Cultural differences, oral mathematics and calculators in a teacher training course of the Brazilian Landless Movement[1]

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Abstract: This paper discusses aspects of a two-year study of a teacher-training course for adult mathematics education organized by a Brazilian landless peoples' social movement. It takes ethnomathematics as a theoretical framework in which cultural differences are central. The paper analyses some of the oral mathematics practices that mark the landless peoples' culture studied. In particular, it discusses a pedagogical process involving the articulation of oral mathematics practices with the use of the calculator, focusing on how pre-service teachers give meaning to their experience and on how cultural differences operated in this setting.

1. Introduction

This paper presents and discusses some elements of a two-year study of a teacher training course for adult education organized by the Brazilian Landless Movement (Movimento Sem Terra)[2]. The main purpose of the paper, is to examine cultural processes involving oral mathematics and its articulations with the use of a calculator. The paper also examines some repercussions for the peasant pre-service teachers[3] who experienced a pedagogical practice which implemented such articulations between oral mathematics and the use of a calculator. Taking as a theoretical framework the ethnomathematics field with the centrality it gives to cultural differences, the study aims to contribute to the debate produced by diverse research approaches in mathematics education as regards oral mathematics. The paper is organized in six sections. Following this introduction, the second section presents a summary of the literature on oral mathematics, situating in this landscape the theoretical approach used in this paper. Here the meanings given to notions such as ethnomathematics, culture and cultural differences are discussed. The third section discusses methodological procedures of the study. The convergences between the methodological perspective and the theoretical framework are highlighted. The fourth section presents and analyzes some of the oral mathematics practices that mark the landless culture studied. Cultural differences which produce and are produced by peasants' oral mathematics practices are presented. The fifth section analyses a pedagogical process involving the articulation of oral mathematics practices with the use of the calculator. It focuses on how the students gave meaning to that experience and how cultural differences operated in that setting. The paper ends with remarks on some of the curriculum implications of the study.

2. Cultural differences and oral mathematics[4]

There is a vast amount of literature concerning what has been called "oral mathematics". In such literature, it can be said that oral mathematics is understood as the mathematics practices that are produced and transmitted orally, not including written strategies. It covers research in the field of psychology with repercussions for education. These studies can be thought of as constituted by two main branches. The first investigates mental calculation skills, analyzed independently from their cultural dimensions, as, for instance, the works of Reys et al. (1999), Thompson (2000) and Irons (2001)[5]. The second branch analyzes oral mathematics at the interface of cognitive psychology and anthropology. The main initial references of these studies are the works of Gay and Cole (1967), Scribner (1984) and Resnick (1983), which were followed by the studies of Lave (1985) and those of Carraher, Carraher and Schliemann (1987).

The theoretical framework developed by these studies influenced much of what has been produced in this area. Analyzing the similarities between them, one could say that they consist of comparative analyses of mental calculation skills in different cultural contexts and their relationships with written calculation procedures, usually taught at school. These studies, inspired by Piagetian clinical interviews and also involving observation of the subjects in 'out of school' settings, mainly emphasize numerical strategies. Moreover, as suggested by Evans:

"[the] subject is asked to solve several sets of problems constructed by the researchers. Typically, the first set of problems are familiar from the work context, but are 'beyond' the familiar tasks; later sets of problems require varying 'levels of transfer'; see below. Transfer is measured in terms of correct performance in solving the different types of problems." (Evans 2000, p. 68).

As will be shown later, this methodological approach differs from the one presented in this paper. What is at stake is the understanding that numerical aspects of a social practice are inseparable from the cultural setting itself. Therefore, it does not make sense to apply tasks that lead to comparisons between 'school mathematics' and 'out of school' practices, since the two contexts are different. As Evans comments about the studies mentioned above:

"When they compared the children's *performances* in street contexts with those in school-like testing contexts, the performances on what appeared to be 'the same task' were superior (in terms of correctness) in the street contexts (Carraher et al., 1985). However, talking about 'the same task in different contexts', and seeking to compare cognition and performance across contexts as different as street markets and testing in school settings, would be seen as highly questionable by researchers accepting the 'situatedness' of cognition This is because different contexts could be expected to differ on a number of aspects, such as the setting, the social relations at play, etc. That is, 'like is *not* being compared with like'. This criticism clearly applies to the production of what I call...'the most celebrated finding of the situated cognition programme' by a number of research teams, and not only by Lave." (Evans 2000, p. 65)

In this paper, a different theoretical and methodological perspective is assumed. It emphasizes that the practices of

oral mathematics are studied as part of the cultural practices in which they gain their meaning, i.e., oral mathematics are seen as an artifact constituted by and constituting culture. It is also relevant to stress that culture is not understood as something consolidated, a finished, homogeneous product. On the contrary, culture is seen as a human production, which is not fixed, determined or closed in its meanings once and for all. This way of conceptualizing culture implies it is a conflictive, unstable and tense terrain, undermined by a permanent struggle to impose meanings through power relations.

The study focused on the discussion of how cultural processes involving oral mathematics are produced and their curricular implications for rural adult education. In assuming the centrality of culture to understand oral mathematics, the investigation has as its theoretical framework ethnomathematics. Since it is a broad and heterogeneous field, it is important to clarify the ethnomathematics approach adapted for this study.

First of all, it is worthwhile mentioning that the ethnomathematics approach is aligned with a postmodern perspective, "which rejects a totalized thinking, the illuminist metanarratives, the universal referentials, the transcendencies and essences, that, imploding modern Reason, leave it in the shards of regional rationalities, of particular reasons" (Veiga-Neto 1998, p. 145). It is these "shards of regional rationalities, of particular reasons", such as the peasant mathematics oral practices, that are of concern to ethnomathematics. They constitute its main object of study.

In such a postmodern landscape, ethnomathematics studies the Eurocentric discourses which constitute academic mathematics and school mathematics; it analyzes the effects of truth produced by the discourses of academic mathematics and school mathematics; it discusses issues of difference in mathematics education, considering the centrality of culture and the power relations that institute it; it problematizes the dichotomy between "high" culture and "low" culture in mathematics education (Knijnik 2004).

It also implies considering what has been stressed by authors like Bhabha, who argues:

"If cultural diversity is a category of comparative ethics, aesthetics, or ethnology, cultural difference is a process of signification through which statements *of* culture or *on* culture differentiate, discriminate, and authorize the production of fields of force, reference, applicability, and capacity." (Bhabha 1994, p. 85)

Thus, it is more accurate to use the concept of cultural difference instead of cultural diversity in analyzing oral mathematics practices.[6] These practices will not be considered as a body of "traditional" knowledges that do not re-update their meanings over time, an inert set that is transmitted from generation to generation, as though it were cultural "baggage". The idea that best describes our position is that of "post-tradition":

"The concept "post-tradition" is also meant to inscribe in the master narratives of Tradition and Modernity the contradictions of everyday performances and subaltern life-stories and worldviews. A point will be made to the effect that post-tradition does not summon origin, purity, homogeneity or continuity. Rather, it is a process that is already in the making. Similarly, the task of the post-traditional researcher is not to conceptualize hegemonizing views of history but to document the fractured histories and life-stories of groups and communities as they surface in people's everyday practices." (Graioud 2001, p. 13)

It is from this perspective of "post-tradition" that oral mathematics are examined in this paper, whilst seeking to avoid what Rosaldo (1988) called "imperialist nostalgia". According to Rosaldo (1988), this notion concerns "a particular kind of nostalgia, often found under imperialism, where people mourn the passing of what they themselves have transformed" (p. 69). He states that an imperialist nostalgia "in its attenuated form", refers to a positioning in which a way of life is deliberately changed, and then one regrets that things did not remain as they were before the intervention that produced this change (Rosaldo 1988, p. 70). In the context of this study, avoiding an alignment with this "attenuated position of imperialist nostalgia" means to not regret the disappearance of oral mathematics as a cultural practice that is valued in educational processes, a disappearance in which school is directly involved.

Oral mathematics practices, specifically those connected to the processes involving addition, subtraction, multiplication and division, take on a more significant role, precisely because they are even now still part of the knowledge of a significant number of youths and adults. These oral knowledges, when absent in the curriculum of youth and adult education, produce social effects such as failure at school. These effects are further intensified when they are related to youths and adults in the rural areas. As we have observed in our fieldwork with the Landless Movement, oral mathematics practices are present in the ordinary life of this social movement, where mathematics is necessary to meet the challenges of production and the commercialization of what is produced. The low levels of schooling which did not allow them to be aware of written algorithms require a constant use of oral mathematics, which constitute an important cultural artifact. In the sphere of the projects on adult education, however, there is a sort of "forgetfulness" about this world outside school. In curricular terms, it is useful to investigate the meanings produced by this "forgetfulness", by the dichotomization and antagonism of these two logics. It is also useful to examine the implications for the curriculum that can be deduced from empirical studies such as those performed previously (Knijnik 1999, 2002b). The examination of these implications may lead to a localized and partial achievement of a "curricular justice", which Connell defines as curriculum organization that takes as one of its principles consideration of "the interests of those who are at a disadvantage" (Connell 1995, p. 12).

3. The empirical part of the research

The research domain consisted of a group of peasants who were taking part in a regular teacher training course for adult education, belonging to the Landless Movement in southern Brazil. This course is officially recognized and is one of those implemented by this social movement in order to improve the struggle for agrarian reform. The

course was organized in six stages. Each of them consisted of "School Time", when the students lived in school, and of "Community Time", in which the students performed specific educational tasks in their own communities.

Data were obtained through the development of the following activities:

1) fieldwork at two MST settlements, involving
   a) the observation of oral mathematics practices among adults with little or no schooling;
   b) interviews with peasants from those communities (audiotaped and later transcribed); and
   c) making a video with one of the peasants who is an expert on oral mathematics.
2) 100 hours of Mathematics Education classes with the teacher training course students, including:
   a) analysis of the strategies associated with students' oral mathematics practices;
   b) discussion of the videotape mentioned in item 1c);
   c) advising the students for their first research experience to be developed in Community time, in which interviews with adults on their oral mathematics practices and a written report on the experience were planned.
3) advice and participatory observation of a 7-day literacy and numeracy workshop developed by the students in a settlement, in which they gave classes to landless youths and adults.

This paper focuses on the results obtained in items 1 and 2.

The empirical part of the research was supported by direct observation and taped-recorded interviews with the subjects involved in the research. The activities were followed by fieldnotes, which allowed the research team to take notes related to what was observed, and about their own ideas and feelings during the fieldwork.

In choosing such a methodological approach, inspired by ethnography, it was considered important to take into account questions arising in anthropology, strongly marked by its ties to the colonial period and the "description of the 'Other'". Like many contemporary scholars (e.g. Lather 1992, 2003; Tyler, 1992), Lidchi argues that in our decolonized era, anthropologists:

> "Have had to question how a discipline which has a growing awareness of its own complicity with colonial forces, whose primary research method – fieldwork – was dependent on colonial support, can ring the changes in the wake of decolonization, globalization and cultural revivalism among indigenous people." (Lidchi 1997, p. 200)

It is precisely in this new social and political reconfiguration of the world, called "Empire" by Hardt and Negri (2000), that new perspectives for anthropology and its related fields are raised. They lead us to understand articles like this one as a discourse about "others", as no more than a representation process, in the sense given by Hall, for whom "representation is the production of meaning through language" (Hall 1997, p. 16). We therefore assume that this paper is our own narrative about what we, with our inevitably partial gaze, observed and heard when performing the fieldwork. Moreover, in narrating oral mathematics practices of landless people, we were aware that we were not "discovering" what "was there". The act of the "writing of one culture by another" implies, in fact, "constructing one culture for another. What is being produced therefore is not a reflection of the 'truth' of other cultures but a representation of them" (Lidchi 1997, p. 200). Questions related to representation – what is represented, who represents it, and how they do it – were therefore taken into account within the research (Knijnik 2004). This position tries to avoid the arrogance of those who claim to speak in the name of others and consider their word as the most valuable.

Taking into account these methodological issues, we found that it would be relevant to analyze the students' voices in the mathematics education classes (mentioned in item 2) considering their experiences in that pedagogical process. Such experiences were understood in the sense giving by Larrosa (2002): "experience could be what happens to us. Not what happens, but what happens *to* us" (p. 137). The pedagogical process developed with the students could be thought of as *knowledge of experience* which, for Larrosa, is, first of all finite knowledge connected to the maturity of a particular subject. Secondly, it is a particular, relative, personal knowledge. Thus, nobody can learn from someone else's experience, unless this is somehow revived. Thirdly, it is knowledge that is inseparable from the individual in which it is embodied. It is not outside us, as knowledge considered to be scientific. Finally, the *knowledge of experience* has something to do with the *good life*, understood as the unit of meaning of a full human life, which transcends the futility of moral life. Modern science is suspicious of experience and converts it into an element of method, giving rise to the idea of experiment, i.e., a stage of the safe, foreseeable route that leads to science. Knowledge, from this viewpoint, becomes a progressive accumulation of objective truths that will remain external to the subjects (Larrosa, 2002). In this study, the meaning given to the act of ' having an experience' goes in another direction: "To have an experience means, therefore, to let us be approached within ourselves by what interpellates us, penetrating us and subjecting us to it" (Larrosa 2002, p. 139).

The empirical part of the research attempted to give voice to the students in order that the experiences they had in the mathematics education classes could be taken into account. Even considering the difficulties involved in the process of hearing the others and writing about them, in making the choices of how to represent the students in this paper we tried to exercise our intellectual humility.

4. The peasant's oral mathematics practices

A large number of oral mathematics practices were seen in peasant everyday life, mainly connected to labor activities and to the purchase and sale of products for daily consumption. Written mathematics was not very current in the landless peasant culture studied. Pencil and paper seem to be "foreign" artifacts to their culture. To manage them requires a great effort, as one settler said, "It is easier to deal with a hoe than with a pencil".

Three aspects of oral mathematics practices produced by the landless peasants were especially relevant for this

paper. The first concerns the close ties between oral calculation strategies and the contingencies in which they are situated. Thus, for instance, a peasant explained that, on estimating the total value of what he would spend to purchase inputs for production, he rounded figures "upwards", ignoring the cents, since he did not want "to be shamed and be short of money when time comes to pay". However, if the situation involved the sale of some product, the strategy used was precisely the opposite. In this case, the rounding was done "downwards", because "I did not want to fool myself and think that I would have more [money] than I really had."

What was observed is that, different from the school mathematics that emphazises the uses of written processes and the "forgetfulness" of the context, discussed by Walkerdine (1988), the oral mathematics of the peasant culture is strongly contextualized and involves complex reasoning. This finding is convergent with contemporary studies that show the need to challenge the beliefs that throughout history, groups who had no written practices had a less abstract style of thinking,

As authors such as Denny (1998) have argued, what makes the difference between these two diverse cultures is not abstraction, but the decontextualization process, which is the main style fostered by written culture, as opposed to the contextuality of oral culture.

A second aspect refers to the strategy of adding, based on a decomposition of the values to be orally calculated. This is what happened with one of the students in the workshop given by the students, when faced with a situation in which he had to calculate 148+239. He explained that, "first one separates everything [100+40+8 and 200+30+9] and then adds up first the numbers that are worth more [100+200, 40+30, 8+9]. (…) This is what really counts". This strategy was found among almost all adults who said that they "were good" at mental calculation. Differently from the addition algorithm taught at school, in oral procedures the peasants considered above all the values of each parcel that was involved and how much difference it would make if it were hundreds, tens or units, i.e., they prioritized the values that contributed more significantly to the final result.

This priority also emerged when the numbers involved in the calculation are decimals. It is observed that recurrently, the peasants use decomposition "to make up integers". This strategy was employed by *Dona Nair*, an already retired settler, who, as a child, attended school for only one year, and did not learn to read or write. On explaining the way she uses mental calculation in her daily activities, she referred to a situation in which two products are purchased, one of them costing R$2.70 and the other R$2.90. She said that to find the amount to be spent, she first of all adds up the integers and then the cents, as follows: "2+2 makes 4. I complete the 90 [cents] with 10[cents] of the 70[cents] to make another 1 *real*. So 4+1 completes 5 *reais*, plus the 60[cents], and I have 5 and 60." As those before mentioned, also in situations involving decimals, what is prioritized in the calculation process are integer values that, according to the peasants, are "more relevant" to the final sum, a relevance which is marked by their culture.

A third aspect found in this study concerns the duplication strategy present in the oral multiplications, a process similar to that used in ancient Egypt, as indicated by Gillings (1982) and Peet (1970). *Seu* Nerci, an illiterate landless man, whose interview was filmed and later used as pedagogical material in the mathematics education classes with the students, when multiplying 92 x R$0.32 (corresponding to 92 liters of milk produced and sold at 32 cents of real[7] [R$0.32] a liter), first doubled the value of R$0.32, and obtained R$0.64; then he repeated the "doubling" operation twice, finding the amount of R$2.56 (corresponding to 8 liters). He added to this the value of 2 liters calculated previously, and thus found the value of 10 liters of milk: R$3.20. The next procedure was to successively double the values found, i.e., he obtained the result of 20, 40 and 80 liters. Keeping "in his head" all the values reckoned throughout the process, *Seu* Nerci ended the operation adding to the value of the 80 liters, those corresponding to 10 liters and 2 liters (calculated previously), and thus found the result of 92 x R$0.32.

Seu Nerci never went to school. When he was a child, the closest school to his home was 20 miles away and there was no public transportation in the rural zone where his family lived. Since early childhood, boys and girls were introduced into agricultural labor and no children went to school. He did not use pencil and paper to write down the sums as he multiplied them. When the video was made he suddenly withdrew to another room at the back of his house to perform the multiplication, only reappearing after he had come to the final result. Here other regularities found in this study should be presented. The first concerns the need, explicitly mentioned by the adults, "to concentrate to think". Like *Seu* Nerci, most of the adults observed at mental calculation activities became deeply involved in the act of reckoning, in an attitude of isolation and introspection. But, unlike *Seu* Nerci, many of the literate adults observed usually took notes during their mental calculations. The notes were used as "markers" throughout the process, especially in those involving greater complexity. Pencil and paper were used only to take notes. No written algorithms were observed in this study, even among those peasants who had had access to them during their schooling. One of the hypotheses for this absence was that the peasants were aware of our interest in their oral practices, which led them to avoid the written algorithms in the calculations they performed in front of us. Here the nature of the relationship between researcher and researched may be important.

As discussed in another study (Knijnik 2002c), such a relationship is double-faced. On the one hand, during fieldwork, on doing the interviews, it is the researcher who asks, it is he/she who, basically, "is in charge" of the investigative process and later, on writing, it is he/she who will use as he/she considers appropriate, what the interviewees have said. Such a process mobilizes the unequal relationship that is established between researcher and researched, an unequal relationship from which there is no getting away. But such an unequal relationship is not fixed. As can be indicated by the lack

of pencil and paper in the peasants' interviews shown in this study, an interchanging power play is exercised: it is not always the researcher who is in a privileged position. When in the field, it is the researched who have the knowledge that one seeks to learn, it is they who know what is unknown by the researcher, it is they who, based on their conveniences and on meanings they assign to the research, select what will be made available to the researcher. This is the other side of the researcher-researched relationship, which, in a way, makes the power slide between the subjects involved in the investigative process. There is no way to escape from this interchanging power play, from those power relations that are permanently exercised in a research study in which ethnographic procedures are used. What remains for the researcher is to include analysis of this issue in their texts, as we have sought to do in this article (Knijnik 2002c, p. 5).

In observing the adult oral practices and hearing the comments of the researched, the importance of analyzing oral mathematics from a cultural perspective has been highlighted. It has been shown that these oral mathematics practices are produced by that peasant culture and that they are its producers. As shown in this section, each strategy used by the interviewees was strongly connected with the situation of which it was part. Moreover, we found that there was not only a diversity of oral mathematics strategies but that the meanings given by the subjects to their oral practices are marked by cultural difference.

5. Oral mathematics and the calculator in the teacher training course

The results obtained in the first stage of the research study, which examined the ways landless adults deal with mathematics in everyday life, showed the centrality of oral mathematics for that peasant culture. This conclusion made it possible to challenge the students of the teacher training course to organize processes in adult education that would exclude written algorithms. On excluding them, another pedagogical approach would be experienced, focusing on the articulation of those two artifacts that are part of the peasant culture: oral mathematics and a simple electronic calculator. From the start, it was said to the teachers that the teaching experience component of the course had as its main goal the problematization of this pedagogical approach, with no intention of giving a "final" answer about "what must be done in adult mathematics education". Even considering this important remark, initially there was resistance against the pedagogical experience proposed. Questions were raised by the students: Wouldn't this mean that the opportunity to "develop the capacity of reasoning" was being suppressed, precisely for those who had had less opportunity to study? Wouldn't the students become "addicted" to the calculator? It was necessary to organize and later analyze pedagogical processes focusing on the articulation between oral mathematics and the calculator for a further discussion of these (and other) questions.

The research team judged that it would be important to begin with a pedagogical process involving the students themselves so that they could have an "experience" of such an articulation, understanding it in the sense given by Larrosa (2002). The students' experiences with oral mathematics and its articulation with the calculator were analysed taking as a central theme the cultural differences of that peasant culture.

The starting point of the experience was an activity in which each of the students interviewed one colleague about their own trajectory as a mathematics learner and their experiences in dealing with oral mathematics and the calculator in everyday life. The data obtained through these interviews were discussed in the classroom. They provided evidence that both artifacts are rooted in the students' everyday life, but not all of them practiced the mental calculations easily. Those who had previous experience of teaching adults expressed their need to learn more about oral mathematics since their students usually bring these cultural practices "naturally" to the class and, in order to follow the Landless Pedagogy[8] in which they are involved, it would be "dissonant" to ignore these oral practices in their teaching. Their worries were also extended to the calculator itself. They argued that this cultural artifact can be found in almost all settlements where they worked but most of the members of those communities (and also they themselves) ignore some of its potentials, such as the use of the memory keys. Apparently, for those students who did not yet have teaching experience in adult education, these arguments did not produce much effect, but they, at least formally, accepted to go further in the learning of oral mathematics and of calculator uses. This attitude was not an isolated one. During the two-year project, it was observed that the narratives which were most valued in the classroom were those enunciated by the students who had "the" experience, here understood not in the sense given by Larrosa, mentioned above. "The" experience by itself, i.e. "any" teaching practice, validated the narratives and functioned as a "guarantee" for the arguments, even if what was called "the" experience was not marked by what "happens to them". As part of our analysis, therefore, during the mathematics education classes we discussed with the group what was changed in them by their experience of the pedagogical process.

It was precisely such a discussion which drove the next stage of the work with the students: the analysis of their own oral mathematics practices and others obtained in the fieldwork done previously by the research team. To take them as a curriculum subject in the teacher training course could give the students the opportunity to experience the complexity of the oral reasoning strategies and their potential in bringing to adult mathematics education major mathematics notions usually taught in a de-contextualized way.[9]

Here it is worth mentioning an episode[10] that can show the meaning given by the research team to these processes. We were analyzing the dairy production of a peasant community, when it became necessary to calculate 17% of R$240.00. Different oral strategies arose among the group of students to solve the question. The most usual strategy was first to calculate 10% of 240 (performed immediately through dividing 240 by 10),

obtaining R$24.00. The remaining 7% were decomposed into 5% + 2%. In order to calculate 5% of R$240.00, they divided into half the R$24,00 found previously (taking 5% as half of 10%). As to the 2%, they decomposed it into 1% + 1%, each of them obtained by dividing 240 by 100.

A second strategy was used in the group: 240 was decomposed into 100 + 100 + 40, and the student who had done this explained that he reckoned 17% of each one of the parcels. In the first two, he immediately found R$17.00. As to the R$40.00, he repeated the decomposition operation (40=10+10+10+10), stating that R$1.70 corresponded to each of these sub-parcels.

A third oral strategy was presented by a member of the group. He explained that, instead of working with R$240.00, it was simpler to think initially about R$250.00, since this could be decomposed into 100+100+50. Immediately he stated that, through this decomposition, 17% of R$250.00 corresponded to R$17.00+R$17+R$ 8.50 = R$42.50 (explaining that the latter value is half of one of the previous parcels). At this stage of the process, there were many questions from his classmates, about how he would "discount what he had added". For the student, however, this "was simple". Since he had added R$ 10.00 to the total amount, now he had to take 17% off R$ 10.00, which would be the equivalent to R$ 1.70. Thus, he found the final result of R$ 40.80.

It was only after discussing all these strategies in class that the calculator was used pedagogically in order to check the result. In other situations in which the amounts involved were more complex (with decimals and/or very large amounts), the oral strategies were used to obtain approximations to the precise value. Once these approximations had been obtained, the calculator was used, supported by the previous estimations.

Episodes such as this one have contributed to the problematization of oral mathematics and its articulation with the calculator, as long as the latter is not used in a merely mechanical way. The discussions also point to the constraints of work that does not include preparing and implementing pedagogical activities through which the students may become familiar with the multiple possibilities of dealing with this technology, such as the use of memory keys.

The work with the students also involved the discussion of theoretical issues linked to cultural differences in mathematics education that could qualify the problematization of oral mathematics and its articulations with the calculator. Concepts such as culture and difference, as conceived by the research team's ethnomathematics approach, were emphasized.

Even considering the influence of Freire's thinking in what is called popular education in Latin America (Knijnik; Wanderer; Oliveira 2004), a cultural perspective which also marked the Landless Pedagogy, it was a complex task to go further into the theoretical issues that support the ethnomathematics approach presented in this paper. In the debate, what seemed to be "natural" for other fields of knowledge (such as history, geography, Portuguese) was hard to understand in the case of mathematics. It took a long discussion to deconstruct the idea that what is called mathematics is a particular mathematics ('academic mathematics') which, with its formalism, produces a neutral narrative that aims to be universal – and to see other ways of giving meaning to the world also as mathematics. The research team was aware of the risks of simplifying this rationale, which can lead to the misconception that academic mathematics and popular mathematics are equal from the sociological point of view (Knijnik 2003). This naïve position was carefully avoided in order not to trivialize the ethnomathematics approach. We considered that academic mathematics and its curricular recontextualization, i.e. school mathematics, are socially legitimised. Everyone has the right to acquire such legitimized knowledge. We are not discussing what kind of knowledge (academic or popular) is superior from an epistemological point of view. Rather, what is highlighted here is a sociological perspective.

6. Final words

The two-year research project constituted an experience (in the sense of Larrosa 2002) for those who participated in it. More than seeing the knowledge built as an "objective" one, we considered that its production produced us as subjects, touching our subjectivities and transforming them. In this process, we identified curricular implications for adult mathematics education in rural areas.

The main implication concerns the challenges involved in incorporating the sophisticated mental calculation strategies, which are part of the peasant culture, to the pedagogical processes developed in rural educational projects. Such an incorporation seeks to problematize the politics of dominant knowledge through what Behdad (1993, p. 43) calls "wild" practices that, to him, are generally "in opposition to the system, contesting and anti-disciplinarian". According to Behdad, "the problematics and the politics of post-Colonial conditions require an anti-disciplinarian way of knowledge that will undermine the social, political and economic reasons that underlie the principle of compartmentalization" (Behdad 1993, p. 43). The ethnomathematics perspective which supports this study is aligned with Behad's anti-disciplinary approach but, associated with the need to undermine compartmentalization, it also highlights another dimension of these "wild" practices. This is to problematize the school curriculum invisibility of the cultures of non-hegemonic groups, which include their own ways of dealing mathematically with the world, such as the culturally mediated handling of oral mathematics. Such problematization takes into account the centrality of looking at cultural differences in mathematics education.

A second curricular implication refers to the challenges involved in articulating oral mathematics with another peasant cultural artifact, the calculator. In the south of Brazil, where the research was done, the use of this "new" technology has spread in the Landless Movement camps and settlements, but usually its study is not part of their school practices. Therefore, the possibility of the articulation of oral mathematics and the calculator can also be seen as a "wild" practice, insofar as the ways in

which the groups deal both with their orality and with the technological and cultural artifact were at the center of the pedagogical process, even if it was not limited only to them. Again, as discussed in Knijnik, Wanderer and Oliveira (2004), cultural differences are a key issue in the mathematics curriculum, not just a "starting point" of the pedagogical work.

The research project produced repercussions in the Landless Movement educational perspective (Knijnik, 2003). Similar work was done in other Landless Movement teacher training courses and the results of the research were disseminated in regional and national meetings with in-service landless teachers. Such dissemination, as far as could be controlled by the research team, tried to highlight that what we had in mind was to problematize the oral mathematics and the calculator in adult education. We did not have the intention of giving "prescriptions" for mathematics classes. Nevertheless, sometimes it seemed that we failed to achieve this goal. Maybe the fact of working with a social movement which has, as a peasant said, "historical urgency to give answers also to education" led us to assume a more "positive" and emphatic position about the theme researched. When writing this paper, we realized that possibly, we had forgotten to keep explaining that we considered the study results local, provisional and partial and that our research approach is marked by uncertainty.

Notes

1. A first and condensed version of this paper was presented at ICME-10 –Topic Study Group 6, Copenhagen, Denmark, July 2-11, 2004.
2 Landless Movement – in Portuguese, Movimento Sem Terra (MST) – is a social peasant movement involving about 250,000 families around the country. Struggling for land reform, it puts education as a central issue in order to achieve their goals. In Knijnik (1998, 1999, 2002a, 2003, 2004) issues about the Landless Movement and its work on education, especially in the field of mathematics are discussed.
3.Throughout the paper the peasant pre-service teachers who participated in the research will be called "students"
4. This section presents some of the ideas discussed in Knijnik (2002b).
5. There is a vast production of studies oriented towards this branch, mainly in the United States and Australia, of which only the most significant were mentioned here. Based on this research there are many studies that, from a more "instrumental" perspective, limit themselves to presenting curricular activities involving mental reckoning.
6. In fact, the expression "cultural difference" is redundant, since all differences are culturally constituted. All the same, in this paper it is used, following authors like Bhabha (1994).
7. The *real* is the Brazilian currency. Its plural is *reais.*
8. About Landless Pedagogy, see Knijnik (1999).
9. Other activities were implemented during those 100 hours of mathematics education classes.
10. Even though this episode occurred with another group of landless students, the ideas it brings can show interesting elements for this discussion.

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