is to establish many types of relations. André is always searching for relations between academic and day-to-day knowledge. Sometimes, these relations come from situations spontaneously brought up by the students. At other times, they are part of the didactical strategies used to teach a certain mathematical topic.

One of his students acknowledges the importance of her every day life being a topic in the classroom and points out clearly that the teacher's approach contributes to her mathematical learning process:

> He works.... he works with our every day life, you know. He teaches us maths... asking us to take… packages of beans, rice, to teach fractions. Things which are going to make it easier for us to learn… our learning, which is something from our daily life… then… it makes it easy… and it really does, because when I had to learn it when I was a child, I was twelve or thirteen, I just couldn't learn it, but the way he taught, it was very easy, you know. Get a 5-kilo bag, divide in, in five of one kilo, it was easy for me, you know. Then, I think that his math is related to our life, to our domestic life… it makes things easier.

Another student emphasizes that what makes learning easier does not come from the topics chosen by the teacher, but from his approach linked to concrete situations from their reality, and to the same extent acknowledges a level of autonomy in André due to the way he conducts his class:

> It is not easier to teach this way, he found a way, a technique to make us learn, because we live it. It does make it easier. Yes, it does. It is way easier to learn fractions with beans, rice, sugar because it is my routine. It is easier than learning with numbers alone without an example...

[6] EJA – For Educação de Jovens e Adultos (meaning Young and Adults Education, in Portuguese).

André is always working with an interdisciplinary approach, establishing relations to other areas of knowledge without missing his target, the teaching of mathematics.

Although André's classes are always planned to focus on a certain aspect of maths education, his dialogical procedures, looking for contextualized connections among the different subjects, *bring the mathematical concepts into life* (Monteiro, 2004) and make them comprehensive in their relationship to the varied aspect of students lives. According to Ubiratan D'Ambrosio, "ethnomathematics is rarely detached from other cultural demonstrations, such as art and religion. Ethnomathematics fits within a multicultural and a holistic concept of education" (D´ Ambrosio, 2001, p.44).

Autonomy experience

André is a teacher who exercises his autonomy in the classroom, especially in those groups where he deals with youth and adult education. In his words:

> In youth and adult education, routine is scarce. Each daily situation is new and it is at the same time motivating… they renew themselves, their outlooks are different, the experiences are different, so we always have a goal, we have the topic to teach, but how is it is going to be performed is related to the expectancies they bring day to day, on that specific day. That is, it is not closed, it is not definite.

This exercise of his autonomy seems to be related to the space André gives his students, the chances he gives them to show their own knowledge and skills. It means that, when respecting his students' knowledge and skills, he is also respecting his own as a math teacher.

For this teacher, the experience of autonomy in the classroom implies voicing and giving autonomy to his students. It also involves ignoring the compartmentalization of school subjects in order to broaden the limits of academic math, in a constant exercise of creativity.

Challenges of the ethnomathematical approach in adult education

Ethnomathematics, as a research area aimed at representing/perceiving/shaping spatial and qualitative relations from diverse cultures offers a theoretical base to understand the many ways different socio-cultural groups make sense of their mathematical knowledge.

Most student who belong to youth and adult education classes have cultural roots which have been socially, economically and culturally marginalized. The ethnomathematical proposal not only acknowledges these experiences, but also allows a new perspective on the student as one who can develop mathematical knowledge. Therefore, it stimulates the *cultural dignity retrieval*, which is related to the "political dimension" (D'Ambrosio, 2001) of ethnomathematics. This is one of the most meaningful contributions to the research in ethnomathematics towards pedagogical practices for young and adult students.

The first part of this paper presented an attempt to use ethnomathematics as a significant theoretical background on which to base curriculum guidelines for a group of people characterized by their cultural diversity and by their experience of

exclusion. A close connection with the ethnomathematical approach has been clearly observed by the teachers who took part in this process.

We noticed a real political and philosophical consolidation in the group during this work, in the interest of educating teachers on the specific needs of young and adult students, mainly the need for a critical educational stance which aims at encouraging both mathematical and life knowledge students bring to the classroom, and not at silencing them.

The second part presented the results of a case study of a maths teacher who works from an ethnomathematical perspective, analyzing his role as mediator among the different types of knowledge present in the youth and adults education classroom. It also highlighted the characteristics of an ethnomathematical practice (Santos, 2004): openness to dialogue, the ability to establish multiple relations and to exercise of autonomy.

An ethnomathematical perspective, according to many writers, engages the process of knowledge legitimazation for specific groups, in a way that makes *invisible* and *frozen* knowledge visible, especially when working with groups either in situations of social exclusion or subordination to social, cultural and economical capital (Knijnik, 1996). In other words, an ethnomathematical perspective engages the process of *knowledge legitimacy*. The results of this research show that ethnomathematical attitudes in the classroom set up a *dual carriageway* validation. That is, while giving a voice to students and their knowledge, André's schooling knowledge (Tardif, 2002) is being legitimated as well. This hypothesis is substantiated when he talks about ethnomathematics and its influence on his pedagogical practice:

> Maybe I already had a tendency towards an ethnomathematics attitude but I just didn't know it was named that. So, in fact, ethnomathematics didn't show me a new perspective, it wasn't that. It just helped me to *support what I already had in mind* (…) (my own practice) has changed because today I am far more aware of it.

A continuous educational process, based on an ethnomathematical outlook among teachers, can give these professionals enough support to perform their mediator roles in classrooms where diverse mathematical knowledges are present.

The ideas developed in this article aim at developing the relationship between ethnomathematics and education in terms of teachers' pedagogical practice and teacher development programs, focusing on the case of youth and adult education. However, they do not mean to propose ethnomathematics as the solution to all maths teaching/learning problems, whether in youth and adult education or in regular education. Ethnomathematics is mostly a tendency in maths education which teachers, who have been open to students' cultural diversity, will identify themselves with. It may contribute the education of maths teachers who work with culturally diverse groups, as it favors the practice of a dialogical, inclusive and autonomous teaching practice.

References

Barton, B. (2004) Dando sentido à etnomatemática: etnomatemática fazendo sentido. In: J. P. M. Ribeiro, M.C.S. Domite, & R. Ferreira, (Eds.) *Etnomatemática: papel, valor e significado* (pp.39-74). São Paulo: Zouk.

Domite, M. C. (2004) Da compreensão sobre formação de professores e professoras numa perspectiva etnomatemática. In: G. Knijnik, F. Wanderer & C. J. Oliveira (Eds.) *Etnomatemática: currículo e formação de professores* (pp. 419-431) Santa Cruz do Sul: EDUNISC.

Domite, M. C. (2009) Perspectivas e desafios da formação do professor indígena: O formador externo a cultura no centro das atenções. In: M.C.C.B. Fantinato (Ed.), *Etnomatemática: novos desafios teóricos e pedagógicos*. (pp.179-190) Niterói, RJ: Editora da UFF.

D'Ambrosio, U. (1997) Ethnomathematics and its Place in the History and Pedagogy of Mathematics. In: A. B. Powell & M. Frankenstein (Eds). *Ethnomathematics: Challenging Eurocentrism in Mathematics Education* (pp.13-24) Albany: State University of New York Press.

D'Ambrosio, U. (2001) *Etnomatemática: elo entre as tradições e a modernidade*. Coleção Tendências em Educação Matemática. Belo Horizonte: Autêntica Editora.

De Vargas, S. M. (2003) Migração, diversidade cultural e educação de jovens e adultos no Brasil. *Educação e realidade 1*(28), pp.113-131.

Fantinato, M.C.C.B. (2003) *Identidade e sobrevivência no morro de São Carlos*: representações quantitativas e espaciais entre jovens e adultos. São Paulo: Faculdade de Educação da USP, Doctorate thesis.

Fantinato, M. C. C. B. (2004) Contribuições da etnomatemática na educação de jovens e adultos: algumas reflexões iniciais. In: J. P. M. Ribeiro, M.C.S. Domite, & R. Ferreira, (Eds.) *Etnomatemática: papel, valor e significado* (pp. 171-184) São Paulo: Zouk.

Fantinato, M. C. C. B (2008) Teachers' practice under the ethnomathematical perspective: A study case in young and adult education. *Proceedings of the Fifth International Mathematics Education and Society Conference* (pp. 228-236) Lisboa: Centro de Investigação em Educação/Aalborg: Department of Education, Learning and Philosophy.

Fantinato, M. C. C. B. & Vianna, M. A. (2006) Teaching Mathematics to Young and Adults: Ethnomathematics and Teachers´ Continuous Education in Rio de Janeiro. *Third International Conference on Ethnomathematics*. New Zealand: The University of Auckland.

Fasheh, M. (1991) Mathematics in a Social Context: Math within Education as Praxis versus Math within Education as Hegemony. In M. Harris (Ed.) *School, Mathematics and Work* (pp.57-61) London/NewYork/Philadelphia: The Falmer Press.

Fiorentini, D. & Nacarato, A. M. N. (2005) *Cultura, formação e desenvolvimento profissional de professores que ensinam Matemática*. São Paulo: Musa Editora; Campinas: GEPFPM-PRAPEM-FE/UNICAMP.

Fonseca, M. C. F. R. (2001) Lembranças da matemática escolar: a constituição dos alunos da EJA como sujeitos da aprendizagem. *Educação e Pesquisa*. São Paulo: Revista da Faculdade de Educação da USP. v. 27, n. 2, pp. 339-354.

Freire, P. (1974) *Pedagogia do Oprimido*. Rio de Janeiro: Paz e Terra.

Gerdes, P. (1997) Survey of Current Work on Ethnomathematics. In: A. B. Powell & M. Frankenstein (Eds). *Ethnomathematics: Challenging Eurocentrism in Mathematics Education* (pp.331-371) Albany: State University of New York Press.

Katsap, A. & Silverman, F. R. (2008) A case study of the role of ethnomathematics among teacher education students from highly diverse cultural backgrounds. *The Journal of Mathematics and Culture*. V 3 (1), pp. 66-102.

Knijnik, G. (1996) *Exclusão e resistência*: educação matemática e legitimidade cultural. Porto Alegre: Artes Médicas.

Knijnik, G. (2006) Cultural differences, adult education and mathematics. *Proceedings of the 13th International Conference of Adults Learning Mathematics* (ALM), pp. 12-24.

Monteiro, A. (2004) A Etnomatemática em cenários de escolarização: alguns elementos de reflexão. In: G. Knijnik, F. Wanderer & C. J. Oliveira (Eds.) *Etnomatemática*: *currículo e formação de professores* (pp. 432-446) Santa Cruz do Sul: EDUNISC.

Monteiro, A. Orey, D. & Domite, M. C. (2004) Etnomatemática: papel, valor e significado. In: J. P. M. Ribeiro, M.C.S. Domite, & R. Ferreira (Eds.), *Etnomatemática: papel, valor e significado*. (pp.13-37) São Paulo: Zouk.

Rio de Janeiro, Secretaria Municipal de Educação (2007) *Multieducação:* PEJA II – Matemática. Rio de Janeiro, 2007.

Santos, B. P. (2004) A etnomatemática e suas possibilidades pedagógicas: algumas indicações. J. P. M. Ribeiro, M.C.S. Domite, & R. Ferreira, (Eds.) *Etnomatemática: papel, valor e significado* (pp. 203-218) São Paulo: Zouk.

Stake, R. E. (1994) Case studies. In: N. K. Denzin & Y. S. Lincoln (Eds) *Handbook of Qualitative Research*. Thousand Oaks, London, New Delhi: Sage Publications.

Tardif, M. (2002) *Saberes docentes e formação profissional*. Petrópolis: Vozes.

Wenger, E.(1998) *Communities of Practice***:** Learning, Meaning and Identity. New York: Cambridge University Press.