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Abstract: This article aims to identify and analyze power relations in the negotiation of meanings in a Community of Practice, called the "Observatório da Educação Matemática" da Bahia (OEM-BA), formed by academics from the university and teachers of Basic Education, who came together to produce educational math curriculum materials. The research carried out was of a qualitative nature and the data were produced through observations of the activities carried out by OEM-BA. To support the analysis, we used Etienne Wenger's Social Theory of Learning and Basil Bernstein's Theory of Codes. By analyzing the data, we identify power relations between academic and non-academic discourses, as well as interdisciplinary and interdisciplinary discourses. This happened when members negotiated meanings relative to teaching and learning content operations with whole numbers and quantities directly and inversely proportional. The results of this research gave visibility to variations in the principles and hierarchies underlying the meeting between academics and scholars.

Keywords: Power relations. Negotiation of meanings. Community of Practice. Mathematics Education.

Introduction

In the area of teacher training, research in Mathematics Education has recognized that the "world" of teachers and the "world" of researchers are distinct and have little dialogue (Fiorentini, 2009; Kieran, Krainer & Shaughnessy, 2013), although both have as one of the converging concerns the teaching and learning of school mathematics. In view of this, researchers from university institutions, in partnership with professors and future professors, have come together in an attempt to break the dichotomy between theory and practice, promote confrontation or reciprocity between different knowledge, and opportune collective reflection (Fiorentini, 2009), aiming to bring these "worlds" closer together and contribute to a mutual appreciation and benefit for both.

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Besides universities, in previous times, the Ministry of Education and its directorates responsible for Teacher Training have shown "concern" with the initial and continuing training of teachers, believing (sometimes) that through training it is possible to face the problems of Education and seek alternatives to improve the quality of teaching and learning in Brazil (Nacarato, 2016). In previous years, the Directorate of Basic Education Teacher Training (DEB), in partnership with the Coordination for the Improvement of Higher Education Personnel (CAPES), presented the main goal of stimulating the appreciation of teaching in Brazil. To that end, DEB created some programs, such as the Institutional Program of Teaching Initiation Grants (PIBID) and the Education Observatory (OBEDUC).

However, in current times, both teacher training and these programs have faced a series of attacks, threats, and cuts articulated by these same official bodies. This is a neglect, as they discredit that universities and these programs have a formative potential and can promote changes in teaching practice, aiming at the quality of education. Currently, PIBID remains active, but has already faced several cuts and threats, which have been confronted by manifestations of university institutions that have resulted in its permanence. On the other hand, OBEDUC was suspended in 2015.

Through PIBID (Rodrigues, 2016) and OBEDUC (Nacarato, 2016), research acknowledges that the support has favored the intensification of formative contexts, since incentive, development, and funding policies help strengthen the partnership between schools and universities, boosting both professional and scientific development. However, these researches recognize that much still needs to be done to stimulate the dialogue between university and school.

Formative contexts have been documented in literature and were created even before these programs existed, but have multiplied after them, which have been called Grupo Colaborativo[3] (Ferreira & Miorim, 2011; Fiorentini, 2012; Gonçalves Júnior, Cristovão & Lima, 2014; Santana, 2015, among others) and, theoretically, Comunidade de Prática (Cyrino, 2009; Beline, 2012; Nagy, 2013; Baldini, 2014; Rodrigues, 2016, among others). In general, the Collaborative Group (CG) is characterized by

[3] Or Collaborative Work, for some authors.

voluntary participation, trust, mutual respect, affection, exchange of experience, responsibility towards the group and common objectives. (Fiorentini, 2009; Ferreira & Miorim, 2011). However, Fiorentini (2009) argues that the meeting between academics and students at the GC not only promotes relationships of peace and harmony, but can also be marked by the existence of conflicts, tensions and power relations.

Fiorentini (2009) also signaled that the relationships between academics and students in GC must be democratic, so that leadership is shared among all and not concentrated on a single individual or a specific group of people. In particular, Santana (2015) pointed out that although members try to establish shared leadership, relationships at KM are hierarchical. These studies suggest that collaboration does not entail the inexistence of hierarchies or power relations, but constructive alternatives must be sought to deal with this. The Community of Practice (CoP) is understood as "groups of people who share a concern, a set of problems, or a passion about some topic, and who deepen their knowledge and expertise in this area by interacting in a permanent way" (Wenger, McDermott & Snyder, 2002, p. 4). In this case, relationships are diverse, admitting competitiveness, negotiation, sharing, heterogeneity, conflicts, tensions and power relations (Wenger, 1998).

Unlike the GC, at CoP, leadership may not be shared and may be centered on only one member of the community, among some or vary among them. Cyrino, Garcia, Oliveira and Rocha (2014, p. 19) state that, generally, the trainer "[...] sometimes assumes the role of expert, but not as a result of the role he has to coordinate the work of the community (this is a question of assigning responsibility)". In other words, the CoP assumes the existence of one or more expert(s) who will not be limited to the trainer, but can be assumed by a teacher or a future teacher.

In Garcia (2014), Baldini (2014) and Oliveira (2014), the trainer assumed the role of expert at some (or many) times, in the CoPs investigated, and the other members - teachers and future teachers - also assumed this role, either when some of them were ahead developing or sharing something, or

mobilizing classroom experiences. Therefore, the expert can vary, depending on what and how they are negotiating at the CoP.

Regardless of the differences between GC and CoP, theory and research recognize the existence of power relations and hierarchies in the meeting between members, but have not gone into depth about it. Our interest is to deepen through the identification and analysis of power relations and hierarchies in a CoP. [4]We will also use the Bernstein Code Theory (1990, 2000). Based on this theory, in any pedagogical relationship there are power relations, whether between parents and children, between doctors and patients, between teachers and students, and among others. Power relations establish the isolation that delimits boundaries between categories, which can be exemplified as: subjects, speeches, practices and spaces. It is the isolation that makes any pedagogical relationship hierarchical.

In this article, we use two theoretical perspectives to identify and analyze power relations in the CoP, called Observatório da Educação Matemática da Bahia (OEM-BA). This CoP was linked to the OBEDUC Program, bringing together teachers who teach mathematics in Basic Education, future teachers and researchers/trainers from university institutions, with the intention of producing materials that would enhance the learning of teachers and students.

Communities of Practice and power relations

Social Theory of Learning provides a theoretical framework that attempts to explain how people learn as they participate in Communities of Practice (CoPs) throughout their lives, whether at work, school, or at home (Wenger, 1998). From this perspective, the CoP is a theoretical unit that derives from the combination of the terms community and practice.

For Wenger (1998), community can be characterized as a grouping of people who interact regularly, build relationships, develop a sense of belonging, and learn together. By developing this sense

[4] What motivated us to opt for this configuration, instead of a GC, was the approximation between the context of this research and the characteristics of the CoP. Moreover, in the GC, the use of the term "collaboration" suggests an attempt at homogeneity among members from the moment they give themselves completely and the leadership should be shared by all.

of belonging, people are recognized and recognize others as members of the community. Practice, on the other hand, is seen as social by denoting doing something, acting in relation to something, which gives meaning to what they are doing in a historical and social context (Wenger, 1998). According to the theorist, practice is the cohesion that maintains the existence of the community, for it is from this that the members engage in actions that allow them to build relationships among themselves and a mutual commitment.

Cohesion makes the practice the property of the community, which allows for three dimensions: articulated enterprise, shared repertoire, and mutual commitment. The enterprise is related to objectives, goals, and actions that community members wish to achieve together, but it is not limited to that, as it also refers to the result of a process that is constituted based on collective negotiations, by including instrumental, personal, and interpersonal aspects. According to Wenger (1998, p. 78, our translation), "the enterprise is articulated not because everyone believes in the same things, but because it is collectively negotiated".

The repertoire is a set of shared resources that "[...] includes routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions or conceptions that the community has produced or adopted in the course of its existence" (Wenger, 1998, p. 83, our translation). These resources can be dynamic and heterogeneous, because they will be available for new negotiations and interpretations.

Mutual engagement concerns the involvement of subjects in articulated ventures, causing members to engage in collaboration and interaction with each other. Mutual engagement enables members to be willing to give and receive help, however competent or inexperienced they may be. However, mutual engagement does not presuppose homogeneity, as it does not imply that relationships among members are always harmonious or peaceful and that all participate actively. The relationships built between them can happen in different ways. According to Wenger (1998), the diversity of origin, cultures, and motivations of community members results in conflicts, tensions, and differences of opinion due to experiences in other CoPs. Diversity does not prevent members from engaging, but

allows them to explore differences to broaden the meanings that are negotiated in the community (Garcia, 2014).

In Mathematics Education literature, for example, the Saturday Group (GoS) formed by university scholars and Basic Education teachers who teach mathematics, was analyzed by Fiorentini (2009) as a GoC and a CoP, whose members belong to different "worlds" and therefore have different interests. According to the author, at the GoS there were elementary school teachers, on one hand, interested in understanding how research could help them face the challenges and problems coming from the school, and, on the other hand, there were academics trying to investigate the experiences, challenges and problems of teachers in the schools. Thus, diversity allowed members to get involved in different activities, collaborating with each other and developing themselves professionally.

Beline (2012), Nagy (2013) and Garcia (2014) pointed out that the divergence of interests was also recurrent in the CoPs investigated. This reinforces the existence of diverse relationships when subjects engage in the social practice of a CoP. From this perspective, even in the communities that add subjects with the same professional status there will be diverse relationships.

Diversity in engagement is an important element to stimulate the negotiation of meanings. According to Wenger (1998), living demands a constant process of negotiation of meanings, because "what we do and say can be related to things we have done and said in the past and yet we always produce a new situation, a new experience" (Cyrino & Caldeira, 2011, p. 378). In other words, we negotiate meanings even in the most routine activities of the CoPs, because "the meaning is not in us, nor in the world, but in the dynamic relationship of living in the world" (Wenger, 1998, p. 54, our translation). In this sense, meaning is related to the notion of experience.

The term "negotiation" can be understood as a process that demands an agreement among members, but it is not restricted to that alone, since it refers to exchange, (re)adjustment, consensus or disagreement. This negotiation, too, may suggest a conquest of something that needs attention (Wenger,

1998). Therefore, the negotiation of meanings is a dynamic, historical and contextual process. Moreover, it involves the interaction of two processes, namely: participation and reification.

Participation is broader than a mere engagement in practice, since it goes beyond involvement in certain activities, allowing us to be transformed throughout the trajectory in the communities. Participation is, therefore, "[...] both personal and social. It is a complex process that combines doing, speaking, thinking, feeling and belonging. It involves the whole person, including our bodies, minds, emotions and social relationships" (Wenger, 1998, p. 56, our translation). For the theoretician, participation is not equivalent to collaboration, because CoPs are subject to situations of conflict, power relations, authoritarianism, positive synergy, success, failure and friendship. From this point of view, we can affirm that not every CoP is collaborative or assumes the characteristics of a GC.

Reification, in turn, is the process that shapes the experience, transforming it into something, referring to both the process and the product. For Wenger (1998, p. 60, our translation), "[...] if meaning exists only in its negotiation, then, at the level of meaning, process and product are not distinct, that is, process and product are always mutually implied". As a process, reification includes "[...] making, designing, representing, naming, coding, describing, as well as perceiving, interpreting, using, reusing, decoding and reformulating" (Wenger, 1998, p. 59, our translation). As a product, the reification "freezes" the experience(s), and may not capture the meanings negotiated in practice. In previous studies, we identified the narrative of the class as reifications of CoP OEM-BA (Silva, Prado & Barbosa, 2016). Although they "freeze" the experiences in a material object, they resulted from a process of participation, reification and negotiation of meanings.

From the analysis of the narratives, we conclude that they "[...] have "their own life" when other teachers use them to understand ways of doing or conducting a task, in order to transform them into pedagogical practice. Thus, their meaning is always amplified, providing new meanings to this reification" (Silva, Prado & Barbosa, 2016, p. 105). However, the narrative will become a risk and an object of alienation when teachers understand it as a static freeze or a model to follow.

Reification depends on participation, as well as the opposite. That is, both are complementary and inseparable processes, since they imply each other (Wenger, 1998). The theoretician states that together they drive the commitment of members in the world as producers of meaning. Throughout his theory, Wenger (1998) presented examples to illustrate these concepts. One of the most widely used examples was the case of order processors of a health insurance company in the United States. He pointed out that the relationships between supervisor and processors were marked by hierarchies, and the participation of processors was shaped by the supervisor at different times in the community.

For Wenger (1998), power can shape the way members participate and negotiate, as it is a legitimate resource to limit participation or enable more active participation. The fact that there are hierarchies, having one or more experts, made Wenger (1998) recognize that social relations are sources of power. He based himself on the theories of power, but did not go into depth about it. The studies of Cyrino and Caldeira (2011) show as a result that, in a CoP, the engagement of future teachers exposed power relations, since some members assumed leadership (the role of expert) in the community. The authors concluded that power relations are characterized as an important element of participation and negotiation of meanings in a CoP and deserve further investigation.

No theory can exhaust all aspects when explaining a phenomenon (Johnson & Christensen, 2012). According to Pamplona e Carvalho (2011) and Tursting (2005), Wenger, in his 1998 studies, timidly signaled the existence of power and hierarchies in the CoP by presenting this case of order processors, but, like Cyrino and Caldeira (2011), the authors reinforced the need for further investigations about it.

Pamplona and Carvalho (2011) proposed an approximation of Wenger's (1998) theory with Foucault's theory to analyze the unequal power relations between subjects who participate in the CoP of teachers who teach Statistics and those who teach Mathematics. Based on these theories, the authors argued that Statistical Education is a field of knowledge, but that power is not fully exercised by the

subjects and the relationships between them have not been emancipatory, capable of providing equality among members.

In this article, however, we use Bernstein's theory (1990, 2000), since it provides us with a systematic theoretical framework, allowing us to analyze the boundaries and variations arising from power relations and the nature of hierarchies. It is precisely this variability that differentiates Bernstein from Foucault, although Santos (2003) identified that "the similarity between the two is that the two are concerned with demonstrating how hierarchies and differences are constituted through techniques, procedures, and rules that classify, normalize, and build the different social groups" (p. 45). In other words, they are theories that present similarities, but have particularities that differentiate them.

For Bernstein (2000), power relations assume isolations that delimit borders between categories. In his words, "isolations are intervals, interruptions, displacements that establish categories of similarities and differences" (Bernstein, 1990, p. 25, our translation). These categories are not restricted only to the subject, but can include discourses, institutions and spaces. Isolations can specialize and position different categories, based on a principle that regulates the degree of maintenance of the boundaries between them. This principle is named as classification by Bernstein (2000). When the categories present a clear separation or distance, we say that the classification is strong. When these categories present a blurring or approximation we say that the classification is weak.

From these variations in classification, we can analyze the nature of the hierarchies. When the classification is strong, the hierarchy is explicit. When the classification is weak, the hierarchy is implicit. Moreover, between the extremes of strong and weak classifications it is possible to have gradations. The strong classification can admit variations for stronger or very strong and so on. This also applies to weak classifications. It is also possible to analyze variations from a strong to a weak rating, and vice-versa (Bernstein, 2000). That is, the degree of variation of the classification is changeable, and can also promote changes in hierarchies. The articulation of Wenger (1998) with Bernstein (1990, 2000)

allows us to broaden the view of power relations between categories, their variation and the nature of hierarchies in CoPs.

Prado, Barbosa and Oliveira (2016) analyzed the images represented in the texts of the educational curriculum materials on mathematical modeling, in terms of power relations between discourses and between spaces. In this study, mathematical modeling was understood as an environment that articulates mathematics with situations external to mathematics. Furthermore, the notion of text for Bernstein (2000) is broader than discourse, that is, as any pedagogical, oral, written, visual or expressed representation in posture, in clothing or by a material. Discourse is an oral and/or written representation made by the subject in communicative interactions.

In these materials the power relations between interdisciplinary discourses (relations between the various mathematical contents), between interdisciplinary discourses (relations between different school subjects), between academic and non-academic discourses (relations between institutionalized discourses and everyday discourses), between the spaces of teachers and students and between the spaces of several students (Prado, Barbosa & Oliveira, 2016) were analyzed. The spaces refer to the organization of the class and the resources used in the room by the subjects. The results of this research show that the materials suggest a blurring of the boundaries between the discourses and the spaces, that is, an attempt to weaken the classification. Thus, the authors concluded that the images were flexible as they created and conditioned possibilities for the integration of discourses and space sharing. The materials analyzed were built by a GC that brought together teachers, future teachers and researchers and/or trainers.

In this article, we are interested in analyzing the power relations between discourses in the production of the material, instead of analyzing the power relations that are represented in the material. Power relations will be identified and analyzed in the very communicative context[5]in which academics and schools meet and negotiate meanings in a CoP that is situated in teacher training.

[5] According to Bernstein (1990), it is in the communicative context, through classification, that the distribution of power is conveyed.

In the context of teacher training, the power relations between the subjects, for many years, were marked by a historical tradition, with specialized positions, whose trainers were seen as transmitters and the teachers or future teachers were seen as buyers. In the light of Bernsteinian theory, we can infer that the classification was strong and the hierarchy explicit.

The terms "transmitter" and "acquirer" are used by Bernstein (2000) to differentiate between the one who teaches (transmitter) and the one who learns (acquirer) in the communicative context. Although these terms induce a notion of transmission and reproduction of knowledge, Bernstein (1990)'s use of them does not match these notions, but as subjects who have different social positions or roles that assume isolation and, therefore, hierarchies.

In the negotiation of meanings between academics and scholars (transmitters and acquirers), in CoPs, the positions may not be so demarcated, since they can perspective teaching and learning together. This happens when trainers view teaching and learning from a more dialogical or democratic perspective. In this sense, boundaries tend to be blurred or approximated, resulting in weak classification and implicit hierarchy. In addition, Bernstein (1990) recognized that in teacher training subjects can be seen only as transmitters, that is, all assume this same role.

The notion of expert, by Wenger (1998) and Wenger, McDermott and Snyder (2002), makes it possible to identify member(s) - either transmitter(s) or acquirer(s) - who are fully participating, leading, sharing repertories, negotiating meanings and/or reifying. In this way, the expert can sometimes be the teacher, sometimes the trainer, sometimes the future teacher or a group of subjects.

Context and methodology

The context of this research was the Observatório da Educação Matemática da Bahia (OEM-BA), which gathered future teachers, researchers and/or trainers from the Federal University of Bahia (UFBA) and the State University of Feira de Santana (UEFS), as well as teachers who teach Mathematics in Basic Education, in the region of Salvador and Feira de Santana, cities located in the

Northeast of Brazil, or in other educational institutions. The meeting between these members had been taking place at UFBA since 2011.

The OEM-BA had the purpose of developing materials on Mathematics topics, linked to the descriptors of Brazil Test, for the final years of Elementary School II. These materials are composed of math tasks, planning, class narratives, student records, class videos, analysis and/or comments. According to Remillard (2005), this type of material can be called educational curriculum materials, whose purpose is to present details of the implementation of tasks to support the learning of teachers and students.

To develop the materials, members participated, interacted regularly, shared repertoires, and negotiated ventures and meanings. Taking these characteristics, the OEM-BA is configured as a CoP, whose social practice is the production of educational curricular materials and the center of interest is Mathematics Education, regarding the teaching and learning of Mathematics and professional development.

The meetings in this CoP took place in two ways, called subgroups and group. The subgroups were composed of at least one graduate student or teacher/trainer of Higher Education, one undergraduate student, and one Basic Education teacher. The subgroups had the responsibility to elaborate the task, the planning, the narrative, film the class, analyze the student resolutions, and edit the videos. Already in the group, all members joined with the responsibility to help each other, monitoring and refining the production of materials by the subgroups.

All members of OEM-BA were invited to participate in the research. To formalize this invitation, an informed consent form was given in which they chose fictitious names or their own name in order to identify them in this research. In the extracts from the meetings that we will present in the next section, it appears the speech of the members who participated most negotiating meanings. Among them, there were two researchers/trainers from university institutions: Thales and Jamille. Thales was the coordinator and author of the project that culminated in the formation of OEM-BA. He is an active

professor/trainer in Post-Graduation Programs and a researcher in the area of Mathematics Education. Jamille is a doctor and teacher/trainer.

In the extracts, four teachers who teach Mathematics participated: Nilla, Neuza, Ricardo and Edy. Nilla and Neuza already have a vast experience in Basic Education. Ricardo, on the other hand, is a teacher who has only a few years in teaching, compared to the cited teachers. In addition, Ricardo joined the Master's course when he was participating in OEM-BA. Edy joined OEM-BA as a future teacher, but later became a Basic Education teacher and Master's student. Besides these, the future teacher Vanessa also participated. At the time, she was a UFBA graduation student, but, nowadays, she became a Basic Education teacher and master's student.

In the presentation of the data, we enumerated the lines and announced the social position that the member occupied during the period in which the data were produced, that is, Future Teacher (FPR.), Researcher (PE.) and/or Teacher (PR.). Some subjects had more than one position in that period, because of that, we made abbreviations to identify them: PR. Nilla, PR. Neuza, PR./PE. Ricardo, PR./PE. Edy, PE. Thales, PE. Jamille and FPR. Vanessa.

The method of this research is qualitative, because the objective is to identify and analyze the power relations in the negotiation of meanings between academics and schools in CoP OEM-BA. With this, we will focus the processes with the intention of understanding the data, which will not be analyzed in terms of frequency or quantity (Johnson & Christensen, 2012).

The observation was used as the main procedure of data production, as it made it possible to follow OEM-BA meetings and analyze power relations. This observation was of the participant type (Alves-Mazzotti, 2002), since the researchers participated in the OEM-BA since its origin. Because of this, the field diary was an instrument used to record first impressions and report the power relations. In addition, we used the camcorder to record the meetings.

After gathering the data, we started the selection and transcription to later analyze them. The data analysis was inspired by Bernstein (2000), who proposes a dialectic reflection between the

theoretical and the empirical. In the analysis of the empirical data, the two theories helped us to identify and analyze the power relations between discourses in the negotiation of meanings.

The power relations between speeches in the negotiation of meanings at CoP OEM-BA

In the following we present the negotiation of meanings in the construction of mathematical tasks elaborated by two subgroups, in which we identify and analyze power relations between the following discourses: academic and non-academic; interdisciplinary and interdisciplinary.

Power relations between academic and non-academic discourses

The PR subgroup. Nilla, PR./PE. Ricardo and FPR. Lara elaborated tasks related to the descriptor 18 of Brazil Test, whose mathematical topic corresponded to the calculation of operations with whole numbers. In the meeting, the subgroup built more than one task to present to the group, so that they could decide which would be the best option, as we can notice in the following speech:

> **(1) PR./PE. Ricardo:** We will present the tasks. Why 'as'? Because, in the last meeting, it was suggested to make a single version, mixing addition, subtraction, multiplication and division of whole numbers. But with the idea of investigation, it became complicated to work with both rules, in this case, for addition and subtraction, and for multiplication and division. Then we made a [task] for addition and subtraction, another [task] in this same model for multiplication and division, and another [task] for problem solving, mixing the four, using the idea of profit and loss. [...] In the first task we'll work with whole numbers and find some rules to help us perform addition and subtraction operations with them. There you have... as it was suggested in the group, put some operations already performed so that they observe the regularities. Then we put some sentences and ask them to record their conclusions. [...]

The subgroup dealt with some difficulties to elaborate a task of investigative character, articulating the four operations with whole numbers. Thus, the PR./PE. Ricardo pointed out that they created three tasks. The first task involved the addition and subtraction operations with integer numbers and the second task involved the multiplication and division operations with integer numbers. However, as the group had suggested the creation of only one task, involving the four operations with integers, the subgroup elaborated a third task contemplating all the operations with integers.

The tasks elaborated by the subgroups allowed the teacher to develop different learning environments. The first two tasks dealt only with mathematics, by requiring students to analyze and search for common patterns in the presentation of mathematical sentences. The third task dealt with contextualized problems, which required students to calculate operations with situations involving the Brazilian Monetary System, from the intuitive notions of profit and loss. While the first two tasks dealt with an investigation of mathematics, the third dealt with problem solving based on everyday life.

Regarding the third task, the members of the subgroup found it more difficult to work with some operations with whole numbers, as we can see in the following dialogue:

> **(2) PR./PE. Ricardo:** The concern, in the third task, is when you have two losses, for example. He will know that I can add it up and it's still a loss. That's the problem, but we think we can see what the student thinks about it! [...] And, in the second question, you can work with the comparison of the total for each sector. For example, cereals with dairy products, you can see that cereals are half the total of dairy products with the opposite sign. So it would be to think of dividing a positive number by a negative number, in short... [...]
> **(3) PE. Jamille:** I find this task more complicated, because of the question of multiplication, right? But isn't multiplication going to appear with negative integers?
> **(4) PR./PE. Ricardo**: No. That's the problem! That's right... we had problems, or better, difficulties to contemplate in the questions all the possibilities of operations with negative integers. Less with less, for example, would not have! It would only be contemplated in the systematization of the teacher, at the end of the class.
> **(5) PR. Nilla**: Mainly division and multiplication.

According to the PR./PE. Ricardo (2), the subgroup had problems in dealing with operations when two negative integers appeared, i.e., two losses, but regardless of this, students could understand that adding these numbers will result in a negative integer, i.e., it is still a loss. He also recognized that it was possible to propose a link between the profit and loss situation to work with the negative and positive integer division operation.

Next, PE. Jamille (3) questioned about the multiplication operation with negative integers in this situation. THE PR./PE. Ricardo pointed out that some operations would not be contemplated in the task, but could be approached at the end of the class by the teacher in the systematization. In order, the PR. Nilla pointed out difficulties to approach the operations of multiplication and division between negative integers.

At the meeting, the group members continued to mobilize ideas and experiences in order to choose the task(s):

> **(6) PE. Jamille:** The first ones were cool, but the third one is very difficult and complicated to reach the goal. And this question of multiplication...
> **(7) PE. Thales:** This context [pointing to the third task] is good for algebraic addition. Everyone knows that. For algebraic addition, it's 'potato', it talks about profit and loss... they operate addition and subtraction quietly, but when they come to multiplication, it's like the literature points out...
> **(8) PR./PE. Edy**: I think that from that [concerning the third task] the students know very well! It's so much that when we explain these terms in the classroom, they dominate very well. The difficulties arise when they go to the exercises, as Ricardo mentioned. That's why I think the first and second are more interesting.
> **(9) PR./PE. Ricardo:** In the third task, you have the concern of what we presented here. Because the students can't reach that profit is more and loss is less. If we don't translate in this language, it gets lost. Even so, this generates a leap that we need to escape and that literature suggests!
> **(10) PR. Neuza**: I agree! And this kind of question [third task] exists too much in textbooks, including in the evaluations of the Brazil Race.
> **(11) PR. Nilla:** It's true. And our goal is to win it. The literature says the following: Call it a commercial model. That this commercial model goes well in the classroom, but after you bring to the formal model the students do not know how to associate. So that's what we need to overcome.
> **(12) PE.** Thales: But do you know what I think? What's my hypothesis? The problem isn't the business model, it's the transition of the model.
> **(13) PR./PE. Ricardo**: That's it! [Shaking his head, confirming]
> **(14) PE. Thales**: Because the teacher does not take care of this transition.
> **(15) PR. Nilla**: Will you be a teacher? I think differently.
> **(16) PR./PE. Ricardo**: I don't think it's the teacher who doesn't take care of it, because I did an assignment like that. [...] I worried about working the operations, I don't know if I made it. But there really is a break. In my head, I thought he [the student] forgot what he learned before, but, in fact, this passage is not so simple.
> **(17) PR. Nilla:** I think it fits a task like the first, breaking with this tradition. [...] that Neuza said. [...] working with patterns and regularities, the idea of research, which is a great gain for the Observatory. [...]

After the discussion, the members decided, together, to opt for the first two tasks, involving mathematical investigation with whole number operations.

In the dialogue above, we can note that the members mobilized experiences from other contexts to justify the choice of tasks and reaffirm that tasks involving contextualized issues are problematic to operate with whole numbers. THE EP. Thales (7) pointed out that, as teachers, members know that working with everyday situations involving profit and loss is a guarantee that students will know how to operate with whole numbers.

THE PR./PE. Edy (8) seemed to agree with PE. Thales (7), using other words to state that classroom experiences confirm that students know how to handle operations in contextualized situations.

However, the PR./PE. Edy (8) emphasized that in using these issues, students seem to dominate the terms related to profit and loss, but continue to present difficulties in operating with whole numbers. Thus, he also stated, as did the PE. Jamille (6), that the first tasks are more interesting. Both Thales and Edy mobilized experiences from the teaching exercise and identified factors that contribute to a distance between mathematical discourses and everyday discourses, such as the notion between profit and loss.

Therefore, the PR./PE. Ricardo (9) reaffirmed that the third task will bring problems for students to understand the relationship between profit and loss and the mathematical symbols. For him, if the relation of which profit is equivalent to the positive sign (+) or the addition operation, and loss is equivalent to the negative sign (-) or the subtraction operation, it is possible that students will be able to solve operations with whole numbers, but this can generate a "jump" present in the studies of Mathematics Education. In the previous meeting, with reference to the study of literature, the subgroup pointed out that this leap refers to the abrupt passage of contextualization to understand mathematical rules.

Next, the PR. Neuza and the PR. Nilla agree with what the members pointed out previously. In particular, the PR. Nilla (11) has mobilized the experiences coming from literature to justify the choice of the first tasks. In mobilizing them, he pointed out that the OEM-BA must overcome the problems in the articulation between two models: the model that makes formal mathematics viable and the other that makes commercial situations present in the daily lives of students viable.

THE PE. Thales (12) expressed his opinion, affirming that the problem is not the use of the commercial model, but that the teacher must work with the passage from one model to the other. THE PR. Nilla doubted it in speech (15). The PR/PE. Ricardo agreed with Thales initially, in speech (13), but later disagreed with him, in speech (16), showing that he experienced it and, even so, realized that students did not understand, because the passage from one model to the other is not simple.

Finally, the PR. Nilla suggested that the OEM-BA should break with the tradition of teaching operations with whole numbers through contextualized questions, which are very present in books and math tests, as Neuza (10) pointed out previously.

In short, the extracts show some members engaged in the selection of tasks, with the objective of producing the materials of this CoP. According to Wenger (1998), we are involved in various communities throughout our lives, and when we engage, we develop actions and interpretations by experiencing new experiences. In other words, we negotiate meanings in the journey of these CoPs, while getting involved in both the participation process and the reification process.

In the statements presented, the members negotiated the meanings related to teaching and learning operations with whole numbers. Regarding participation and reification, the members got involved in actions such as talking, talking, thinking, perceiving, interpreting, reusing, agreeing, disagreeing, doubting, as well as socializing and mobilizing ideas and experiences from other communities they participate(ram).

The experiences related to the teaching exercise came from the school context and the ideas related to the research results came from the scientific community (study of literature). These experiences and ideas helped the members to both bring together and separate the following discourses: academic and non-academic.

Inspired by Prado, Oliveira and Barbosa (2016), we are considering academic discourses as those related to science and other fields that permeate academic institutions. These discourses are related to Mathematics, which has a specialized and formal language that includes abstractions, rules and symbols. The non-academic discourses are characterized by an everyday language, whose common sense ideas do not demand a formalization, but are widely used in society. For example, the idea of profit and loss is widely used in everyday life, assuming different interpretations.

We are not disregarding that academic discourses (of Mathematics) were socially constructed, but, based on Bernstein (2000), we recognize that Mathematics has its own language that governs it and

distinguishes it from other sciences and from an everyday and non-formal language. The models, formal and commercial, presented by the PR. Nilla (11), resemble what we are calling academic and non-academic discourses, respectively.

In light of Bernstein's (2000) theory, we infer that, initially, the subgroup elaborated tasks with different characteristics, which resulted in variations in the degrees of maintenance of the boundaries between the discourses. The first two tasks dealt only with a formal mathematical language, from the identification of patterns and regularities. In them, there was no articulation with contextualized situations or a daily language, however, there was a predominance of academic discourses, demarcating them and distancing them from non-academic discourses. This resulted in a strong classification and, consequently, an explicit hierarchy.

On the other hand, the third task dealt with the articulation between the formal language of mathematics and everyday language, through the intuitive notion of profit and loss. In this task, there was an approximation between the boundaries of academic and non-academic discourses, resulting in a weak classification and, consequently, an implicit hierarchy. Therefore, in both cases there was an isolation, but the boundaries between the discourses changed depending on the characteristics of the tasks proposed by the subgroup.

In the negotiation of meanings, the members mobilized experiences and ideas that favored the distance between the academic and non-academic discourses. The experiences and ideas regulated the negotiation of meanings and further demarcated the boundaries between them. Negotiation led to a strong classification and explicit hierarchy as they decided to select the first two tasks in which the use of mathematical terms and concepts predominated. According to the members, this selection allows students to better understand operations with whole numbers.

At the end of the dialogue, we can highlight a moment in which PE. Thales disagreed with the PR. Nilla, making the boundaries between discourses less clear, by pointing out that the problem does not match the use of contextualized tasks (the business model that the PR. Nilla pointed out), but the

way the teacher(s) deals with the passage to formal mathematics. The experiences of the teaching exercise, however, have regulated this negotiation, strengthening again the boundaries between the discourses.

Moreover, we can identify that the PR./PE. Ricardo acted as an expert, leading the discussion, providing moments of negotiation of meanings and allowing members to expand and develop expertise in this area. At the same time, we identified that he acted as a transmitter, having the other members as buyers (as they were invited to analyze the subgroup's proposals) and transmitters (as they legitimized the expert's speeches and decided together to select the first two tasks).

Power relations between interdisciplinary and interdisciplinary discourses

The presentation of the task by another subgroup also triggered discussions, new interpretations and experiences. The subgroup formed by the PR. Neuza, PE. Roberta and FPR. Vanessa opted to work with the following mathematical topic: directly and inversely proportional magnitudes. This topic corresponds to the descriptor 29 of Brazil Test. In a meeting, the subgroup presented to the members its ideas to elaborate the task with this topic, as shown in the following dialogue:

> **(18) PR. Neuza:** So, the idea is to divide the class into groups, right? Take that class to the court. And, on the court, we'll demarcate three distances. We put it this way: Today, we will make an experience that will generate movement, register and observations. Why did we put the experiment? Because he will be measuring, he will really experiment. [...] Choose three different speeds to go from A to D and fill in the tables. [...] Then, at the distance from A to D, we will work at a constant distance and he [the student] will go at different speeds to cover these distances. [Simultaneously, the teacher presents on the slide a table with the columns distance/speed/time]
> **(19) PE. Jamille:** How will you mark this speed?
> **(20) FPR. Vanessa:** So, at the moment of the task, if he has any doubt, then it will... Neuza will suggest that you can walk, you can walk faster and run.
> **(21) PR. Neuza:** Actually, it's three rhythms, isn't it? Past, the slow rhythm. [...] What I want is for him to notice the constant distance, but speed modifies [...] Time changes in relation to speed. He will see that it is inversely proportional. When I increase the speed, time decreases. That's the observation we want him to make. And he will do it for himself. [...] Is that right? In the table, he'll have what? That the distance is constant and the time will change because of the speed. [...]
> **(22) PE. Thales:** But you have to think that the big point is that students won't get a constant speed.
> **(23) PR. Neuza:** That's why we want one student, one only.
> **(24) PE. Thales**: Because, look, if any one of us moves from here to there at the same speed, or rhythm... [...]
> **(25) PR. Neuza:** Will our goal be achieved? Is the time difference going to happen? It's going to happen! No matter the rhythms. It may not have a pattern, proportional, because of this interference.
> **(26) PE. Thales:** Now, won't that make it hard for you? Why is the objective to work with direct and inversely proportional magnitudes?
> **(27) PR. Neuza:** Yes.

> **(28) PE. Thales:** Won't it make it hard to formalize? Precisely because it will. We won't have ideal values.
> **(29) PR. Neuza:** Ideal. But it will have variation. Do you consider that you will have different values of increase and reduction?
> **(30) PE. Thales:** Go. But this doesn't guarantee that they will be in order. A pattern. As it will move the body, the speed, I think it will give results that will make the task difficult.
> **(31) PR. Neuza:** And it will, because they will be different students, with different rhythms.
> **(32) PE. Thales:** It will give differences. [...]

The task of the subgroup, according to the PR. Neuza (18), consisted in conducting a practical experiment with students, in which they would use some quantities involving physics, such as speed, distance and time. To carry out the task, the PR. Neuza (18) pointed out that it was necessary to fix three different distances, so that the students would discover the possible variations between the quantities.

When questioned, by PE. Jamille (19), about how the speed would be registered, the FPR. Vanessa (20) and PR. Neuza (21) suggested to relate speed to actions like walking, accelerating steps to walk faster, or even running, i.e., going through three different rhythms. In addition, the PR. Neuza (21) pointed out that the proposal of the task was to make students understand that as speed increased, time decreased. In this case, they corresponded to inversely proportional magnitudes.

However, in the sequence of lines 22, 24, 26, 28, 30 and 32, the PE. Thales questioned aspects that could make the formalization of mathematics impossible. For him, speed (or rather, rhythms) will not be constant to help find ideal values that provide order and possible patterns. Thus, the task could not make possible the proportionality between the inverse or direct magnitudes.

Initially, the PR. Neuza gave the impression that she disagreed with PE. Thales in lines 23, 25 and 29, when trying to justify that, in each group, a student will register the speed, the time will be different and that there will be variation between the magnitudes, increasing or reducing them. From the moment Thales questioned the aspects of the task, the PR. Neuza (25) began to despise the rhythms and the proportional pattern. After Speech 30 of PE. Thales, the PR. Neuza (31) recognized that the practical experiment would not guarantee proportionality between magnitudes, by admitting that the experiment performed by different students would result in different rhythms as well.

After that meeting, the subgroup decided to elaborate another task to contemplate the mathematical topic, as we can notice in the speech below:

> **(33) PR. Neuza:** [...] So, today, let's study the relations between magnitudes, using our geometric knowledge, build in this mesh three rectangles with heights of the same measurement... The three have to have the same height and bases of different measures. Now, fill in the table and answer the following questions. Then, he will put here, [explains pointing to the table] the fixed height, here, the bases will be different, and the area will be, of course, the product of the base by height.

The task reworked by the subgroup involved other quantities, namely: height, base and area. The relationship between these quantities depended on the confection of rectangles in a grid, the height would be fixed and the other quantities would be investigated. That is, the quantities involving physics were disregarded and other quantities were used on the basis of articulation with content of Geometry.

We can notice that, initially, the subgroup tried to elaborate a task that would approximate Mathematics with other disciplines, in this case, Physics. Like Mathematics, Physics also has a specialized language that tries to explain various phenomena, properties and relationships. The articulation of Mathematics with Physics came from the use of magnitudes that involve Physics to teach directly and inversely proportional magnitudes.

Inspired by Prado, Oliveira and Barbosa (2016), we identified a relationship between interdisciplinary discourses, that is, a relationship between different areas or school subjects. In this initial relationship, the subgroup elaborated a task that approximated the boundaries of Physics with Mathematics, resulting in a weak classification and an implicit hierarchy.

In an attempt to establish the relationship between the interdisciplinary discourses, some members became involved in actions such as talking, talking, thinking, perceiving, interpreting, agreeing, disagreeing and exchanging information or ideas. Based on Wenger (1998), they participated, reified, and negotiated meanings related to teaching and learning of direct and inversely proportional magnitudes.

In the negotiation of meanings, they generated interpretations about the consequences that the teaching of directly and inversely proportional magnitudes can have, if they develop a task that will depend on the experiment with the movement of the students' body. The members recognized that the

imprecision of the values collected through the experiment would make it impossible to achieve the mathematical topic. This caused the members to build a new task. In this task, there was no longer the articulation between Mathematics and Physics, the subgroup decided to concentrate the task on Mathematics. In this way, the degree of maintaining the boundaries between interdisciplinary discourses admitted a variation, resulting in a change in classification from weak to strong, consequently changing the hierarchy from implicit to explicit.

However, this task articulated different contents of the Mathematics discipline. In this case, the variation in the degree of maintenance between the interdisciplinary discourses gave rise to the relationship between the interdisciplinary discourses. According to Prado, Oliveira and Barbosa (2016), interdisciplinary discourses are characterized by the relationship between different mathematical contents. The change between the discourses resulted in different classification principles.

The relationship between the interdisciplinary discourses, in the new task, generated an approximation between different mathematical contents, resulting in a weak classification and converging to an implicit hierarchy. Thus, in this category, we identified different degrees of maintaining boundaries between interdisciplinary discourses and between interdisciplinary discourses.

Finally, we can identify that the PR. Neuza acted as a transmitter when she invited the other members to analyze the proposed task of her subgroup, thus having them not only as buyers, but also as transmitters, as they had the function to legitimize and evaluate, together, the ideas of the subgroup for the proposed task. Initially, the PR. Neuza also acted as an expert, leading the discussion and opportuning the negotiation of meanings. However, the role of the expert varied and the PE. Thales assumed this role, leading the discussion and allowing the other members to expand and develop expertise in this area. This variation happened when the PE. Thales identified limitations in the proposal of the task that would make proportionality between the magnitudes impossible.

Final considerations

This article aimed to identify and analyze the power relations between speeches in the negotiation of meanings at CoP OEM-BA. As results, we identified power relations between academic (mathematical) and non-academic discourses, when members negotiated meanings relative to teaching and learning operations with whole numbers, as well as power relations between interdisciplinary and interdisciplinary discourses, when members negotiated meanings relative to teaching and learning of directly and inversely proportional magnitudes. These power relations were identified in the elaboration of mathematical tasks.

The power relations between the academic and non-academic discourses initially enabled an isolation that fostered a double classification and hierarchies, according to the tasks elaborated by the subgroup. The first two tasks led to a strong classification and explicit hierarchy, since in them there was a distance between formal mathematics and everyday situations. The third task led to a weak classification and implicit hierarchy, since in it there was an approximation between formal mathematics and everyday situations involving notions of profit and loss. In the negotiation of meanings, the members chose the first two tasks, by mobilizing ideas and experiences that favored the distance between formal mathematics and contextualized situations. This distancing made the boundaries between the two discourses sharper, converging to a strong classification and an explicit hierarchy.

The power relations between the interdisciplinary discourses, on the other hand, initially made possible an isolation that fostered a weak classification and an implicit hierarchy, when the subgroup presented a task that allowed the articulation or approximation between Mathematics and Physics. However, in the negotiation of meanings, some members identified limitations that made it impossible to formalize Mathematics in terms of proportionality between direct and inverse magnitudes. This limitation triggered a reformulation of the task by the subgroup.

The negotiation of meanings resulted in a variation in the degree of maintenance of boundaries between interdisciplinary discourses, since the new proposal of the task by the subgroup no longer permeated the articulation between Mathematics and Physics, involving only terms and concepts of

Mathematics itself. Around this, the weak classification and implicit hierarchy varied to a strong classification and explicit hierarchy. This variation also drove the emergence of power relations between interdisciplinary discourses, since the new task involved different mathematical contents. Faced with the approximation of some mathematical contents, we inferred that the classification was weak and the implicit hierarchy. In other words, we also found a double classification and hierarchies, but depending on the relationship between the interdisciplinary or the interdisciplinary discourses.

Based on these results, we concluded that the negotiation of meanings at CoP OEM-BA offered more possibilities of variation of power relations than the educational curriculum materials, since the reified materials freeze the experiences and, consequently, did not show the negotiation process that originated the material. This result suggests that the CoPs have more training potential than the educational curriculum materials investigated by Prado, Oliveira and Barbosa (2016), although the materials investigated are different. In addition, the results of this research gave visibility to variations in the principles and hierarchies underlying the meeting between academics and schools.

Thus, both the strengthening and the weakening in the degree of maintaining the boundaries between the different discourses show a concern of CoP OEM-BA in reflecting that not every contextualized situation or related to other disciplines favor the formalization of Mathematics and student learning.

The results of this article suggest that further research on power relations between discourses, between spaces and between subjects, should be carried out so that they can broaden the horizons of the CoPs, so that the scientific community recognizes that power relations underlie any social relationship and that they need to be dealt with in the context of teacher training in order to strengthen the dialogue between university and school.

References

Alves-Mazzotti, A. J. (2002). O método nas ciências sociais. In: A. J. Alves-Mazzotti & F. Gewandsznajder (Orgs.), *O método nas ciências naturais e sociais:* pesquisa quantitativa e qualitativa (pp. 129-178). São Paulo: Pioneira.

Baldini, L. A. F. (2014). *Elementos de uma Comunidade de Prática que permitem o desenvolvimento profissional de professores e futuros professores de matemática na utilização do Software Geogebra.* Tese de Doutorado em Ensino de Ciências e Educação Matemática. Londrina: Universidade Estadual de Londrina. Retirado em 25 de março, 2015, de: http://bdtd.ibict.br/vufind/Record/UEL_efc5365fc2f32b83bfa4e3b5e7345868.

Beline, W. (2012). *Formação de professores de matemática em comunidades de prática:* um estudo sobre identidades. Tese de Doutorado em Ensino de Ciências e Educação Matemática. Londrina: Universidade Estadual de Londrina. Retirado em 25 de março, 2015, de: http://www.bibliotecadigital.uel.br/document/?code=vtls000171431.

Bernstein, B. (1990). *Class, Codes and Control:* the structuring of pedagogic discourse. London: Routledge.

Bernstein, B. (2000). *Pedagogy, symbolic control and identify:* theory, research, critique. Lanham: Rowman & Littlefield.

Cyrino, M. C. C. T. (2009). Comunidades de prática de professores como espaço de investigação sobre a formação de professores de matemática. In: I. L. Batista & R. F. Salvi (Orgs.), *Pós-graduação em ensino de ciências e educação matemática:* um perfil de pesquisas (pp. 95-110). Londrina: EDUEL.

Cyrino, M. C. C. T., & Caldeira, J. S. (2011). Processos de negociação de significados sobre pensamento algébrico em uma Comunidade de Prática de Formação Inicial de Professores de Matemática. *Revista Investigação em Ensino de Ciências,* 16(3), 373-401.

Cyrino, M. C. C. T., Garcia, T. M. R., Oliveira, L. M. C. P., & Rocha, M. R. (2014). *Formação de professores em Comunidades de Prática:* frações e raciocínio proporcional. Londrina: Universidade Estadual de Londrina.

Ferreira, A., & Miorim, M. (2011). Collaborative work and the professional development of mathematics teachers: analysis of a Brazilian experience. In: N. Bednarz, D. Fiorentini, & R. Huang (Eds.), *International approaches to professional development for mathematics teachers:* explorations of innovative approaches to the professional development of math teachers from around the world (pp. 137-149). Ottawa: University of Ottawa Press.

Fiorentini, D. (2009). Quando acadêmicos da universidade e professores da escola básica constituem uma comunidade de prática reflexiva e investigativa. In D. Fiorentini, E. C. Grando, & R. G. S. Miskulin (Orgs.), *Prática de formação e de pesquisa de professores que ensinam matemática* (pp. 233-255). Campinas: Mercado de Letras.

Fiorentini, D. (2012). A Investigação em Educação Matemática desde a perspectiva acadêmica e profissional: desafios e possibilidades de aproximação. *Cuadernos de Investigación y Formación en Educación Matemática,* 8(11), 61-82.

Garcia, T. M. R. (2014). *Identidade profissional de professores de Matemática em uma Comunidade de Prática.* Tese de Doutorado em Ensino de Ciências e Educação Matemática. Londrina: Universidade Estadual de Londrina. Retirado em 25 de março, 2015, de: http://bdtd.ibict.br/vufind/Record/UEL_065ce08177666d0ab53bae62c1d60c03.

Gonçalves Júnior, M. A., Cristovão, E. M., & Lima, R. C. R. (2014). *Grupos colaborativos e de aprendizagem do professor que ensina matemática:* repensar a formação de professores é preciso! Campinas (SP): FE/UNICAMP. Disponível em: https://docs.google.com/file/d/0BzM7EA04taCJeVczaHFDZ3h4WlU/edit

Johnson, B., & Christensen, L. (2012). *Educational research:* quantitative, qualitative, and mixed approaches. Thousand Oaks: Sage.

Kieran, C., Krainer, K., & Shaughnessy, J. M. (2013). Linking Research to Practice: Teachers as Key Stakeholders in Mathematics Education Research. In M. A. Clements, A. J. Bishop, C. Keitel, J. Kilpatrick & F. K. S. Leung (Eds.), *Third International Handbook of Mathematics Education* (pp. 361-392). New York: Springer.

Nacarato, A. M. (2016). A parceria universidade-escola: utopia ou possibilidade de formação continuada no âmbito das políticas públicas? *Revista Brasileira de Educação,* 21(66), 699-716.

Nagy, M. C. (2013). *Trajetórias de Aprendizagem de professores que ensinam Matemática em uma Comunidade de Prática.* Tese de Doutorado em Ensino de Ciências e Educação Matemática. Londrina: Universidade Estadual de Londrina. Retirado em 25 de março, 2015, de: http://bdtd.ibict.br/vufind/Record/UEL_30e35e04a0247177cebdd72a1c6e83eb.

Oliveira, L. M. C. P. (2014). *Aprendizagens no empreendimento estudo do raciocínio proporcional.* Dissertação de Mestrado em Ensino de Ciências e Educação Matemática. Londrina: Universidade Estadual de Londrina. Retirado em 25 de março, 2015, de: http://bdtd.ibict.br/vufind/Record/UEL_87451d1d1375befa64f6afd7b1473e8d.

Pamplona, A. S., & Carvalho, D. L. (2011). A Educação Estatística e as relações de poder em Comunidades de Prática. *Bolema − Boletim de Educação Matemática,* 24(39), 351-366.

Prado, A. S., Oliveira, A. M., & Barbosa, J. C. (2016). Uma análise sobre a imagem da dimensão estrutural da prática pedagógica em materiais curriculares educativos. *Bolema − Boletim de Educação Matemática,* 30(55), 738-762.

Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research,* 75(2), 211-246.

Rodrigues, M. U. (2016). *Potencialidades do PIBID como espaço formativo para professores de matemática do Brasil.* Tese de Doutorado em Educação Matemática. Rio Claro: Universidade Estadual Paulista. Retirado em 25 de março, 2015, de: https://repositorio.unesp.br/handle/11449/146706?locale-

attribute=pt_BR#:~:text=A%20pesquisa%20mostrou%20que%20o,a%20teoria%20e%20a%20pr%C3%A1tica.

Santana, F. C. M. (2015). *O trabalho colaborativo com professores de matemática e seus conflitos entre/nos textos produzidos por seus participantes.* Tese de Doutorado em Ensino, Filosofia e História das Ciências. Salvador: Universidade Federal da Bahia e Universidade Estadual de Feira de Santana. Retirado em 25 de março, 2015, de: https://ppgefhc.ufba.br/sites/ppgefhc.ufba.br/files/santana_tese_completa.pdf.

Santos, L. L. C. P. (2003). Bernstein e o campo educacional: relevância, influências e incompreensões. *Revista Cadernos de Pesquisa,* n. 120, 15-49.

Silva, L. A., Prado, A. S., & Barbosa, J. C. (2016). Narrativas de aulas de matemática: reificações de comunidades de prática. *Zetetiké,* 24(1), 93-107.

Tusting, K. (2005). Language and power in communities of practice. In D. Barton & K. Tusting (Eds.), *Beyond Communities of Practice:* language, power and social context (pp. 36-54). New York: Cambridge University Press.

Wenger, E. (1998). *Communities of practice:* learning, meaning and identity. New York: Cambridge University Press.

Wenger, E., McDermott, R., & Snyder, W. M. (2002). *Cultivating communities of practice.* Boston: Harvard Business School Press.