# Appropriation of numeracy practices in youth and adult education: values and discourses in confrontation[I]

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## Abstract

This article discusses issues concerning the appropriation of numeracy practices by young and adult students of primary and secondary schools. We consider these social practices that involve mathematical ideas, criteria and representations to be literacy practices, constituted by ways of using written language and informed by the relations that they establish with the values and knowledge of written culture. We analyze the discursive positions taken by subjects in classroom interactions during the correction of a mathematics activity in which students were requested to indicate the order of magnitude of some objects and the expression of their approximate measurements using the decimal metric system. While the school proposal required the production of estimates at the expense of reference in specific situations, students produced responses referenced in contextual situations and tried to be precise. Our analysis suggests that the learning processes of school numeracy practices are not restricted to a technical dimension, and are related to the ways subjects learn the values linked to them. In the educational discursive interplay, students take various positions, which sometimes sympathize with the school's ways of knowing, and sometimes question them. Thus, students act as subjects of learning in several ways of knowing and relating to the world.

## Keywords

Numeracy – Literacy – Appropriation – Learning – Youth and Adult Education.

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# *Apropriação de práticas de numeramento na EJA:* *valores e discursos em disputa*[I]

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**Resumo**

*Este artigo contempla questões da apropriação de práticas de numeramento no contexto escolar por estudantes jovens e adultos da Educação Básica. Consideramos essas práticas sociais que envolvem ideias, critérios e representações matemáticas como práticas de letramento, constituídas por modos de uso da língua escrita e informadas pelas relações que estabelecem com valores e conhecimentos relativos à cultura letrada. No âmbito do estudo aqui apresentado, analisamos as posições discursivas assumidas pelos sujeitos em interações em sala de aula ocorridas durante a correção de uma atividade de matemática em que se solicitava que os alunos indicassem a ordem de grandeza de alguns objetos e a expressão das medidas aproximadas no sistema métrico decimal. Enquanto a proposta escolar requeria a produção de estimativas em detrimento da referência em situações específicas, os estudantes produziram respostas que se apoiam em situações contextuais e buscam a precisão. A análise sugere que os processos de apropriação das práticas de numeramento escolares não se restringem a uma dimensão técnica, estando relacionados às maneiras de os sujeitos se apropriarem dos valores a elas vinculados. No jogo discursivo escolar, alunos e alunas assumem posições diversas, que ora se solidarizam com os modos de conhecer escolares, ora os questionam, colocando-se como sujeitos de aprendizagem, nos diversos modos de conhecer e se relacionar com o mundo.*

**Palavras-chave**

*Numeramento – Letramento – Apropriação – Educação de Pessoas Jovens e Adultas.*

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## Proposition of the problem and methodology

Social situations including the use of reading and writing that occur in a literacy-focused society call for an increasing diversity of knowledge. Specifically, we can highlight mathematical knowledge, for it provides support to most of the social relations that occur within this society, which are as attached to quantitative arguments as it is to written expressions. Therefore, social practices involving quantification, measurement, orientation in space, sorting, and classification—which are referred to as numeracy practices in this article—are part of the uses of the written language. With that in mind, the appropriation of school practices on numeracy was also contemplated within the investigation which was developed here regarding the appropriation of school practices on literacy for young and adult students in elementary education. The reason for doing so, is because we believe that the appropriation of the written culture cannot forego the constitution and/or mobilization of certain numeracy practices,

> not only because mathematical representations appear in written texts, but because the written culture itself which pervades and constitutes such practices is also filled with principles embedded within a same rationality that forges or parameterizes the so-called numeracy practices, and is thus reinforced by them. (FONSECA, 2009, p. 55)

However, it is worth noting that an analysis that associates numeracy practices to written culture, does not disregard the oral practices of numeracy. Even if the written technology is not utilized, such practices become part of a literacy-focused society, in which it is possible to observe the marks of a written culture

> as an idealization to be achieved, as an accessory which one can use or waive, as an intimidation to which one resigns oneself or can resist; as a validation one can submit oneself to or question, as something we respect or cheat, or as something that we worship or disdain (p.55).

Thus, for the analysis of the appropriation of numeracy practices which is addressed in this article, we were able to utilize studies on the processes of appropriation of the literacy practices, especially those that reflect on knowledge, as well as on the values and skills involved in the configuration of the reading and writing practices experienced by youngsters and adults with minimum education. Such is the case with the studies of Marinho (1992), Ribeiro (1999), Galvão (2002), Kalman (2004), Lúcio (2007), and Souza (2008), who reiterate that, upon deciding to begin or return to their academic trajectory, and even if they are illiterate, individuals have built methods to relate to the social demands of literacy, which have been learned throughout several occasions of the cultural lives in which they operate. The perspective that we adopted allows us to think that the same could be said regarding the demands for quantification, measurement, sorting, organization, orientation in space, and other issues associated to mathematical ideas that permeate the many activities of the personal and social lives of students of the Youth and Adult Education (EJA). Similarly, we identified in several other issues of the analysis of the numeracy practices, the possibility of referring to studies about literacy, especially those which are reffered as *New Literacy Studies* (STREET, 2003). These have provided relevant contributions to the discussion over the issues regarding the use of the numeracy practice concept as an analytical tool, providing "in addition to new principles and theoretical assumptions, some key tools for the analysis of the literacy phenomenon" (SOARES, 2004, p. 104).

Thus, the theoretical basis of our research was built based on the confrontation that was established between the analytical possibilities

of the empirical material which has been produced and the studies in the fields of literacy, numeracy, and those of EJA, particularly those of Soares (2003, 2006), Street (2003, 1984), Rojo (2009), Kleiman (1995), Fonseca (2009), Souza (2008), Oliveira (2001), and e Ribeiro (1999). We also resorted to studies that focus on reflecting over the appropriation processes, in connection to the Vygotskian perspective developed by Smolka (2000) and Bakhtinian approach contemplated by Kalman (2009).

The empirical material from which the interactions featured in this article were extracted was produced in a research conducted in a public school, whose educational proposal explicitly stated the intent of creating opportunities for young and adult students to have meaningful experiences in reading and writing. The class that we surveyed was at an intermediate level of elementary school. This academic level would allow us to contemplate the literacy and numeracy practices experienced by students, who, having a certain level of reading and writing technology and some basic mathematical skills, would be invited to develop activities focused on the approach of some more complex skills of literacy (ROJO, 2009), aiming at appropriating socially valued literacy and numeracy practices.

Every night, during one academic semester, we participated in the dynamics of the classroom activities, making audio recordings and taking notes about said dynamics, dialogues held between the teacher and students, and even about the situations in which the students would request assistance from the researcher to perform the task at hand. Throughout the entire study, we sought to "integrate the culture of the individuals being observed to 'see' the 'world' through their perspective" (VIANNA, 2003, p. 26).

From listening to the recordings and reading the field diary, we created narratives of teaching and learning situations involving literacy practices (including those of numeracy), in which students assume discursive positions. In this article, we present an elaborate analysis based on the reflections, resulting from the interactions that occurred in one of the classes that we observed. Such interactions have been highlighted here because, within the verbal interaction games that occurred during those encounters, students indicated different ways of understanding and how they related to school numeracy, mobilizing values, and adopting discourses which were occasionally in agreement and occasionally in confrontation with those who subsidize school practices.

## **School alphabetization, alphabetism, literacy, and numeracy:** mastery of skills and appropriation of practices

The mobilization of concepts of literacy and numeracy practices in the EJA studies indicates the need to further study the appropriation of reading and writing to reach beyond the analysis of individual capabilities of persons with regard to their use (ROJO, 2009). Instead of determining the level of proficiency of individuals regarding certain literacy or numeracy skills, these theoretical models seek to understand the uses of reading, writing, and mathematical relations in their socio-cultural dimension, indicated by the contextual contingencies and relations of power. Considering that we sought to understand how students participate in social practices—in this case, the school activities – which involve the use of written language and mathematics, we mobilized the concept of literacy practices – among which we included those relating to numeracy – as being plural, social, and culturally determined reading and writing practices, in which the specific meanings that are adopted by the social group depend on the context and institutions, in which they are practiced (KLEIMAN, 1995).

It is worth remembering that this analytical perspective is referred to by Street (1984) as an *ideological model of literacy,* and that, according to the author, opposes the

*autonomous model of literacy* which postulates a single type of use of writing (and we could add, of mathematics) as being universal, disregarding the context in which it was produced. According to Kleiman (1995, p. 28), in this model,

> the literacy practice focused is that which leads to the production of an essay type text (i.e., expository and/or argumentative text) precisely the texts which differ the most from speech, particularly if the pattern of speech is a dialogue.

Among the problems which result from the use of this theoretical perspective is the dichotomy between speech (which is considered to be linked to the communication context and is of an informal nature and seldom planned) and writing (which would be in itself, planned, formal, and autonomous with regards to the social situation and to its world of reference), and the consideration of a direct link between the acquisition of writing (and of school mathematics) and the development of abstract and logical thinking. In contrast, studies based on the *ideological model* indicate that the relations between the two modalities of use of language (oral and written) depend on the social contexts in which they are found. Furthermore, these studies postulate that when the consequences of the use of writing through the autonomous model are presumed as universal and generally beneficial, these are subsequent to a type of literacy (schooling), which emphasizes written work, regardless of the specific social contexts. Thus, this type of literacy not only values knowledge as a whole but also the skill of expressing it. (OLIVEIRA, 2001).

Given the nature and principles of our research, it would be of little help to consider the concepts of literacy and numeracy as restricted to a set of skills which need to be mobilized to meet the needs presented by several social situations. These concepts lead us to directly link the acquisition of these skills to positive consequences, such as "cognitive and economic development, social mobility, professional progress, citizenship," (SOARES, 2006, p. 75). Marcuschi (2001, p. 40) emphasizes that discussing literacy only in terms of skills obscures important aspects of the relations with the written culture, such as

> the ways in which writing is used to measure the adequacy of the individuals communication (whether standard of deviant), the specific roles associated to those who claim the right to appoint what is standard and judge the deviant, and the ways in which the writers adopt standard ways to communicate a message in a persuasive manner.

Therefore, it is important to comprehend the literacy practices as a result of more ample social processes that can "strengthen or question values, traditions, and the ways in which power is distributed within the social contexts" (SOARES, 2006, p.76).

Studies on the social uses of reading, writing, and mathematics by youngsters and adults with minimal education, enable us to perceive the students at EJA as individuals of (other) cultures and (other) knowledge. This is important not only for qualifying the development of the analyses of the impacts of schooling with regards to the literacy and numeracy practices of the individuals but also for subsidizing the investigations that focus on understanding the strategies used by these students to appropriate the school practices of reading, writing, and mathematics which they experience (cf. RIBEIRO, 1999; FONSECA, 2001; CABRAL, 2007; FARIA, 2007).

Therefore, to understand the characteristics of the practices of reading and writing encountered by students within a school context, it was necessary to conceptualize school literacy, alphabetization and alphabetism. These terms can be defined in several ways and with different

intentions by researchers of 'reading and writing', as well as educators, managers, media, and so on. We need to use this concepts in a way which, assisting the understanding of the perspectives adopted by the subjects, would be more beneficial in the operationalization of the analysis of the empirical material.

The studies we have undertaken lead us, therefore, to assume that literacy practices which occur within the school context are specific to that environment and are characterized as being planned, implemented, and selected by educational criteria with predetermined objectives (SOARES, 2003). Thus, it is possible to identify school literacy practices, focused on the learning of reading and writing, that aim at providing students with certain literacy skills that are usually socially valued. These practices are configured in reading and writing activities, which occasionally aim at teaching the concepts and procedures relating to the written registry of the mother tongue and mathematics – alphabetization – and occasionally aim at promoting the learning of more complex skills of reading, writing, and mathematics: alphabetism (ROJO, 2009).

Our interest in understanding the behaviors undertaken by the students and "the social and cultural assumption adopted by them, which determine their interpretation and give meaning to the uses of reading and/or writing in that specific situation" (SOARES, 2006, p.105) surpasses the concern in only identifying the skills involved in the school activities or in assessing whether the students have managed to successfully master the skill. Therefore, in this study, we sought to focus on the socio-cultural dimension found in situations involving appropriation of reading and writing practices within a school context. We focused on discerning the meanings that the individuals assign to such practices. By considering reading and writing practices as social activities, we want to investigate the ways in which individuals adopt them: the particularities of the uses adopted by individuals in several contexts; the purposes of those who use them and the expected and achieved effects; the posture adopted by readers or writers before other readers, and the ideas and meanings that guide the participation of each one, as well as the conception that people share about themselves. (KALMAN, 2009).

To do so, we take on the term "appropriation" according to the theoretical perspective of authors such as Bakhtin (1997, 2000), Smolka (2000), and Kalman (2009), who are based on the common premise that if, in one hand, the relations in which the individuals are in are important factors in explaining their ways of being, relating to others, and knowing, on the other hand, these individuals play an active role in the processes of understanding the world. Appropriation is, therefore, understood as being an active response of the individual to social interaction and not as a mechanical reproduction (SMOLKA, 2000). It is related to the issue of allocating meanings and methods mobilized by the individuals to interpret a social situation, in other words, to learn. Therefore, we believe, as does Bakhtin (1997), that learning implies the appropriation of discourses, a process in which individuals convert the words of others into their own words, opposing the words of the speaker with a contra-word.

Thus, upon analyzing the ways in which students at EJA appropriate the practices of school numeracy, we acknowledged, as Smolka (2000, p. 13), that "to render it yours, to make it your own does not actually mean, nor does it always coincide, with making it adequate to the social expectations." Therefore, we are not interested in judging the extent to which the appropriation of school numeracy practices, by students of EJA, leads them to exhibit expected and socially valued behaviors. We turn to aspects of their relationship with the written culture and school mathematics, expectations regarding schooling, demands, criticism, desires, and proposals for pedagogical actions that impact and become part of the manner in which numeracy practices appropriation are assumed by these subjects.

### *But Márcia, it depends on the door*

The episode which is presented below, and to which we propose the reflection that we wish to contemplate in this article, occurred on the night of May 4th, 2009. In light of an unsatisfactory result on a test on measurement systems, teacher Marcia[1] initiates an activity in which the goal is to work the idea of order of magnitude to create references that would help in the understanding and production of records in the decimal metric system. She, therefore, challenged the students to write the approximate measurements of some objects in their notebooks:

> *Teacher:* Well, let's start the correction, ok? But here is the deal: before we make the corrections, I would like you to open your notebooks and write: letter a. In front of letter a, you will write this: a door of a house. It has the following width...?
> *Student*: What? A door of a house?
> *Elizângela*: But Márcia, it depends on the door.
> *Teacher*: No... it's the standard size. Now... a bee measures approximately... The length of a garage is approximately...
> *Clarice*: All the sizes are standard, right? Because there are people who have one car, two cars...
> *Silvia*: What size car do you want?
> *Teacher*: No... It's a small car, it's not a truck, nor is it a pickup truck. A teacher's car.
> *Silvia*: Width of size?
> *Teacher*: No... The length... What you are referring to as size is the length, ok?
> *Teacher*: A 10 year-old child measures approximately... in height.
> *Elizângela*: Maybe the child is short... Maybe the child is tall.
> *Teacher*: No... It's an average sized child, guys. They are not the tallest nor the shortest. A skinny girl, medium height, weighs approximately how much?
> *Neuza*: That's an easy one.
> *Teacher*: Of course, right? You are the girl I'm talking about. Well, guys, these things are valid for us to get the dimension, right?
> *Neuza* [to a classmate]: Do you think you got many right or many wrong? The majority.
> *Teacher*: Let's see now. A door, guys, the average width.
> *Milton*: Of a house it's 70, of a bathroom it's 60.
> *Teacher*: Well then, this thing here is one centimeter right? Is it more or less the size of a bee? Then we can say that a bee is more or less one centimeter. So, in the case of the door...
> *Clarice*: But Márcia... That one centimeter long bee is too small.
> *Neuza*: Yeah it really is, Márcia.
> *Clarice*: That would be a banana tree bee. But the honey bee would be three centimeters.
> *Teacher*: My Gosh.
> *Clarice*: Yeah...
> *Milton*: Three centimeters?
> *Teacher*: That one is really big isn't it?
> *Adriana*: We are going to have to measure the bee then.
> *Neuza*: This bee of Marcia's is too small.
> *Clarice*: I am going to kill a bee and bring it in.
> *Teacher*: The orange, we would split the orange... Each orange here, would you all agree that it has an average size of an orange. So, we will use this. I cut it ... [draws on board].
> *Neuza*: But Márcia, there are some really big oranges.
> *Teacher*: How much is this going to be... Approximately seven, eight centimeters.
> *Student*: Ten.
> *Teacher*: I said an average sized orange. Ten is too big. Ten would be if it were that type of orange called *bahia*-orange.

**1-** We used the real names of individuals here, who authorized (and even demanded) that their names be used.

> Neuza: There is also the *pêra-rio* orange as well.
> Silvia: There are some really big oranges. Yeah... really big. *Pêra-rio* has some really big ones.

In this interaction, the teacher suggests to the students the exercise of thinking about the order of magnitude of some objects and expressing the approximate measurements within the decimal metric system: "a door of a house. It has the width of...?" However, the students summoned to answer questions on lengths within a context of "mathematics school activity," require greater specifications in the questions to be able to produce the possible "correct answer." "But Márcia, it depends on the door" or "What size car do you want?" To each question raised by the students, the teacher emphasizes that the activity aims at estimating an approximate measurement of the objects, and not determine their measurements within specific contexts: "No..., it is the standard size."; "Now a bee measures approximately...," "The length of a garage is approximately..."

The idea of an activity to theoretically work with the order of magnitude would render specifications expendable, in favor of estimates, because the goal was to provide students with the comfort of working with certain units of measurements and create references which would be used in problem solving situations. Therefore, referencing in a student's everyday situation is, within that context, at the service of (and subjected to) the school numeracy practice. This numeracy practice is informed by a value that permeates it, and in general terms, that permeates the mathematical knowledge that runs in school: that of generalization. It is this generalization that allows and demands the formation of concepts, applicable to specific situations, but which can also de detached from them.

Conceptualization, therefore, actualizes the abstract thinking (VYGOSTSKY, 2005). If this is true for modern science in general, in academic mathematics, we found a prototype model of building knowledge based on abstractions. This way of understanding mathematics decisively permeates the discourse of school mathematics. Bishop (1994, p. 66,) notes that

> we are well aware [...] that mathematics is concerned with abstractions and at school level there is a great deal of effort put into "abstract thought" as it is often called

This willingness to work within the perspective of generalization, however, was not agreed upon in advanced between the teacher and students, perhaps because the teacher assumed it as being implied. Thus, these students unawareness of such intentions, rely on specificity, not only due to its importance in practical situations but also due to its relevance in producing a single (and correct) answer, which to them is considered a value of school mathematics, which they should strive to achieve: "Of the house, it is seventy, of the bathroom, it is sixty."

Throughout the interaction, the students not only take on critical positions with regards to the teacher's proposal but also produce the paradoxes and contradictions that permeate the school's teaching and learning processes. On one hand, the mobilization of several daily practices of measuring, given the announcement of each item in the activity, indicates a discomfort among students with regards to the fact that the suggested task is not concerned in considering the variability of the possibilities presented by the measuring situations with which they are more familiar: when the teacher asks, "A 10 years-old child measures approximately... in height," Elizângela replies "Maybe the child is short... Maybe the child is tall." On the other hand, the enunciation of the specifics involved in other social experiences of measuring is not encouraged by the desire to challenge the school practice. If we consider that the individuals did not understand the purpose of the didactic proposal of working with the order of magnitude, we can acknowledge that

the positions taken on by students indicate, nevertheless, a search to create conditions for producing an accurate result, to the detriment of finding an approximate answer. Indeed the production of a single and exact answer is a valued practice in many activities of school mathematics, and students adhere to this value during this moment.

The idea that success in mathematics is exclusively ensured through the production of single and exact answers echoes throughout another numeracy event that we observed, in which the teacher was correcting division operations with the students, on the board. In this instance, a student Emílio, exclusively concerned with mathematical precision, completely disregards the approximate answer that he had obtained for dividing 402 by 3, despite positively being assessed by the teacher with regards to his performance:

> *Teacher*: So, you place the remainder here. So it's all correct, right? Emílio, it means you do know how to divide, but why did you stop here then?
> *Ana:* It's a puzzle.
> *Emílio*: I don't know how to explain it.
> *Teacher*: But Emílio, you said the result was 132, didn't you? But let me tell you something, isn't 132 and 134 really close to each other?
> *Emílio*: Yes, but if I got it wrong, there is no excuse.
> *Teacher*: Oh Emílio. For God's sake, stop being so dramatic.
> *Emílio:* If I had to take a test, they wouldn't forgive my mistake. So why should I forgive it?

Similar to Emílio's assessment about his own answer to the division of 402 by 3, the judgments expressed by other pupils and Milton about the possible answers to the activity on measurements presented in the first interaction, do not contemplate generalization, instead they focus on other values, also particularly highlighted in the mathematics education: precision and certainty. Even when they refer to non-school situations, what these students of EJA say are filled with words grounded in a conception of teaching and learning of mathematics, in which success occurs when the student finds the exact answer to the problems presented. In this model, the dynamics of lessons should contemplate dealing with a series of exercises, which frequently refer to artificial situations – referred to by Skovsmose (2007, p. 82) as *virtual reality* – which need to be solved based on the assumption that

> all the relevant data to solve the problem are presented accurately; non-relevant information for solving the problem are left aside; it is possible to solve the problem by means of mathematical techniques, which have already been presented and are well defined; and there is one and only one correct solution (SKOVSMOSE, 2007, p.83).

Thus, the students indicate the fragility of a dichotomous treatment with regards to the goals and values related to school and everyday knowledge. Apparently, upon summoning daily experiences, they seek to be loyal to the ideology of certainty, which, in addition to being typical of a school discourse, constitutes a better known environment to them than the field of generalization, and therefore is an attainable path toward conquering inclusion within the discourse promoted by the school. Once they avail themselves of empirical evidence as a procedure which will attest to the accurateness of the answer ("We will have to measure the bee, then," "I am going to kill a bee and bring it in"), Adriana and Clarice, for example, have the intention of showing their main interlocutor – the teacher – that they are aware of the importance of a single answer within the school environment and know how to find it. Similarly, Milton becomes engaged in the discussion regarding the measurement of doors in a house, determining that such a measurement does not

allow for an approximate result, one that can be generalized for all the doors of a house (the standard size), and thus demands that a specific and exact answer be produced: "of the house it's 70, of the bathroom it's 60." On taking on such positions, students aim at ensuring – and succeed – a qualified participation in that teaching and learning situation, as subjects of knowledge who mobilize experiences and judgments within the educational scene.

In addition, the task of generalizing is difficult to be justified for students who, having acquired certain expertise with regards to measurements in everyday and contextualized situations do not see why they should neglect that information when negotiating over the meanings discussed within this interaction. While the teacher is firm in presenting a school reading of the exercise ("The length of a garage is approximately..."), which holds the expectation of a general answer for the question, regardless of specific contexts, the students read this same exercise based on other social experiences; experiences which allow and demand a specific measurement for each situation: "What size car do you want?." These subjects, in addition to questioning the ingenuity of the didactic practice in assuming that everyday experiences would be able to fit into the pedagogical purpose of the question being posed, lead us to suspect about the school belief that "the data presented in an explicit way and the phrasing of the questions would be sufficient for a-single-interpretation of the text within the mathematical problem" (MENDES, 2001, p. 142). The fact is that the teacher trusted in the efficiency of the phrase of the problem to guide the question to what she wanted to address (order of magnitude and expression of measurements in the decimal system). However, we could say, paraphrasing Smolka (2000), that the need to reinforce her intention on several occasions of the interaction ("No... it is the standard size; No... it is an average sized child) indicates that the students were affected by the activity in a different way than what was presumed when the activity was proposed, and that they created ways to provide specific participations, based on values, which in this activity and based on its purpose, would not be relevant.

Faria (2007), on his research about the relationships between mobilized and constituted numeracy practices in the interactions among the subjects of EJA, also notices situations in which students range from proceeding in a sense of adhering to the pedagogical intentions of an activity to seeking to reference their position to daily practices, which are not formatted by the academic script. The author's analysis of the students comments regarding the academic problem[2] which referred them to a daily practice—the purchasing of medicine in the necessary dosage prescribed by the doctor—indicates that the diversity of possibilities presented by the resources effectively mobilized within a social life, such as, pick-up the medicine at the health center, buy chopped meat, not take the last dosage, and so on – weakens the perspective of obtaining a general solution for the proposed school activity.

However, the questions expressed by students, who desire to redirect the intent of the activity, helps us to reflect about the teaching and learning of mathematics in school, and about the importance of identifying the values which are involved in this teaching and learning. Gelsa Knijnik (2006), on analyzing the pedagogical process of a teaching course offered to rural workers of the Landless Movement (Movimento dos Trabalhadores Sem Terra (MST)), where she was also a teacher, tells us about a situation in which the students confronted the methods of land measuring used in settlements in comparison to the method of calculating the area of a land as indicated in the mathematics of the books. The author, instead of addressing the issue with an analysis restricted to the

**2-** Presentation of the academic problem: "The drug Tropinal is sold in boxes with 20 pills. With a prescription of two pills, three times a day, for seven days, how many boxes will you need?" (FARIA, 2007, p. 182).

technical aspects which inform the popular and academic knowledge, provides the student with a reflection about the values, strategies, and conceptions involved in knowledge:

> The popular methods of land measuring needed to be analyzed within the context where they were commonly used, where they had a meaning. There was no space for an aseptic, neutral mathematics, one which was not linked to how it was actually used (KNIJNIK, 2006, p. 76).

By the end of the course, many students concluded that if on one hand, the knowledge acquired within the community was more practical, and in dealing with squared or almost square surfaces produced results which were very similar to those in the mathematics of the books, on the other hand, the methods of the academic mathematics should also be "taught to children and adults, due to the *precision* they produced, when the lands were of greater lengths" (KNIJNIK, 2006, p. 94). Even though, in the interaction analyzed in our research the values being confronted were different – generalization and precision, it is worth highlighting that on mobilizing a political and pedagogical strategy that aims at explicitly rendering the socio-cultural mark of the different ways of performing math, Knijnik enables students to negotiate meanings and understand that both the academic as well as popular mathematics are cultural ways of mathematically knowing and dealing with the world. They not only shape procedures and distinct strategies but also different values – precision and pragmatism, which in this case, support decision making with regards to the procedure to be adopted in measuring land and assessing the results.

The reference to the analysis performed by Knijnik and her students reinforces the argument in favor of the potentiality of the concept of numeracy practices in the pedagogical field as well. That is, if the objective is to understand the knowledge mobilized by students to make sense of the school literacy practices: this theoretical model allows us to acknowledge and consider the socio-cultural dimension of performing mathematics, which results in not being

> conceived as a set of observable behaviors resulting from the mastery of certain skills, and thus can be analyzed as a social practice, marked by contextualized contingencies and by relations of power (FONSECA, 2009, p.53).

Going back to the first episode we presented for analysis, it is worth dwelling upon the discussion generated by the last item of the exercise proposed by the teacher Márcia, which referred to the circumference of the Earth, an item unknown to most students. In the correction of the activity, the teacher asks them to think about how many kilometers it would take to go around the Earth. Contrary to what occurred with the other items, the students refused to take a risk; the teacher then acknowledged the difference in the task being proposed to the student in comparison to the previous tasks:

> *Teacher*: Well, now with regards to Earth, it is really difficult, right guys? Because none of us have that experience. Because everything which is beyond our experience is very complicated. Now can we imagine... Well, so tell me what numbers have you all reached?
> *Neuza*: 400 kilometers.
> *Clarice*: I didn't put anything because I don't have the slightest idea.
> *Teacher*: Who wrote something different? Earth, to travel around the Earth?
> *Clarice*: Gee Márcia, I would imagine it would be millions of kilometers, but I really don't have a clue. None really.
> *Teacher*: She thinks its millions of kilometers.

*Luzia*: I wrote four.
*Teacher*: Four what?
*Luzia*: Million.
*Teacher*: Hey Silvia, what did you write?
*Silvia*: I didn't write anything.
*Teacher*: C'mon guys, why are you so scared of trying? Don't be silly! Nothing is going to happen if you try.
*Clarice*: It won't even hurt.
*Teacher*: You didn't write anything either? Hey Milton, you are an example that I always use.
*Silvia*: You should also give some examples right?
*Students*: [laughter]
*Teacher*: And you?
*Student*: I didn't write anything.
*Student*: I didn't do anything
*Teacher*: See guys. It all becomes very difficult for us to imagine, it gets complicated right?

Despite the specification of the current item having the same structure of the previous items, the teacher acknowledges and admits that this time it would not be possible to refer to the order of magnitude based on student´s experiences: "Well, now with regards to the Earth, it is really difficult, right guys? Because none of us have that experience. Because everything which is beyond our experience is very complicated." If, in the previous situations, the knowledge about the objects being measured sustained the posture of questioning adopted by students, when the task demanded an answer which could not be referenced on experience, most of the students opted in being more cautious in risking a hypothesis: "I didn't put anything because I don't have the slightest idea."

Apparently, if all the items in the activity referred to non-familiar situations, perhaps the objective of identifying the orders of magnitude would become more explicit, for it would be quite a plausible path to solve the task by producing general answers, as could be seen based on student's responses: "I would imagine it would be millions of kilometers." Yet, a didactic proposal based on situations and practices unknown to students could inhibit student's participation, as actually occurred in the last item of the task: "I didn't put anything because I don't have the slightest idea." In this item, the academic situation composed of questions which had not yet been addressed by them, did not favor the creation of a network of meanings (CHARLOT, 2000) based on issues that the adult students could have experienced with regards to the practices of measuring.

In addition, this interaction also indicates the multiple pressures comprised in the situations of teaching and learning mathematics – and other areas of knowledge in school – and reiterates the complexity of the relationship between school and everyday knowledge. Not even the prior acknowledgement that school knowledge consists of values that oppose everyday knowledge nor that everyday knowledge is a prerequisite for the development of school practices, and therefore will assist in the learning process, can be confirmed in the analyzed episode. What this and several other episodes witnessed by us in schools, which we experienced as educators, or we saw narrated in literature, or in school environments indicate, is that the ways in which such knowledge will be configured and related, is conditioned by dialogues that subjects have among themselves – confronting knowledge, intentions, and values, considering the understanding of the previous experiences of the school situation, the meanings which have been created in other social experiences, and the positions they intend, or can assume within the interaction.

## Final Considerations

The episode analyzed here as well as others in which we dug into throughout our investigation, suggest that the processes of appropriation of school numeracy practices are not restricted to a technical dimension, and are in fact also related to the ways in which

the subjects appropriate the values which are linked to them. Bishop (1994), in his study on mathematics in different cultures, highlights *values* as being the determining aspect in the ways individuals relate to the world. He also notes that the teaching of school contents deals, essentially, with the several values associated to knowledge. Bishop mentions Kroeber and Kluckhohn (1952), who state that

> values provide the only basis for the fully intelligible comprehension of culture, because the actual organization of all culture is primarily in terms of their values (p. 340 apud BISHOP, 1994, p. 61).

It is this understanding of how the appropriation of values defines the appropriation of practices of a culture that leads Bishop (1994) to urge educators to seek "a deep understanding of the values of mathematics" to fulfill their roles as "enculturators". The author also warns us with regards to the risk

> to become totally engrossed in the symbolic and manipulative aspects of mathematics through the technique curriculum, and thereby ignore values entirely (BISHOP, 1994, p.61).

Indeed, even if we neglect to reflect about the values addressed when we propose the use of mathematical procedures, concepts, and representations, "we do teach them, unconsciously, implicitly and, of greater concern for education, uncritically"[3] (BISHOP, 1994, p.61, translated by us).

**3-** "[…] we do teach them, unconsciously, implicitly and, of greater concern for education, uncritically."

However, if on one hand it is crucial to perceive that the values are constituents of mobilized numeracy practices not only by the teacher, upon proposing and developing activities of mathematics, but also by the students, when they seek to make sense of the practices of school literacy, on the other hand, it is equally important to highlight that these values are in confrontation in school discursive games, and that subjects do not always assume agreeing opinions.

What we tried to highlight in the interactions we analyzed was that the utterances produced by those men and those women, students and teachers of EJA, "reflect all types of experiences, not only based on content but also based on their dialogical interdependence with other dialogues held prior to theirs" (RAMÍREZ; WERTSCH, 1998, p. 208). Thus, through the decisive mediation of the institution, students at EJA pragmatically alternate the arguments they mobilize and the positions they assume: occasionally sympathizing with the way of knowing proposed by the school—posing as subjects who wish to master this way of using school mathematics and the values associated to it –, and occasionally questioning the school's approach — and pose as subjects who have created another way of using mathematics, composed of other values, conceptions, and a different relation with the world. This discursive activity, that spreads speeches which have been delivered and cultivates future purposes, organizes and justifies current actions: not only does it establish the ways of appropriating literacy practices (among which are those of numeracy), which are found and are reconstituted there, but it also defines those males and females as subjects of learning.

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