



From the singular to the plural: female kindergarten teachers and their learning in Mathematics Education

Do singular ao plural: professoras de infância e suas aprendizagens em Educação Matemática

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Abstract

The object of this study is to analyze experiences of continuing education for preschool teachers in a collaborative work group. This work aims to highlight multiple learnings resulting from the interactions propitiated in the sharing of pedagogical practices. We validate data from an investigation, funded by CNPq, of qualitative nature whose data were obtained from a questionnaire that focused on gathering information about the process experienced. The theoretical framework includes questions about childhood, curriculum, learning to teach, and training in collaborative environments concerning Mathematics Education. Given the results, we can infer that the teachers who participated in the Study and Research Group "Other Views on Mathematics"

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(SROVM)/UFSCar) learned much more than we intended in terms of the possibilities that collaborative practice offers with its potential. The evident learnings involved: a) the relationship between theory and practice; b) the possibility of sharing; c) methodological improvement; and d) the teachers' mathematical knowledge.

Keywords: Collaborative Group; Mathematics Education in Childhood; Childhood Education; Teachers' education.

Resumo

Tomamos como objeto de análise experiências da formação continuada de professoras da Educação Infantil em um grupo de trabalho colaborativo. Destacar múltiplas aprendizagens decorrentes de interações propiciadas no compartilhar das práticas pedagógicas é objetivo deste trabalho. Validamo-nos de dados de uma investigação, financiada pelo CNPq, de cunho qualitativo cujos dados foram obtidos a partir de um questionário que teve o foco de angariar informações do processo vivenciado. O enquadramento teórico abarca questões acerca de notas sobre a infância, currículo, aprendizagem da docência e a formação em ambientes de colaboração em relação à Educação Matemática. Face aos resultados, podemos inferir que as docentes partícipes do Grupo de Estudos e Pesquisas "Outros Olhares para a Matemática" (SROVM/UFSCar) aprenderam muito mais do que pretendíamos em termos das possibilidades que a prática colaborativa perspectiva com seu potencial. As aprendizagens evidentes implicaram em: a) relação teoria e prática; b) possibilidade de partilhas; c) aprimoramento metodológico; e d) conhecimento matemático das professoras.

Palavras-chave: Grupo Colaborativo; Educação Matemática na infância; Educação Infantil; Formação de professores.

Introduction

The surplus of my vision contains in germ the finished form of the other, whose unfolding requires that I complete his horizon without taking away his originality. I must identify with the other and see the world through his value system, just as he sees it; I must put myself in his place, and then, back in my place, complete his horizon with everything that is discovered from the place I occupy, outside of him; I must frame him, create for him an environment that finishes him off, using the surplus of my vision, my knowledge, my desire, and my feeling (Bakhtin, 1992, p. 45).

When we take as a basis the epigraph with Bakhtin's words to open the section that seeks to present this text, we have as a foundation to affirm that there is, in the collaborative environment, the possibility of leaving the singular actions for plural practices (and vice versa) from the other's look to itself, since, in the negotiation of meanings that we attribute to a particular object (in this case Mathematics Education in childhood), many other unique and multiple looks open. In this scope, the dialogical relationship is a presupposition for the sharing and re-signification of experiences that are the object of reflection in collaborative contexts such as the one constituted, approximately a decade ago, by the Study and Research Group "Other Views on Mathematics" (SROVM) of the Federal University of São Carlos (UFSCar).

That said, this article is structured from research, funded by the National Council for Scientific and Technological Development - CNPq from the Universal Edital 01/2016 - which is based on data produced by the movement of singular/plural learning of the participants of the group, which is developed in the context of a curricular activity that integrates Teaching, Research, and Extension. In this space undergraduates in Pedagogy and Mathematics participate by obtaining credits (grade and attendance) and Kindergarten teachers from a municipal network in the interior of São Paulo State receive a 60-hour

certification every semester for their participation since it constitutes an environment of initial and continuing education for teachers. Our goal in SROVM is to produce, recognize and give new meaning to mathematical and methodological knowledge that is fundamental in the education of young children, thus promoting the formation of those involved.

Taking into account that SROVM has been, since 2010, a space for teacher training focused on Mathematics Education in infancy, more specifically for Early Childhood Education, we assume that there are relevant learnings for those who benefit from it as an environment for work, study and projection of collaborative actions.

Given the above, the question to be problematized in the text that follows focuses on understanding, from the reading and categorization of data from a questionnaire answered by teachers of children aged 4 and 5 years: what contributions and learning occur from interactions in a collaborative group of Mathematics Education in infancy in the perspective of redefinition of teaching practice in early childhood education based on the perceptions of participating teachers? To this end, we subdivided the text into sections, which are presented below: a) theoretical assumptions that demarcate the referential of action from the concepts of child, infancy, Early Infancy Education, the conception of curriculum, teaching-learning, the conception of teaching practice in Mathematics Education in infancy, and, contexts of continuing teacher education in collaborative groups; b) methodological outline in which we highlight the context, the qualitative approach of the study, objective and procedures of analysis of the results; c) description and analysis, based on data from the open questionnaire used in data production, in the perspective of bringing to light the characteristics of the questions and the meanings they have to the teachers; and d) final considerations in which we resume the question of the article and highlight the main results.

It is because we understand, in line with the Law of Directives and Bases 9.394/96 (Presidência da República, 1996), that Early Infancy Education is the first stage of Basic Education, as well as for defending the position that experiences with children need to be intentional acts, from the point of view of the possible approaches based on interactions and games that unfold the knowledge about experiences of mathematical nature, we justify the relevance of this study that explores the movement of multiple learnings of a group of teachers who study, with other perspectives, Mathematics in infancy.

Notes on Infancy and Early Childhood Education

Many have been ways of talking about childhood, many are allusions to a term that crosses the entire history of western humanity, and even if we follow the propositions of the French anthropologist Philippe Ariès (1978) for whom the conception of childhood is a modern invention. Based on this author's statements, we could certainly say that the 18th century was also the century that invented the child. That is, the society that previously saw parties, entertainment, and work practices common to adults and children, goes through a process of true segregation of the child and he becomes the subject of care, attention, and

reflection. In this scenario, we see that some habits and attitudes, for example, games and chores, which used to be commonplace and part of 'life' for adults and children, become the object of specific care that aims to train the child for certain purposes generally understood as the best for them and society. It is in this scenario that the school closest to the model we have today appears, and that also, in the context of cultural practices, an idea of school appears, aimed at young children, with characteristics directly linked to caring.

Even considering these issues presented by Ariès (1978), we certainly could not escape the different allusions to the infantile at other times in the history of the West, or in other words, this notion present, since Greek antiquity, whether in Platonic propositions that allow us to think of in-fans as that being deprived of reason, until the current moment in which we verify an idea of 'disappearance of childhood' present in the proposals presented by Postman (1999). We will not stick to a detailed discussion of these considerations, but we believe that works such as Postman (1999), Kohan (2003), Corazza (2004), and Leite (2011) among others present the central considerations for what could both reaffirm the thesis proposed by Ariès (1978) as well as expand its field of reflection and discussion.

It is worth emphasizing that thinking about the concept of childhood, and consequently, its relationship with the child requires us to place it in its relationship with the settlements of its time and the forces that constitute our ways of thinking and acting, which today we understand as necessary practices to work with children, also became to be and conduct our ways of thinking the formative processes not only of the child but also of the adult, specifically the teacher. On the other hand, childhood is presented as a concept that is somehow located in a borderland between several areas of knowledge, such as Philosophy, Politics, Language, Psychology, and Sociology, among others. What seems possible to us to think, without necessarily stating, is that the ways we deal with children are close, and connected to the ways we think of childhood, and also that the conceptions of this phase of life influence our practices, our ways of living and dealing with children. Thus, what we have in hand when we talk about teacher education processes is that they cannot be unaware of the set of forces that present themselves regarding the plural reality of the teacher himself, allied to the multiplicity of ways of being and being with children, as well as a plurality of ways to compose the way of acting and thinking these not simple sets that are the adult, the child, childhood, and Early Childhood Education.

As pointed out earlier, the close relationship we establish between childhood and the child implies the ways we end up marking our practices in educational processes. In this scenario, what we have is that these ways, in general terms, end up proposing and/or creating public policies in the field of Early Childhood Education. Since the creation of the Statute for Children and Adolescents and the Law of Directives and Basis for Brazilian Education (Ldb - Law 9394/96), childhood practices have been shaped by a certain conception of citizenship. This conception gains more and more consistent outlines in later documents such as the National Curricular Guidelines for Early Childhood Education (MEC, 1998). The fact is that, together with these conceptions, the Early Childhood Education teacher has to respond to this

conception of childhood, which often ends up modulating the teaching practices and the educational processes.

In a particular way, teacher education has been presented in many different ways and has had very specific contours in the places where training occurs. What we have verified is that Early Childhood Education, in the training courses, is populated with discourses on *what and how to do with children*, these discourses and these practices often generate *action protocols* that distance teachers from the experience with the Early Childhood Education institution, from its daily life and from its ways of producing meaning for educational practices.

Notes on professional development for early childhood teachers

The teaching profession implies an evolving and continuous professional development process that comprises: i. personal development, i.e., individual growth that incorporates skills, personality, abilities, and interaction with the environment, ii. professionalization, which implies the acquisition of knowledge and skills specific to the exercise of teaching, and iii. professional socialization, i.e., the interactions of the teacher with his/her professional context (Gonçalves, 1992). Professional development has an intentional character since it encompasses systematically planned activities and experiences that aim to promote change and consider the teacher as a subject who learns by engaging in teaching, evaluation, observation, and reflection activities (Vaillant & Marcelo, 2012). Therefore, it also implies a constant attitude of "inquiry, of formulating questions and problems and the search for their solutions" (Vaillant & Marcelo, 2012, p. 169).

Thus, learning to teach is a complex, dynamic and continuous process, incorporates the teacher's personal and professional trajectory, goes through different phases, demands the offer of a diversity of learning formats, and requires support, willingness, time, and mental space, interactions and reflections regarding the teaching activities, the educational context, the educational curriculum among other aspects (Mizukami et al., 2002; Gatti, et al., 2019, among others).

This learning process is marked by the uniqueness of each subject in training who has a history and distinct experiences therefore each teacher can present their formative demands and for each formative experience the subject assigns a different meaning, which may or may not be incorporated into their practice (Gatti, et al., 2019; Mizukami et al., 2002).

However, there are formative needs specific to the teacher, to the level of education in which he or she works, to the particularities of the children, and the context, among other elements, which are independent of the teacher's subjectivity (Lima, 2015). Thus, the training proposals for teaching to work with children must recognize and consider the constitution of Early Childhood Education - its history, public policies, the work of the early childhood teacher, and the characteristics of being a child.

About the specificities of the early childhood teacher already in the early 2000s, Oliveira-Formosinho (2002) conceptualizes the teaching professionalism of these professionals considering the aspects that distinguish them from those who work in other levels of education. According to Oliveira-Formosinho (2002, p. 134-135) this teaching professionalism "concerns the professional and integrated action that the person of the educator develops with children and families based on her knowledge, skills, and feelings, assuming the moral dimension of the profession" and "is located in the world of interaction and develops roles and functions there" (Oliveira-Formosinho, 2002, p. 138). It also involves aspects of being a child such as globality, vulnerability, and dependence on the family/adult. The idea of globality refers to the holistic way in which the child learns and develops - it is not possible to sectorize its learning and development, which requires the teacher to integrate knowledge. Moreover, this child is vulnerable physically, emotionally, and socially; therefore, the emotional/socio-emotional aspect should be one of the privileged aspects of Early Childhood Education (Oliveira-Formosinho, 2002).

For this reason, teaching in Early Childhood Education results in a comprehensive role - compared to teachers at other levels of Basic Education, since it requires physical and psychological care and educational actions in an inseparable way. It also requires intense interaction at different levels with various partners such as classroom assistants, psychologists, social workers, mothers/fathers, community leaders, and volunteers, among others.

Notes on curriculum, pedagogical practice, and continuing education in collaborative contexts

The focus of this research is preschool children, aged 4 to 5 years and 11 months. Authors such as Edwards, Gandini and Forman (1999); Kishimoto (1996); Rossetti-Ferreira and collaborators (2011), and Faria (2005) have been studying and challenging the School Pedagogy with the Pedagogy of Childhood, which considers the specificity of young childhood from categories such as time, space, relationships, gender, social classes, family arrangements, children's cultures, play, documentation, identities, planning by project, experiences, languages, movement, child, otherness, observation and care. Thus, to do Early Childhood Education is not to bring the curriculum of elementary school to the education of young children and also "is not to do nothing with them", or just to care, but it is to make a pedagogy that considers, respects and values childhood (Azevedo, 2012).

We understand that the child has the right to access different languages in Early Childhood Education (Edwards, Gandini & Forman, 1999). The mother tongue, the mathematical language, the expressive language, and the technical language, among other languages and knowledge, need to be present in the Early Childhood Education curriculum and present themselves as formative potentials to the development of the child, from the earliest age. In this understanding, we do not necessarily need to have specific moments to approach mathematical knowledge in Kindergarten, because we understand, like Haddad

(1997), that this phase of life implies recognizing that we are talking about a perspective of human development that does not take place outside a historical, social, political, and economic context, i.e., the child does not live isolated in "little boxes" of knowledge and events. The child explores, observes, acts, and makes decisions in face of what happens around him/her. Therefore, we are dealing with human development, which is significantly closer to the vision of an ecological childhood education proposal (Haddad, 1997).

When referring to Mathematics Education and its approach to the young child, we draw attention to the fact that, developing integrally, it makes no sense to have a "class day", nor to consider this term, because in terms of human development, interactions and play, as specified in the National Curriculum Guidelines for Early Childhood Education (MEC, 2010), are the basis for the constitution of the curriculum in kindergarten and preschool.

In this context, the fundamental axes of a curriculum that incorporates such languages are interactions and play, so we need to ensure different experiences, including providing children with "the exploration and use of mathematical knowledge in the appreciation of the basic characteristics of the concept of number, measure, and shape, as well as the ability to orient themselves in time and space" (Brasil, 2010, p. 16).

Numbers, quantity control, spaces, shapes, magnitudes, measures (Lorenzato, 2006), probability, and statistics (Lopes, 2003) are present through games, play, children's stories, unconventional problem-solving, and class projects. Math language will be present in every routine of Kindergarten. Mathematics can be inserted in the children's universe, because we understand it as a "product of human activity and that it is constituted in the development of problem-solving created in the interactions that produce the human way of living socially in a given time and context" (Moura, 2006, p. 489). Therefore, the child can appropriate mathematics as a social product that involves his life.

From this perspective, we should not demand from children, in the preschool phase, that they systematize calculations from algorithms, but, rather, ensure that they have different experiences that provide opportunities for playful contact with numbers, space, shapes, magnitudes, measures, statistics, and probability, dealing with notions that will arouse curiosity, discovery and learning in a meaningful and constructed way and not just memorized.

A proposal of mathematics work for Early Childhood Education should encourage the exploration of a wide variety of ideas, not only numerical but also those related to geometry, measurements, and notions of statistics, so that children develop and maintain with pleasure a curiosity about mathematics, acquiring different ways of perceiving reality. A proposal of this type incorporates the contexts of the real world, the experiences, and the natural language of the child in the development of mathematical notions, without, however, forgetting that the school should make the student go beyond what he or she seems to know, trying to understand how he or she thinks, what knowledge he or she brings from his or her experience in the world and making interferences in the sense of leading each student to progressively expand his or her mathematical notions (Smole, Diniz & Cândido, 2000, p. 9).

That said, the training of early childhood education professionals still faces, even today, in the 2020s, historical challenges when we think about the process of professionalization and the pedagogical practices that have unfolded in the everyday life of institutions. For us, having the opportunity to highlight the work articulated with the ethical principles of a career that seeks the inseparability between caring and educating [mathematically] babies and young children (Ciríaco, 2020), represents foundations that sustain theoretically and methodologically the pedagogical work we carry out.

Therefore, thinking about the implementation of collaborative practices, in the field of continuing education, might be a rich and promising path to be explored with teachers so that they understand the specificities of the encounters and enchantments with Mathematics Education in childhood.

We propose to break with the "packaged", closed, imposed "from top to bottom" continuing education and invest in in-service training, in groups, based on the reflection on the practice of teachers of early childhood education. The idea is to invest in collaborative group work, giving teachers the security to assume subversively responsible attitudes and actions (D'Ambrosio & Lopes, 2015).

The doctoral research of Azevedo (2012) points out that it is necessary to think of new forms and spaces for continuing education that develop teacher training processes and favor joint, cooperative, and collaborative work, and break with the practice of teacher isolation, since initial training is essential, but not enough to fully train the teacher, because he needs a continuing education that supports him in the real and daily needs of the profession, since the social reality, the teaching, the educational institution and the purposes of the educational system evolve, and teachers need to build alternatives of innovation and change for the policies and pedagogical practices.

Following this line of reasoning, continuing education comes to fulfill a need for continuous study, for permanent training (Imbernón, 2009), since society is in constant transformation and requires professionals capable of dealing with diverse demands. Therefore, given the demands placed on the work of professionals in Early Childhood Education, for example, it is pertinent to investigate the impacts that participation in a collaborative study group causes on the training and performance of these teachers.

The proposal of the group, in which the collaborative interactions were propitiated and in the context in which the research reported here was subsidized, is to create a culture of analysis of pedagogical practices, having in view the transformations of these practices by teachers, with the collaboration of the University, because "the transformations of practices occur in a process of reflection on these and problematization of practices, from the needs and problems experienced by teachers in school contexts" (Pimenta, Garrido & Moura, 2001, p. 9). Thus, investigating to what extent the transformations of practices occur and what is necessary for this seems to us, at present, to be a strong indicator of resistance and a catalyst for the multiple learning that working with children requires from the teacher.

We start from the studies of Fiorentini (2004) and Pimenta (2005), who state that the development of Study Groups does not occur spontaneously and requires collaboration. Its purpose is to create a culture of analysis of pedagogical practices, with a view to their transformation by teachers, with the collaboration of the University.

In short, the research in progress intends to highlight that it is possible to turn the space of a study and research group inside the University into a space of initial and continued teacher education, in which the three pillars are present: teaching, research, and extension. With voluntary participation, it is possible to propose a dialogue between generations. Undergraduate students (future teachers), Early Childhood Education teachers, more experienced teachers, and University researchers.

Methodological Procedures

As explained, the data of the research shared here were produced based on the experience of collaborative work of SROVM/UFSCar, a group that develops in the perspective of collaborative work with teachers of Early Childhood Education.

Specifically, the information present in the article concerns the CNPq-funded research entitled "*Mathematics Education in Childhood: theoretical and practical impacts on the training and performance of Early Childhood Education teachers*", from the Universal Edital 01/2016, based on a questionnaire developed with the group. Thus, we seek new developments to investigate directly with teachers in their work with children, particularly those of preschool age, with a qualitative focus.

In Mathematics Education, qualitative research is remarkable; in its many variants, it "pays attention to people and their ideas, seeks to make sense of discourses and narratives that would be silent" (D'Ambrosio, 2004, p. 21).

About the collaborative basis, in methodological terms, Fiorentini (2004) and Franco (2005) state that in a collaborative study group, it is possible to create a culture of analysis of pedagogical practices, given its transformations by teachers, from the collaboration and partnership with the University. Based on the needs and problems experienced by teachers, a process of problematization and reflection on their pedagogical practices is developed, which we have experienced in the interactions provided by SROVM, since its foundation in 2010.

We chose to conduct research with the teachers, not only to theorize practices of teaching and learning Mathematics in Early Childhood Education but also, above all, to investigate the impacts on training and professional practice when integrating a group that proposes to study Mathematics Education in childhood from the perspective of collaboration.

In general terms, the instruments for the production of research data were: oral (videotaped) and written narratives of the teachers; documents and planning; researchers' diaries; and open questionnaires (2nd semester 2019), answered by the teachers who worked directly with preschool. For this investigation, we used the open-ended questionnaire as the main source of data.

Faced with the possibilities that open up, with the analysis of the answers, our proposal was to elucidate the impacts of participation in SROVM for training and professional practice with children aged 4 to 5 years and 11 months, in the period from 2018 to 2019 (during 3 semesters), regarding the work with mathematical language in childhood in which elements negotiated in the planning reflected in the group sessions were incorporated, in teaching practices.

That said, for the article at hand, among the 18 teachers who participated in the project in 2018 and 1st semester of 2019⁸, 8 were selected to answer a questionnaire related to this research. The criterion was to select those who worked, in the circumscribed period, with preschool children.

The teachers answered the questionnaire, sent by e-mail, which contained open questions (14 questions) designed according to the research objectives. The questions included information about: a) professional formation; b) data about the formative experience in/with the group; c) difficulties working with Mathematics in Kindergarten before and after participating in the Study and Research Group "Other Views on Mathematics"; and, finally, d) what theoretical and methodological knowledge was learned and/or redefined and incorporated into the pedagogical practice. In the set presented, there were questions, along the axes, that mentioned the writing of experience reports, the participation in events in the field of Mathematics Education, as well as the publication of these reports in event annals to divulge the knowledge produced and legitimized in the group regarding the field of Mathematics Education in childhood.

The approach to the investigative context in the process of transcription, reading, and categorization of the data, made it possible to structure a posteriori analysis categories, as follows: 1st) contributions of the group for the processes of re-signification of the teaching practice in early childhood education (rethinking the actions based on collaboration); and 2nd) from singular to plural - contributions of the group for the professional development in childhood Mathematics Education.

Among the categories of analysis, made possible by the reflective scrutiny in the critical appreciation that we performed of the teachers' answers, we will highlight, in this text, the experience of description and analysis of the 2nd category, given the teachers' statements that point to elements that best characterize indicators that go towards understanding: What contributions and learning occur from interactions in a collaborative group of Mathematics Education in childhood in the perspective of re-signification of teaching practice in Early Childhood Education based on the perceptions of the participating teachers?

With the approach of the investigation context in which the research is subsidized, it is possible to say that there is a movement of re-signification of the teaching action beyond the individual perceptions of each teacher, the reason why analyzing the "change in

⁸ The group has been performing since 2010, non-stop, however, for this research we made a time cut from the present working period.

professional practice" and the "reflection on the practice itself" seems to us to be an emerging point of the statements produced from the questionnaire data. After reading and transcribing the statements of the group, we reached the consensus that the information gathered moves towards the sense of verifying to what extent the contact with theoretical and methodological perspectives, based on the collective reflections present in the previous focus of analysis, provide opportunities for professional development beyond the group space. That is, we will try, in this axis, to make an effort to understand the processes of constitution of the pedagogical practice in Mathematics Education based on the experiences of teachers with children, so "from singular to plural" will unveil how the group provides an opportunity for better performance in the exploration of mathematical notions in the preschool institutions where the participants worked, to highlight the role of SROVM in the expansion of the didactic-pedagogical and conceptual repertoire.

In summary, as we will see below, the answers obtained refer to the group's contributions to continuing education in a perspective that points to evidence of learning in curricular, academic, social, and political development.

Description and analysis of the data

We will highlight the multiple learnings of the teachers based on the themes of teaching professionalism, learning to teach, what it is to be a preschool teacher, and learning from the singular to the plural with different experiences for each teacher.

Given the analysis, we highlight the strength of the training work carried out in the group, which empowers the teachers to remain resistant to going against closed curricula that do not respect the child, childhood, and teaching autonomy, arising from models of technical teaching emerging from the capitalist society that sees education as a marketing principle.

Regarding the experiences in the group context, the teachers indicated that being part of an environment with collaborative characteristics enabled **learning related to the relationship between theory and practice**. This relationship can be seen explicitly in the following excerpts:

[...] offers the teacher the possibility to unite theory and practice in addition to instigating them to seek different ways than the conventional ones to offer students a more meaningful knowledge of mathematics (Rosana, 9 Dec. 2019).

[...] we were able to approach theory and practice, with the possibility of reviewing and evaluating our practice, in addition to listening and exposing new ideas together with colleagues. (Karla, Oct. 21, 2019) (Emphasis added)

Certainly, the dynamics contributed to continuing education. This bridge between theory and practice was fundamental so that I could look at my work differently, identifying which aspects needed to be improved, which ended up implying the search for other materials to explore other languages. (Zilmar, Oct. 23, 2019) (Emphasis added)

[...] as I see us as intellectual professionals who must possess and produce knowledge combining theory and practice. (Lucimara, Oct. 22, 2019)

When evaluating the development of SROVM throughout the three semesters, the teachers, again, mention the contribution to the articulation of theoretical contributions connected with their practices, instigating them to seek to change the practice they develop. As we can see in the following account:

[the group] offers the teacher the possibility of linking theory to practice besides instigating him/her to seek different ways than the conventional ones to offer students a more meaningful knowledge of mathematics. When exposing your work to colleagues, it is possible to hear opinions and suggestions that always add and expand the view on the subject addressed. (Rosana, 09 Dec. 2019) (Emphasis added)

One of the essential characteristics of a collaborative group is the articulation between theory and practice stated by authors such as Boavida and Ponte (2002) and Fiorentini (2004). The intention of the researcher-trainer, responsible for the foundation of SROVM, was to articulate the theoretical foundations with the conceptions that the teachers had of Early Childhood Education and Mathematics Education so that the conceptual and didactic models of each teacher were re-signified from the reflection on their practice, supported by collaborative work and learning.

The articulation between theory and practice is fundamental in the teacher education process, considering that teachers of Basic Education are producers of knowledge, as well as academic researchers at the University (Zeichner, 1998), however, teachers of Basic Education have the privileged situation of having direct practice with children.

When the Basic Education teacher assumes the role of teacher-researcher, he/she can articulate theory with practice, and one of the fruitful spaces for this is the collaborative groups, which, together with their peers, reflect on their practice, strengthen themselves as a professional category that produces changes, and become powerful to resist the macro public policies that go against the achievements in the area of Early Childhood Education and Mathematics Education.

The constant dialogue between university researchers, teacher-researchers from Basic Education, and future teachers is what will guarantee the articulation between theory and practice that is so important for the construction of a more ethical and democratic social relationship, as well as to produce autonomous professionals and reflective practitioners who are committed to high-quality education for all children.

Another important aspect to be considered regarding the entry of the teachers in the group refers to the fact that, along with the aspects specifically linked to training, such as the offer of knowledge, reflections, and approximations between theory and practice as pointed out above, we also saw emerging in the reports the **possibility of sharing**, of what can be thought of as an effective political sphere in the sense that Rancière (1995, p.7) presents as the production of the common, "sharing means two things: participation in a common whole and, conversely, the separation, the distribution of shares". We observe that the channels that are produced in the sharing, in the encounters with the other, are channels that release the

potency of the educational activities when the teacher feels "safer" when someone looking at "simple things" can discover the force that the educational act can circulate, when the "experience" leaves the space of a particularity, privacy, and finds its flow in the collective (plural) exchanges. In general, what we see is that, along with the theoretical knowledge, the practical propositions, and the knowledge that circulates there, the training space has given rise to another look at the educational experiences, no longer a spectator look, but a look that makes one act, that moves.

We can observe these moments in some reports like the ones presented below:

I believe it did [contribute] because first, we discussed both the shared experiences and the chosen texts; then we elaborated on an experience and presented it to the group. Thus, we were able to approach theory and practice, with the possibility of reviewing and evaluating our practice, as well as listening and exposing new ideas together with colleagues. (Karla, Oct. 21, 2019) (Emphasis added).

Yes, this dynamic adopted is very rich and fruitful. It is from this exchange and the teacher's interventions that I particularly reflect on the practice, the positive and negative points, what is possible with my class, and how I can adjust or redo the activities. I believe that everything is a set: read the texts, elaborate on the activity, perform with the class, expose in the group and discuss, in this sense, the reflection comes and, perhaps, a new action; this is positive in my training. (Sandra, Oct. 15, 2019) (Emphasis added).

These reports indicate the power of the dialogue built by the teachers throughout the group activities, highlighting the reports as a tool for professional learning. Another example is Ceily's statement - presented below, which reveals the continuity of the partnership and collaborative work that has been developed among the teachers in the school unit in which they worked:

Through this children's story, I am putting together, in partnership with teacher Rosana, a picture book with the participation of the children through drama and body expression. In this experience, we are working on spatial notions. [...] "Little sponge" project: Through the collection of used kitchen sponges I assembled a comparative chart between two rooms (mine and teacher Zilmar's) to work with the children counting, comparison of quantities, pictorial and numerical registers. (Ceily, 03 Nov. 2019) (Emphasis added).

Still, on dialogue and working with others, Waldirene's account illustrates that the group provided intellectual and affective support:

The exchanges of experiences were always very enriching for my teaching practice. Giving the incentive to think and plan differentiated activities, involving play. (Waldirene, Oct. 16, 2019) (Our emphasis).

Dialogue is one of the characteristics of a collaborative group, and for this to occur, it is essential to build less hierarchical relationships that provide an environment of trust and open communication. The teachers' testimonies, when evaluating the group's development, show that they increasingly felt at ease to express themselves during the discussion/analysis of texts and when reporting on their activities in the field of Early Childhood Education teaching. This allowed each teacher to look at her practice and that of the others and to build together different ways of acting.

In the area of the reflective teacher, spaces for continuing education that take into account their practice as a starting and ending point, the participants of a group such as SROVM, for example, have the opportunity to expand their knowledge and expertise as they expose in the collective the uniqueness of their work. Also in the collaborative environment, as the data indicate, there was a **methodological improvement** in the incorporation of mathematics in the experiences with children in Early Childhood Education. When evaluating the development of the group, the articulation of the teachers' knowledge about mathematics with the different ways of approaching it can be seen, considering the characteristics of being a child and including the intentionality of the educational activity. Thus, the teachers reported **learning about mathematical knowledge**, the focus of the Early Childhood Education curriculum, revealing the re-signification of their actions. Many teachers indicated, for example, that they learned that mathematical knowledge goes far beyond numbers, numerals, and geometric figures. The statements presented below illustrate this learning.

[...] identifying which aspects needed to be improved, which ended up implying the search for other materials to explore the other languages. (Zilmar, Oct. 23, 2019). (Emphasis added).

Before SROVM, I had difficulties playfully working mathematics with children, to bring new experiences and experiences. I was very insecure in working with the various mathematical concepts. I had no idea how many experiences I could share with the children. And that mathematical knowledge goes far beyond numbers, numerals, and geometric figures. [The texts I studied and borrowed books deepened my knowledge about mathematics in childhood. With this, I was able to expand the experiences and experiences shared with children, offering new possibilities of working with mathematical language through methodological strategies (children's books, unconventional problem solving, and games and play). (Ceily, 03 Nov. 2019) (Emphasis added).

Participation in the SROVM group contributed to the understanding of basic concepts of Mathematics Education and provided the experience and research of methodologies to be developed thinking about the child motivated to knowledge. Motivating the teaching practice to research and do differently in the group with children, escaping the traditional ways, as a teacher who only teaches and has a methodology sheet and paper only. (Waldirene, Oct. 16, 2019) (emphasis added).

I believe that before SROVM I was more "stuck" to the mathematical work on "paper", without concrete or more content-based experiences, for example, number sequence, calendar, addition, and sets; not that this is not important, but it was not something practical, fun and dynamic for early childhood education. For example, until I did SROVM I had never thought of working with measures with children and would not even know where to start, geometric shapes also worked more mechanically. So, the group brought this to my practice, the innovation and the re-signification of something I was already working on, but with another vision, other experiences, and theoretical support. [SROVM helped me to go beyond mathematical activities, to work with numbers, and introduced new perspectives with the use of games and play. [...] Games and play are essential alternatives in early childhood education, and SROVM brought this reality to my practice. (Sandra, Oct. 15, 2019) (Emphasis added).

Mathematical knowledge appears at all times because logical-mathematical reasoning contemplates the spaces and interpersonal relationships. We should not stick only to

numbers and this SROVM helped me to understand better [...] I always try to propose problem-solving, which many times are not in the planning because when I identify it in the routine I already work with the child. For example, we are putting away little pieces of paper. We have two buckets for this. The child puts the pieces together, assembled them, and then realizes that not everything will fit. Then I ask how can we store the pieces so that they all fit. Two children want the same toy, but we only have one. I have also been working on the number-quantity correspondence, graphs of fruit preference, and graphs of means of transportation used by the children to move around... In short, I try to explore the child's daily life. Then I think about spaces and shapes, magnitudes, numerical notions, and information processing (Lucimara, Oct. 22, 2019).

It can be seen, therefore, in the answers that the pedagogical practices were given new meaning in the continuing education process in the group. The games, children's literature, and problem situations permeated the pedagogical work that, supported by the collectivity, improved their theoretical and practical knowledge. The different methodological alternatives that were expanded in the teachers' repertoire enabled multiple learnings.

The collaboration, in the case of this research, as well as in the research of this kind, such as Forte and Flores (2009), implied the sharing of experiences and materials, supported by a theoretical debate requested by the group, and this was no different with SROVM. From this context, the authors state that "the thinking and practice of teachers are susceptible to change if the two axes interact and find fertile ground to operate significant changes that are deemed essential in the educational field" (Forte & Flores, 2009, p. 782). Besides this aspect, we believe that having better mathematical knowledge, based on collective reflections in the sharing of professional experiences, helps the Early Childhood Education teacher to improve her practice. After all, having the mastery of methodological knowledge is not enough for effective work with mathematical language. In other words, we are saying that it is not enough to know "how" to approach mathematical aspects with children, it is necessary to have ample knowledge about their properties to enhance the curriculum development, from the first children's experiences, which points to the relevance of mathematics training and training for the teaching of mathematics to female teachers.

It is important to note that along with the movement of teachers that indicated changes in the practices with children, it was not only the conceptual perspectives about the relationship between theory and practice, and more specifically the practices that were changing, but also along with this, the changes themselves **indicated that how they conceived childhood also produced changes in the practices with children**, and the changes in the practices with children signaled different perspectives on conceptions of childhood (Leite, 2011). All this created a change in the direction of the work, such as, for example, the valorization of games and playful aspects and the centrality of the work based on the child. The excerpts below point in this direction.

As I produced the reports, I realized that my conception of the child was changing, I started to consider the child as the center of the pedagogical planning and to have more attentive listening. In this context, the conversation groups were fundamental for

this change. Games and play have gained a larger space in the children's daily lives, today they can share their opinions and can make their own decisions. (Ceily, Nov. 03, 2019) (emphasis added)

As noted above, the teachers participating in the Group moved to look at their practice and the practice of others. This was enhanced by the dynamics instituted with the collaborative experience when they were asked to publish their work in scientific events through reports of experiences. Thus, with the cyclical movement of collaboration, the participants of the group reach the production of knowledge when they systematize what they do and dissertate, through written narratives, their reports of practices experienced in doing mathematics with children, as was the case of SROVM teachers. This situation also leads them to write about their actions, seeking, as Anjos, Nacarato, and Freitas (2018, p. 205) point out, the reflection on "conditions and possibilities of learning and teaching development in the dynamics of this collaborative work.

This, undoubtedly, also allows us to make an analysis of the forms of reworking of knowledge of the Early Childhood Education teachers and what is the role of the other in this context.

For example, regarding the writing of the self in the preparation of texts that were published in events, the reflective record of one's practice becomes a central aspect in the learning made possible by collaboration. In their testimonies, they highlight that the experience of writing about what one does contributes to rethinking the educational process, as well as to the expansion of ways of acting when one tries to organize a sequential thought of the process lived to narrate in words what happened at the moment of materialization of the thought/planning.

My first experience with reporting was in SROVM and it was initially challenging. After the first report, I felt able to reflect on my practice and transform this reflection into systematized knowledge capable of boosting other practices of other professionals. (Zilmar, Oct. 23, 2019) (emphasis added).

The writing and reading and presentation of the experience reports to the group made them reflect critically on the teaching performance, which involved: the choice of theme, planning, the methodologies used, and different forms of evaluations of the acquisition of knowledge and development of children, because while recording the experience the writer rereads and evaluates the experience lived. (Waldirene, Oct. 16, 2019).

Writing the report on a pedagogical practice means for me to reflect on the action. As I write, I remember the practice, the planning, the materials, the interventions, and the children's actions, and all of this makes me reflect on the whole process. In this moment of writing, I am re-signifying my practice, my knowledge, and what I could have done or could be different. Writing after practice is a reflection on the action, and later a new action can be thought of or a new direction, therefore it can validate the previous knowledge and re-signify it. [...] When I wrote the reports, many ideas came up and memories of other experiences, other classes, my entry into the profession, and what I can still do with the other classes that will come. It is also a process of retrieving memories and "*how can I do it differently?*", "*Did I do it the*

right way?"/>. That is why I think that feedback is important, not to point out: right or wrong, but to elucidate new proposals, ideas, etc. [...]I believe that the process of writing about the practices, and making the report of the practices beyond the reflection on the process, makes me think about my role as a teacher, the challenges, the joys, anxieties, the advancement and maturation in the profession. (Sandra, Oct. 15, 2019) (Emphasis added).

Writing is not a very easy task and writing about one's practice makes the exercise even more difficult. Writing an experience report enriches the teacher's work a lot because it allows him to evaluate his work and to think about his proposals and the answers offered by the students. In everyday life we do not have many opportunities to think about what we do, when writing about it we put ourselves in the role of evaluators and reflect on our goals and the adequacy of the proposal always guided by the students' feedback, such as degree of involvement, participation, etc. (Rosana, 09 Dec. 2019) (Emphasis added).

In the reports, it is evident the idea that reflection implies reconstructing or reorganizing the experience, adding meaning to it, and increasing the ability to direct the course of subsequent experience (Rogers, 2002). This process implies thinking about practice - present and past, as Sandra's statement, indicates, critically analyzing it, confronting reality with what is desired, dialoguing with peers, connecting her knowledge and the educational approaches she uses to new ideas, projecting a future practice and thus making an impact on it.

In Rosana's statement, it is also valid to highlight the lack of opportunity in the teacher's routine to think about pedagogical practice, and in Zilmar's the idea that reflection can build a systematized knowledge. Teaching practice implies decision-making during the action, that is, the teacher thinks about what he/she does while acting, however, it is also fundamental that this reflective process occurs after the action. Thus, it is necessary the opportunity to distance oneself from the immediacy of the teaching action, moreover, the reflective process demands time is rigorous, and is rooted in scientific inquiry (Rogers, 2002).

Another aspect evidenced in the statements - and which is a consequence of the realization of collaborative work, is the idea that the reflective process is not only individual, that is, it implies a collective dimension (Rogers, 2002). Thus, the sharing of ideas among people with a diversity of experiences can help elucidate issues and assist in more detailed analyses. Furthermore, Sandra's account reveals that thinking about practice goes beyond reflecting on knowing how to teach; it encompasses being a teacher in its entirety.

Moreover, in collaboration, as Fullan and Hargreaves (2000), authors of the specialized literature on the subject, point out, everyone works together for a certain end [common purpose]. In the case of the group, the purpose of the culmination of the actions shared in the SROVM sessions lies in the possibility of transcending the singular vision, to reach plural postulates that lead the Early Childhood Education teacher to realize that she is not alone, that exploring mathematical experiences in childhood, from interactions and games, in intentional pedagogical acts can be a reality present in the daily life of her profession. Thus, learning originates from the act of working together, from the members supporting, negotiating, and collaborating.

In this context, one of the group's activities is to socialize the results of what we propose with the children. To this end, we consider it important that the members expose their plans with the perspective of validation and critical appreciation of the others, which we understand occurs with a non-hierarchical formation and that has been done, over the last decade, with shared leadership, mutual respect, and co-responsibility in the direction of the actions, as demonstrated in the reports:

I am used to doing my work quietly in my school; from the moment I leave this comfort zone, it is natural that insecurity arises, because it requires putting yourself in front of an audience that will somehow evaluate you. At the same time that it was tense, it was rewarding for the fact that it made me realize that presenting work is an opportunity to share experiences and this makes us grow. (Zilmar, Oct. 23, 2019).

[...] first, we discussed, both the shared experiences and the chosen texts; to then elaborate on an experience and present it to the group. (Karla, Oct. 21, 2019).

Providing moments of study and exchange of experiences. By listening to reports in the group I had a repertoire to plan the work with my class. (Zilmar, Oct. 23, 2019).

Because of the statements resulting from the collective engagement of daily activities in which Mathematics is present in Kindergarten, it is possible to infer that the appreciation of the "other" about "herself", when sharing her experiences, places the preschool teacher in constant pedagogical praxis. In the action of reflecting, in a shared way, the production and transformation of teaching knowledge occur, changes in the teachers' identity are incorporated, and their abilities of theoretical and methodological approach to Mathematics Education are expanded. The incorporation of references to performance, facing the study activity, planning, development, and exchange of information about the interactions with children seems to contribute to the teachers to internalize habits, expectations, abilities, and plural understandings in the singularity of their knowledge and actions with childhood.

The history of the group, according to the teachers' words, has been moving towards the promotion of autonomy, expansion of the repertoire of action both in terms of references (in the relationship between theory and practice) and in the development of a sense of critical analysis when solving problems arising from the teaching activities and when making decisions in the organization of the educational process. Thus, we can state that "the context of the collaborative group becomes a fertile space for the (re)development of teaching knowledge. First, we highlight the dialectical movement established in the group, in which theory and practice are articulated and become mutually constitutive" (Anjos, Nacarato & Freitas, 2018, p. 212).

Final considerations

[...] I learn from you but you think I learned from your lessons because it wasn't, I learned what you didn't even dream of teaching me [...] Clarice Lispector, 1969.

In addition to achieving what we assumed as the methodological principle of the actions and dynamics resulting from the continuing education process in a collaborative group, we can state, based on the enunciation of the reports presented throughout the analysis

object of appreciation in the article, that the Preschool Education teachers "learned much more than we dreamed of teaching". Their words revealed learning beyond the "lessons" made possible by negotiation and collaboration in SROVM/UFSCar. In analyzing the contributions and learning that occur from the teachers' interactions in the group, some formative characteristics that contribute to the professional development of these educators were identified, namely: i. Theorization of practice, ii. Dialog as a tool for teachers' learning, iii. Potentiality of writing to engage in a reflective process.

The teachers seem to have been involved in a process of theorization of practice in which theory empowered them to engage in the realization of quality practice in Early Childhood Education. Enabling them to look at the theory in the light of the practice they develop. From the theory - a project of a non-existent practice - each teacher can know the reality and develop goals to change it, building action plans and putting themselves in motion (Pimenta, 2006).

It is worth pointing out that this movement was not exclusively individual. We argue in this article that it was dialectical, between the plural and the individual. Belonging to a collaborative group enables the empowerment of the teacher in her dimension, at the same time that, in the shared practices, a deeper and more consistent knowledge is produced, giving security to the teaching practice. The dialog with the other - in the theoretical discussions, in the sharing of practices, and the production of written narratives, was essential for the teachers' learning. Just as theory can empower the teacher and her work, dialog about and disseminating her practice can also generate empowerment. These aspects show respect for the teacher's knowledge and can be one of the ways, together with other principles and actions developed by the group, to bridge the divide between teachers and academic researchers (Zeichner, 1998). Also, the writing of her practices empowers the teacher, who feels valued when her work is accepted to be presented at an event. This legitimizes her work in the group and the spaces of Early Childhood Education. The writing of practice is a process. When the teacher produces her texts, narrates her experiences orally, and rewrites the text, she experiences different forms of reflection on her practice, narrating orally, in writing, and in presenting the work at events (socialization).

Participating in the group demanded from the teachers other views of their practice, their theories about mathematical knowledge, children, and Early Childhood Education. Thus, they expanded the knowledge and skills of the repertoire of knowledge necessary for teaching. This allowed them to continue to constitute themselves as resistant: to content-based practices in Early Childhood Education and loneliness in the teaching profession. It was observed the development of professionals who share with others their dilemmas, knowledge, theories, and ideas of practices, and thus can analyze a problem from different references and foreshadow action plans, being aware of the origins of their actions and the impacts they may cause on children.

In summary, as we saw in the excerpts analyzed, the learning and knowledge in the group collaborate to a re-signification of contents and concepts possible to be carried out with

Mathematics in Kindergarten, ensuring playful learning spaces. In the teachers' statements, they show how much they have learned about playful activities, childhood, and the mathematics possible in Early Childhood Education. Certainly, many of the tasks that the teachers performed were loaded with mathematical situations, but they didn't realize it. The group made it possible to give meaning and significance to the mathematical practices found in games, play, storytelling, and problem-solving, which could be enhanced through theoretical knowledge.

The feeling of trust and belonging to the group mobilizes the participants to expose their practices and ways of thinking, which enables everyone to learn together. There is the mutual respect in the group, which dilutes hierarchies, and at every moment a participant takes the lead, given the desire to share their experiences, doubts, and desires to learn. All this could be evidenced by the voices of the participants themselves. It is necessary to break with a conception of teacher training in which the trainer points out what teachers learn. It is desirable that teachers themselves can reflect on their practices and talk about their learning, as the participants in this research did.

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