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Disputes in a Pre-Service Mathematics Teachers' Programme: An (Im)Possible Narrative

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ABSTRACT

Background: The curricula of the undergraduate programmes for pre-service mathematics teachers' education have been debated (and disputed) in Brazilian academic communities over the past decades. **Objectives**: To investigate actions and disputes among mathematicians and mathematics educators which took place during the curricular changes and creation of the night undergraduate programme for pre-service mathematics teachers' education at UFRJ. **Design**: Fictional dialogues were built to present and analyse data from individual interviews. **Setting and Participants**: Interviews were conducted with seven lecturers, five retired and two in office, who have played central roles in the institution or in designing curricula for the programme. **Data collection and analysis**: Data analysis and production were conducted through the re-storying methodology. **Results**: The dialogues indicate that the modification in the priorities of the group of Mathematics Education teachers at the IM-UFRJ moved the faculty away from the discussions that culminated in the curricular changes of 2001 and 2008, either from the understanding of what the laws and resolutions said, or in internal spaces for debate, such as the Fundão Project. **Conclusions**: Our analysis indicates that disputes take place in a landscape that transcends teachers' education and reaches more complex political and epistemic terrains, partially related to tensions between mathematics and mathematics education, but that cannot be reduced to this binarism.

Keywords: Curriculum; Pre-service teacher education; Mathematics education; Narratives; Disputes.

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RESUMO

Contexto: Os currículos dos cursos de formação inicial de professores de matemática têm sido debatidos (e disputados) nas comunidades acadêmicas brasileiras ao longo das últimas décadas. **Objetivos**: Investigar as ações e disputas de matemáticos e educadores matemáticos ocorridas nas ocasiões das mudanças curriculares e da criação do curso de Licenciatura em Matemática da UFRJ no turno noturno. **Design**: Foram construídos diálogos fictícios para apresentar e analisar dados de entrevistas individuais. **Ambiente e participantes**: As entrevistas foram realizadas com sete professores, sendo cinco aposentados e dois em exercício, que desempenharam papéis centrais na Instituição ou no desenvolvimento do currículo desse curso. **Coleta e análise de dados**: Foram realizadas por meio da metodologia de *re-storying*. **Resultados**: Os diálogos indicam que a modificação nas prioridades do grupo de professores de Educação Matemática do IM-UFRJ afastou o corpo docente das discussões que culminaram nas mudanças curriculares de 2001 e 2008, seja a partir do entendimento do que diziam as leis e resoluções, seja em espaços internos de debate, como poderia ser o Projeto Fundão. **Conclusões**: Nossa análise indica que as disputas se dão em uma paisagem que transcende a formação de professores e atinge terrenos políticos e epistêmicos mais complexos, parcialmente relacionados a tensões entre educação matemática e matemática, mas que não podem ser reduzidos a este binarismo.

Palavras-chave: Currículos; Formação inicial de professores; Educação matemática; Narrativas; Disputas.

MATHEMATICS TEACHER EDUCATION AND CURRICULUM: NECESSARY AND POSSIBLE THEORETICAL ARTICULATIONS

Since the 1990s, the relationship between mathematicians and mathematics educators has occupied a prominent place in mathematics education research (Nardi, 2016, p. 362). We believe that theories in the field of curriculum can help to unveil theoretical or political disputes that tend to take place in the academic territory, specially regarding the education of mathematics teachers. According to Gabriel (2013), these disputes may be manly due to the fact that different areas of knowledge area at stake, with differences in action, recognition by the academic community, and affiliation to scientific domains – in our case, mathematics in exact sciences and mathematics education in human sciences. The complexity of those differences is highlighted by authors affiliated with post-critical curricular theories (e.g.

Lopes, 2013), and transcend the binarism that permeates the discussion. This study explores this complexity from an epistemic position that chalenges the role of mathematics as a school discipline, seeking to overcome "the vision of a closed, flawless, and complete science," which implies a conception fo mathematics teachers education that considers the teaching of the discipline "as a body of knowledge which are interrelated with other sciences, including the humanities" (Silva, 2014. p. 522).

In this paper, we report part of the first author's doctoral research, supervised by the second author. The general aim of this research was to investigate the curriculum of the undergraduate programme for pre-service mathematics teachers certification [1] (*licenciatura em matemática*) of the Mathematics Institute of the Federal University of Rio de Janeiro (IM-UFRJ) from the 1980s onwards, within the institutional and political terrain in which successive curricular versions were conceived and implemented. More specifically, our doctoral research investigates this issue from the following standpoints: (i) of the institution and its official documents (Costa-Neto & Giraldo, 2019); (ii) of the lecturers of the *licenciatura* in mathematics as actors who participated directly in the construction of these curricular versions; and (iii) of the students of the *licenciatura* in mathematics (prospective teachers), whose professional education occurred in this context (Costa-Neto & Giraldo, 2020). Beyond the conventional meanings of curriculum as knowledge or content, we understand curriculum as a set of texts and discourses related to and dependent on the contexts in which they are inserted (Oliveira & Lopes, 2011).

Here, we focus on the second standpoint described above, highlighting actions of lecturers, who identify themselves as mathematicians or mathematics educators, on conceptions, developments, and facts related to the curricular versions of the *licenciatura* in mathematics at UFRJ. As Nardi (2008) points out, the teaching and administration of higher education programmes in the exact sciences, particularly curricula design, often involve negotiations between lecturers and the departments in which they work. In the case of the *licenciaturas* in Brazil, such negotiations can be even more complex, since the areas to which the lecturers who teach these programmes are affiliated do not

[1] In Brazil, the pre-service certification of teachers to work in elementary and secondary education is done in undergraduate programmes associated with the respective discipline, called *Licenciaturas*. Thus, in this paper, the undergraduate programmes for pre-service teachers certification will be henceforward referred to by the Portuguese word *licenciatura*, or *licenciatura* in mathematics when that is the case.

necessarily correspond to the areas of the departments in which the programmes are allocated. Thus, in this study, we address the following research question: *How do negotiations and actions among lecturers who see themselves as mathematicians or as mathematics educators take place in the context of a* licenciatura *in mathematics?*

We seek to answer this research question through the views of lecturers involved in some way with the process of constructing the curricular matrices of the *licenciatura* in mathematics, collaborating to carrying out new proposals or being agents of resistance to their implementation. We understand that such negotiations occur in contexts in which the meanings about curriculum are transformed by the flow of texts and discourses, as highlighted by Oliveira and Lopes (2011). Like Nardi (2008), we characterise a lecturer as a mathematician or as a mathematics educator according to their academic and professional activities, not necessarily only from their formal academic qualifications. Fiorentini and Lorenzato (2012, p. 4), for example, consider that mathematicians "tend to conceive mathematics as an end in itself," and carry such conception for teachers education, when they work in it, by "promoting an education for mathematics that prioritise formal content and a practice focused on the preparation of new researchers in mathematics". The authors also highlight that mathematics educatores tend to promote education through mathematics, as they conceive "mathematics as an important means or instrument for the intellectual and social preparation of children, young people and adults, as well as of mathematics teachers" (Fiorentini & Lorenzato, 2012, p. 4). We do not consider that the characterisations proposed by the authors may constitute generic definitions for mathematicians and mathematics educators as professionals, or for mathematics and mathematics education as research fields. However, those characterisations may indicate professional or epistemic, potential or necessary approaches which, to a certain extent, affect the subjects in their fields of action. In this sense, we understand that such characterisations bring school mathematics teachers closer to the figure of mathematics educators, but there may be greater complexity involving their subjectivities, education backgrounds, trajectories, practices, and meanings of practice and teaching.

Research on teachers education has accumulated a significant theoretical corpus in recent decades, with seminal works in the field of education (e.g., Shulman, 1986; Tardif, 2013) and in the field of mathematics education (e.g., Ball et al., 2008; Carrillo et al., 2013; Moreira, 2012; Moreira & Ferreira, 2013; Fiorentini & Oliveira, 2013). Such debates can be articulated with broader research in university mathematics education, which has been

consolidating significantly in recent years (Winsløw et al., 2018), being more attentive to institutional, disciplinary, and curricular factors that, in broader political contexts, can influence how mathematics teachers education occurs. The Brazilian mathematics education research community (e.g., Moreira, 2012; Moreira & Ferreira, 2013) has argued that the *licenciaturas* in mathematics should take more into account a professional perspective, which should be pervaded by reflections on school practice and should more explicitly integrate mathematical practices aimed at teaching, also highlighted by researchers in international contexts (e.g., Ball et al., 2008). In the Brazilian context, the curricular reforms of *licenciaturas* in mathematics, at least since the 1980s, have been influenced by this debate, carried out in academic publications in the last thirty years, and which we highlight in Costa-Neto and Giraldo (2019).

For example, Moreira (2012) criticises the influence of the undergraduate programmes for the certification of mathematicians (*bacharelados*), over the *licenciaturas* in mathematics. We consider that this influence may be due to the power relationships between the research areas involved and, consequently, between the individuals who are affiliated to these areas. According to Moreira (2012), such relationships are mainly expressed by the "3+1" model – three years with "mathematical content," followed by a year with "didactics" – which was dominant in *licenciaturas* in Brazil until the early 1990s. In this model, the education prospective teachers consisted of two separate, non-overlapping clusters. Although this organisation has been progressively put aside in most Brazilian universities, its internal logic remains practically unchanged and still underpins the current curricular structures, which are variants of the "3+1" model (Moreira, 2012). One of these variants consists of the inclusion of a third cluster, the so-called "integrating modules", which focus on mathematics teaching and was fostered by the emergence of the academic community of Mathematics Education. However, this cluster is often presumed to comprise practical knowledge, a set of techniques on "how to teach a particular topic", with little intersection with other curricular components. Regarding the integration of these three clusters, Moreira (2012, p. 1141) argues that "institutions cannot accomplish this task, because its accomplishment is impossible under the 3+1 logic". Fiorentini and Oliveira (2013) refer to this variant as an "*quasi-trichotomy*", in analogy to the dichotomous logic of mathematical and pedagogical knowledge, assumed as necessary for teachers education in the 3+1 model. Moreira and Ferreira (2013) also state that in *licenciaturas* in mathematics, there are explicit conflicts and disputes for "hegemony" between two stances – one that sees teachers' knowledge as plural in nature, with specificities emerging from school practice;

and another that considers mathematical knowledge as the (only) reference knowledge for teachers education and practice.

Thus, we consider that the discussion on mathematics teachers education is in line with some issues identified in the field of curriculum in the same period and context. When investigating the discursive disputes present in teachers education in a time frame between 1996 and 2006, Dias (2012) identified as central issues of that context*: teachers' protagonism; teachers' professionalisation as an axis; centrality of practice; and curriculum projects in dispute*. Among those issues, the first three have been repeatedly addressed in works in mathematics education based on theories on teachers' education, such as those carried out by Cochran-Smith and Lytle (1999), Tardif (2013) and Nóvoa (2009; 2017). However, the last issue, *curriculum projects in dispute*, lacks further discussion, since "when curricular investigations in the area of mathematics education occur, they have overprivileged the prescriptive curricula organised throughout the twentieth century, in Brazil" (Pires et al., 2014. p. 487), not evidencing disputes over mathematics curriculum projects in school education or teachers education. Thus, we will try to use the integration of these theoretical discussions in the fields of curriculum and of teachers education, along with a methodological approach that puts in prominence the narratives of the actors involved in this study.

CONTEXT, AIMS, AND DATA PRODUCTION

We conducted semi-structured interviews with seven lecturers from IM-UFRJ, five retirees and two in service, who played important roles in the institution in the last 50 years. The criteria for choosing those participants were based on the degree of involvement with the *licenciatura* in mathematics, including their teaching activities and administrative positions during the period, their relations with the faculty staff and mentions in previous interviews by other participants. Such criteria are consistent with the discussion on the fields of curriculum and teacher education we conducted in the previous section. The participants formally agreed to the terms of confidentiality of the study: their personal identities will be kept confidential by using pseudonyms, but the institution (IM-UFRJ), the context of this research, is revealed.

The interviewees are identified by the pseudonyms *Ana, Elis, Inês, Olga, André, Edson, and Úrsula* and introduced in the order of the interviews, which took place between January 2018 and June 2019. Ana, Elis, Inês, Olga, and Úrsula have undergraduate degrees and masters' degrees in mathematics

and have worked as mathematics school teachers before they became lecturers. André and Edson have all academic education (undergraduate, masters' and doctorate degrees) in mathematics and worked more directly in the preparation of mathematicians at the undergraduate and postgraduate levels. Ana and Úrsula are doctors in mathematics, Inês and Olga have PhDs in mathematics education, and Elis has only a masters degree in mathematics. Thus, all of them have some experience in pure mathematics research, at least as masters' students. Ana, Elis, Inês, and Olga migrated their research affiliation to mathematics education during doctoral studies (Inês and Olga), or later, along with their teaching activities (Ana and Elis). André and Edson remained as researchers in pure and applied mathematics along their careers. André and Edson reached the top of their careers as full professors. André is professor emeritus, the highest honorific title awarded to a lecturer at UFRJ. At the time the interviews took place, Ana, Elis, Inês, Olga, and André were already retired, having worked at the IM-UFRJ between the 1950s and the second decade of the 2000s: Ana from 1978 to 2017; Elis from 1964 to 1993; Inês from 1979 to 2010; Olga from 1976 to 1996; and André from 1952 to 1996 (the latter having started his teaching activity when the IM-UFRJ courses still belonged to the National School of Philosophy – FNFi). Úrsula and Edson are still in service at the Institute of Mathematics, performing their teaching activities in the *licenciatura* in mathematics and in the undergraduate programme for mathematicians certification. Edson and Úrsula have been lecturers at IM-UFRJ, respectively, since 1976 and 1997 (the latter worked previously at another university for 14 years).

During their careers at UFRJ, the interviewees: occupied academic-administrative positions at different levels; participated actively in the design of curricular versions of the *licenciatura* in mathematics; participated in extension and in-service teachers education projects; developed instructional resources for mathematics teaching in school and higher education. Not all of them performed all those actions. Ana, Inês, and Olga also participated as lecturers of the Graduate Programme in Mathematics Education of UFRJ (PEMAT) since its creation in 2006: Ana until 2011, Inês until 2010, and Olga works there to date. André worked as a lecturer in the Graduate Programme in Mathematics of the UFRJ, the same one in which Edson works to date. Elis, Olga and Inês worked, since 1983, in the extension action *Projeto Fundão*, aimed at mathematics teaching, with Inês participating until 1999, and Elis and Olga to the present day. Thus, according to Nardi's (2008) and Fiorentini and Lorenzato's (2012) notes and definitions, and based on the professional characteristics and activities listed above, we identified lecturers *Ana, Elis,*

Inês, and Olga as mathematics educators, and André and Edson as mathematicians. *Úrsula, on the other hand, was not strictly linked to any of these two research areas* due to the specific characteristics of her activities and professional trajectory. Thus, we point out that the establishment of disjoint categories, such as those that the research literature would suggest, may conceal some aspects.

The interviews were conducted by the first and second authors with each of the participants individually, and then were fully transcribed. The interview script was designed to: (1) deepen understandings of gaps which emerged from the analysis of official documents, part of an earlier stage of the study (Costa-Neto & Giraldo, 2019); (2) explore participants' views on the relationships and disputes between mathematicians and mathematics educators, as well as their actions. For this stage of the investigation, we selected five episodes, three of which we present in this paper. All of episodes presented here regard themes related to the curriculum of the *licenciatura* in mathematics at UFRJ. To select them, we read the transcripts of all interviews and highlighted recurring issues that presented constitutive, critical, or contradictory elements in relation to the scenario of mathematics teachers education at UFRJ. In this process, in the individual interviews, we identified utterances that referred the same episode, based on answers to the questions in the script or spontaneous comments of the participants on a given issue.

As we used semi-structured interviews, the questions were not asked in the same order, nor were phrased the same way as they appear in the original script. Rather, the development of each one depended on how the conversation would go. Below, we present the questions in the script that are related to the episodes we address. This script was initially designed to clarify gaps in the document analysis we conducted in a previous stage of this research, but this clarification of gaps did not determine the the episodes choice.

Table 1

Questions of the interview script

[…]
7 – In 1988, another change in the curricular matrix of the *licenciatura* in mathematics took place. Five new topics were incorporated, seven were withdrawn and two had their names modified, according to the list below. What motivated those changes? Why were these modules withdrawn and others incorporated?
[…]

10 – Talk about the process of creating the evening classes of the *licenciatura* in mathematics, which culminated in a new curricular organisation in 1993.
[…]
15 – In the evening classes curricular strand, in 1993, several modules had their name changed in relation to the day classes strand. Why did that happen?
16 – The most recent curricular changes, in 2001 and 2008, basically modified the internship time load, and included compulsory curricular requirements in compliance with laws. Why were other curricular changes not made, taking advantage of that moment? Has the faculty debated that possibility?
[…]

We present the data in a dialogical format (Nardi, 2016) that seeks to provide readers with an intimate view of the contradictions and convergences in the participants' utterances. We wish to allow readers different interpretations of the data, as we seek to highlight the complexity inherent in the disputes that characterise the curricular terrain in which those participants worked. We stress that the first and second authors cannot be considered as external or neutral observers. On the contrary, we were former undergraduate students and are currently lecturers at UFRJ, working in academic faculties (School of Application and Institute of Mathematics, respectively) that are co-responsible for the *licenciatura* in mathematics. We are, therefore, deeply involved with the institution under study – which produces a bias that parvades the different stages of the research, from the methodological instruments design, the conduction of the interviews, to the selection and discussion of the episodes. However, we do not seek methodological ways to neutralise that bias. On the contrary, we assume it as part of the research. In other words, the results we report here are shaped by our intersubjective relationships – by (shared or not) perspectives and experiences, convergences and divergences among the interviewees and the researchers. Just as we acknowledge that bias, we strive to preserve a look of strangeness that seeks not to disregard conclusions different from those we expect. Thus, what we report is here *a re-storying narrative* (Nardi, 2016) of the actions and negotiations among mathematicians and mathematics educators regarding the *licenciatura* in mathematics at UFRJ – that is, *a version of this story, through the lenses of its actors* (participants and researchers), which puts the voices of the respondents in prominence.

FROM INDIVIDUAL INTERVIEWS TO FICTIONAL DIALOGUES AMONGST LECTURERS

In order to put in prominence the respondents' voices and to reveal points of agreement, disagreement, and possible contradictions, we gathered the voices of the seven participants in a fictional dialogue among them, built up upon raw data from the transcripts. Thus, we intend to grasp ideas and impressions put forward in their utterances during the interviews. Such methodology is consistent with an understanding that, when constructing narratives from utterances of the subjects who contributed to the research, we access meanings and emotions that surface at the time of data production, enabling different interpretations (Barbosa, 2015). To promote the intertwining of the participants' discourses, we use elements of the "*re-storying* narrative approach" (Nardi, 2016, p. 362), a process that aims to build a story from original data, taking into consideration elements such as the problem, the characters, and the scenario in which the actions and decisions of the characters are discussed and presented together.

The fact that the participants were interviewed separately was important to avoid possible mutual influences in their answers. That is, it allowed the emergence of statements that possibly would not have begin put forward if the interview had been collective. On the other hand, our presence and position as interviewers is likely to have interfered with what was said and, mostly, with what was possibly omitted, due to our experiences shared directly or indirectly and to our common or divergent views with the interviewees. This produced *a first bias* in the data produced.

The participants' statements presented here correspond to their original utterances in their individual interviews. However, we built *fictional dialogues*, composing those lines in orders reconstructed by the authors. Interventions of the interviewer character are introduced in the restored dialogues to not only connect the respondents' utterances but, mostly, to stress aspects considered relevant to the reported episodes. As well as the selection of the speeches, the choice of the order in which they are reconstructed, and the emphases produced by the interventions of the interviewer character are determined by our own experiences, authors of this paper, as students and lecturers of the institution. This constituted *a second bias* of the data.

Thus, we characterize such dialogues as *fictional*, in the sense that they are reconstructed with eight characters – the researcher and the participants Ana, Elis, Inês, Olga, André, Edson, and Úrsula – based on the seven interviews conducted with each participant separately. Our procedure is inspired by

Nardi's (2008, 2016) work, in which the composition of the fictional dialogue was based on interviews with groups of participants conducted separately, and choices were made in the light of elements of the study, influences of literature, and research questions. In this paper, we present three episodes reconstructed through this procedure, after identifying the participants' utterances on themes arount lecturers' actions and their views on the relationships between mathematicians and mathematics educators in the context of the pre-service education of mathematics teachers at UFRJ. We selected the episodes based on several factors, incluing the importance of events, documents, facts, or relationships in the construction and in the conception of the curricula of the *licenciatura* in mathematics. As the evaluation of this importance also depends on our experiences as students and lecturers of the Institution, the selection of episodes constitutes *a third bias* of the data produced.

Thus, based on the arguments presented by the interviewees, we built the sequence of answers and their interactions to create a fictional dialogue among the eight characters, in which the alternation of ideas and the views of the characters are present. There are not necessarily comments from all the participants in each of the episodes, since in some of them, not all intervened, for reasons that include "having no recollection" or not being lecturers at the institution in the period in question. Table 2 below presents a summary of the three episodes presented, as well as the questions of the interview script from which the utterances that constitute these episodes were extracted.

Table 2

Episodes

	Episodes	**Questions of the script**
Episode 1	*on the inclusion of the module Geometry I* in the curriculum of the *licenciatura* in mathematics of UFRJ	7
Episode 2	*on the creation of the evening classes of licenciatura in mathematics of UFRJ*	10 and 15
Episode 3	*on the curricular changes of 2001 and 2008*	16

As Nardi (2016) points out, the proximity of the authors to the raw data, the transparency of the process that makes them "responsible and replicable" (p. 364) and, specifically in this work, the possibility of establishing

communication between lecturers are important constituent elements of the *re-storying* process. Thus, we offer a *re-reading* of the original data – as we believe to be the case for any type of data description, including those that present full original transcripts. Our participation in the interviews, the order of the utterances, the interventions of the interviewer character in the fictional dialogues, and the selection of the episodes are biased by the fact that we, authors of this paper, are deeply involved in the studied institution, and, thus, produce a particular interpretation of the story – *a possible narrative*. On the other hand, the fact that the dialogues were restored from utterances made separately by the participants -and that, possibly, would not have been expressed in the same way in a collective conversation- characterise this narrative not only as fictional but, to a certain extent, as *impossible*.

Thus, we produce a version of the history of the curriculum of the *licenciatura* in mathematics that is, on the one hand, narrated from our own subjectivities, perspectives, experiences, intertwined with the experiences of the respondents, and the meanings we produce for these experiences; and, on the other hand, restored from dialogues that possibly would not occur collectively. Our version of this story is, therefore, a tensioning of possibilities – *a (im)possible narrative*, in which we situate ourselves both as researchers and subjects, as authors and characters.

We present below the restored dialogues referring to the three episodes, according to the sequence described in the table 2. A section with comments and partial considerations follows each of these episodes.

Episode 1: On the inclusion of the module Geometry I

Researcher: In 1988, there were changes in the curricular matrix of the programme: five new modules were incorporated, seven were withdrawn and two had their names modified. The new modules were named: Conhecimentos Fundamentais da Matemática I e II, Matemática Combinatória, Geometria II and Evolução da Matemática [Fundamental Mathematics Knowledge I and II, Combinatorics Mathematics, Geometry II, and Evolution Mathematics].

Elis: Geometry I and II.

Researcher: Geometry I was in the 1983 curriculum

already.

Ana: Elis is right. Geometry I appeared in 1988 too.

Elis: I remember a lot of this fight. There was no geometry there. If the teacher of the module Matemática do Curso Secundário [Mathematics of the Secondary School] wanted to give some geometry within this module, he would do so. But there was no geometry as a module.

Researcher: There was only Geometria Diferencial [Differential Geometry], then?

Elis: Yes, and I remember that the argument of several lecturers of the Mathematics Institute was as follows: "Elementary geometry, the student who enters here must know beforehand. It's not to be taught here." I remember that Inês and I wanted to talk to those lecturers. André himself was angry with me for a long time. Then, it got better. But he was really furious. He wouldn't admit it at all.

André: Me? I don't remember any of that at all. I participated in a lot of discussions about the mathematics programme curriculum. But this discussion of the *licenciatura* in mathematics involved more the education people, didn't it?

Edson: I don't remember that discussion either. I didn't participate, so I don't remember, but I remember the titles of the modules. Perhaps it has a little to do with the fact that, once, I taught one of these modules that started in 1988. My focus is not on the *licenciatura* in mathematics. And with the creation of the department... not the department, the creation of the mathematics education group, I thought that this group had to have a lot more focus on the *licenciatura* in mathematics than myself.

Researcher: But how was the inclusion of the module Geometry I, then?

Inês: It was a novelty. The first geometry class was in

1986, and it was unofficial because the new curriculum had not yet been approved in the higher instances. We started working with it by force. And this discussion on curriculum we won because we had the statistics lecturers on our side. The statistics people also couldn no longer stand those four introductory early semesters of basic cycle, which were not introductory whatsoever. It was just like four semesters of the Mathematics programme.

Ana: Now, I think geometry was offered since 1983, but as an elective module. As a concession, then.

Olga: I didn't study geometry when I was a student, I only taught it. I do not remember this moment of insertion because I was doing my doctorate abroad at that time. But I remember that Professor André was one of those who thought that we did not need to offer geometry in undergraduate.

The (non) place of geometry in the licenciatura in mathematics.

When citing the modules that were included in the 1988 curriculum, according to the official documents, the researcher is faced with comments from lecturer affiliated with Mathematics Education that contradict the official information. According to Elis and Ana, the module Geometry I, which officially appears in the 1983 curriculum, became compulsory only in 1988. Such comments are not contradicted by the other participants. However, the respondents point out the resistance of lectures affiliated to the area of Mathematics regarding the inclusion of a module on Euclidean geometry, with the argument that this would be a theme "of elementary education" and, therefore, its inclusion in the curriculum of an undergraduate programme of the Institute of Mathematics of UFRJ would be a kind of "downgrade" for the Institution. Those notes are brought to the scene with the quote to one of the participating mathematicians, André, who the lecturers identified as an agent of such resistance. However, this professor does not confirm recalling such discussion.

From this context, we found, in the mathematicians André's and Edson's comments, indications that the responsibility for the discussion on the curriculum of the *licenciatura* in mathematics should lie over the group of

lecturers integrating the mathematics teaching/education area. In this sense, we realise that those manifestations reveal an estrangement of the mathematicians to the *licenciatura* in mathematics. That is, in their utterances these lecturers do not put themselves as agents of curricular reforms for the programme. However, when describing the process in which the module was inserted, the lecturers affliated to the area of mathematics education stress the difficulty they had to implement the module Geometry I for the *licenciatura* in mathematics, caused by the subordination of the early semesters of all undergraduate programmes of the IM-UFRJ (not only the *licenciatura*) to the mathematics programme. The support of the lecturers linked to the statistics programme in a process of modifying the curricula seem to have been linked to a move to overcome those constraints. Thus, the positions of lecturers André and Edson, combined with the final comments of Elis, Inês, and Ana, suggest that the *licenciatura* in mathematics would not be the responsibility of the mathematicians. Meanwhile, it seems that mathematicians do not legitimise this responsibility for mathematics educators, since modifications only occurred when the lecturers from another department subscribed to the request for reformulation of the early semesters of the programmes.

Thus, from this episode, we express a possible interpretation of the inclusion of the module Geometry I in the curriculum of the *licenciatura* in mathematics: it had been offered as an elective module at least since 1983; but from 1986, it became, unofficially, part of the first year of the programme; and was official included as a compulsory module in the 1988 curriculum. In this process, the resistance to the insertion of the module is evidenced in the clash between two conceptions: one that takes on the relationships between school mathematics and academic mathematics and the importance of approaching the former in the *licenciatura* in mathematics; and another that tears them apart, idealizing a hierarchy between them and placing the mathematical (or the mathematicians') knowledge in the center of the education of mathematics teachers, as underlined by Moreira and Ferreira (2013). Such clash, even if not made explicit in discussions for the curricular reforms at that time, is uncorvered by explicit actions, in the case of mathematics educators, or implicit actions, in the case of mathematicians, present in the dialogue we restore.

Episode 2: On the creation of the evening classes of* licenciatura *in mathematics of UFRJ

Researcher: Ana, do you think that the "3+1" format was

still present in the curricular organisation of the *licenciatura* in mathematics in the 1980s?

Ana: Yes. Look, the format really changed in 1993, with the creation of the evening classes.

Researcher: Can you talk a little about the process of creating the evening classes of the *licenciatura* in mathematics of UFRJ?

Edson: Not only with mathematics, but it was also with physics, with chemistry... But I know that it was Ana, who held an administration position, who led this movement.

Ana: Yes. I was in administration, and so was Elis.

Elis: Yes. I don't know why, but we began to feel that it was possible to have *licenciatura* in mathematics evening classes at UFRJ. There were lots of evening classes in private colleges... Td then, this time, I had Ana's partnership, instead of the partnership I had with Inês in 1988. Inês was abroad doing her PhD.

Ana: I think some data motivated us to do this. In the 1970s, we certified 30 mathematics teachers per year at UFRJ. And they were always the best teachers in town. In the 1980s, we only certified two or three students. And this decrease occurred mainly because of the downgrading of the teaching career.

André: I wasn't part of that discussion. But I'm very interested in the evening classes. To this day I talk with a former student who works as a lecturer at the IM, and she told me that the students are very weak. Arent' they?

Elis: Not quite, André. The concern was that we were aware that a student enrolled in evening classes would come from a full day's work and could not have the same pace as a student from the day classes. Also, there was that cultural thing that the evening classes were weaker. We wanted to stand against that idea. So, one of the things we thought about was, for

example, diluting the "Calculus I" in two semesters. For the student to have time, to have breath to keep up.

Researcher: But that was the profile you expected to an evening class student?

Ana: Yes. The Associate Director of the Physics programme at the time came to talk to me. As we certified few teachers in the day classes, both in physics and here, and we knew that this was related to the teachers' low salary and downgrading, he said: "For those who earn a minimum wage, graduating as a teacher represents social ascent".

Olga: Exactly. Our students in the evening classes were low-income people who needed to work. The way the day classes curriculum was, it was very difficult for them to get a job.

Ana: Yes. Especially for social layer C and D, the lower layer, this would represent social ascent. For a housemaid's daughter. It was this target audience that we wanted to receive. That people that does not have the same access as the middle class: to newspapers, to books, to foreign languages...

Researcher: Did the approval of this evening classes meet resistance at the IM-UFRJ?

Elis: I don't recall much of great resistance. I believe there was no such thing, but we had great debates. We worked a lot on that. There was a group that participated, but it was few people. I even believe that the project and the new curriculum were approved more easily than that of 1988.

Ana: I don't think it was that easy. I remember that you and I, Elis, made the first version of the curriculum and then, of course, we negotiated with everyone. There was the issue of departmentalised modules in day classes. That is, if it were the same way to the evening classes, the workload of the departments

would increase more at a time the evening many people wouldn't like to work, and it would never go through in IM high council. It passed in the council because we found out a possibility of not assigning the modules directly to the departments.

Edson: So, I remember there was a discussion about this issue of distribution in the departments. There was a distribution, and the evening classes have a code, which is a non-departmental code. The commitment was as follows: the distribution would take place according to the number of lecturers in each department, and this agreement remains to this day. For example, in the Department of Applied Mathematics, the guys does not like to teach at evenings. So, they propose an exchange: they take a module in the day classes of our department, Mathematical Methods, and we take an evening module because there are more people in our department who like to work with the *licenciatura* in mathematics.

Researcher: Why don't they like to teach at the evenings?

Edson: Oh, they do not like it because they leave the campus late, or they have no interest in the *licenciatura* in mathematics, some reason... I do not know, but they do not like it.

Evening classes created by whom and for whom?

In response to the researcher's question about the 3+1 model as an influence of 1980s curricula (as pointed out by Moreira, 2012), Ana, one of the lecturers of the area of mathematics education, indicates the creation of the evening classes of the *licenciatura* in mathematics, in 1993, and its curricular matrix as responsible for the rupture with that model. Then, a sequence of comments on the process of creation of the evening classes follows. In those comments, we stress, firstly, the joint actions between the Institutes of Mathematics, Physics and Chemistry, and, secondly, the data indicated by the mathematics educators as triggers for the process: a drastic decrease in the

number of certifications in the day classes, and the high number of *licenciaturas* in mathematics in evening classes in private institutions of tertiary education.

In this context, the comment from André, a professor of area of mathematics, brings to the debate an important element about his evaluation of the profiles of students from the *licenciatura* in mathematics. By indicating that the students in the evening classes are "very weak", we consider that this professor is clearly referring to the profile expected from prospective mathematics teachers: one must know well the mathematical contents of school education, assumed as prerequisites to keep up with the programme. From this context, we infer that such mathematical contents of school education are those that have scientific mathematical knowledge as a reference, as Moreira and Ferreira (2013) point out with respect to the stance of teachers education that disregards teachers knowledge with its own epistemology. In the wake of this comment, there is the counter-argumentation of the lecturers involved in the creation the *licenciatura* in mathematics, standing against the logic of the "weakening" of the evening classes, taking into account the fact that the students are workers, and proposing modifications in a module known for having a high rate of failure in the first year of the programme. In this sense, the students' socioeconomic profiles intended by those who led the construction of the (then) new evening classes are highlighted: people with low income, workers from less favoured social layers, who see teaching as a professional opportunity for social ascent.

Then, when inquiring about possible resistances to the creation of the evening classes by the IM-UFRJ faculty, the researcher is informed about the existence of debates and intense work of the group dedicated to the process of conceiving these classes. Furthermore, the answers of the two lecturers most involved with the process, Ana and Elis, seem to diverge to some extent. While Elis states that the new curriculum and the new evening classes were more easily approved than in the 1988 process, Ana indicates a complex negotiation scenario that involves a timeload increase for the IM-UFRJ departments. In this scenario, the distribution of the timeload among the departments opened up the possibility that a certain department would not give evening classes and would exchange modules with other departments instead, as reported by the lecturer mathematician Edson.

Thus, with regard to the creation of the evening classes of the *licenciatura* in mathematics of UFRJ, we are stricken by the positions that define the target audience aimed at, and the context in which such definition occurred. At a time when public higher education was still much less accessible

to underprivileged groups and university seats were almost entirely occupied by the Brazilian middle and upper social layers, our attention is caught by the attitude of the agents involved with the creation of the evening classes, aiming at people from less favoured groups as prospective teachers. Meanwhile, it is also worth noting that those agents were only lecturers linked to the area of mathematics education, and that the mechanism created for timeload distribution allowed departments with fewer lecturers interested in teachers education and evening shifts not to participate in the evening classes.

Episode 3: On the curricular changes of 2001 and 2008

Researcher: We had curricular changes in 2001 and 2008 too. Elis and Olga, you were already retired, but you may have some memory of how the debate was, since you continued to work on the *Projeto Fundão*. Do you remember anything?

Elis: There was no debate about it there.

Olga: The *Projeto Fundão* focused more on in-service education. We no longer got involved in those things concerning the *licenciatura* in mathematics. When Elis was an undergraduate lecturer, some things were debated there. But after that, after she retired...

Elis: Yes. I tried to discuss things in the *Projeto Fundão*. But about those changes, I believe they were to comply with federal resolutions, weren't they?

Úrsula: That's right, I was the one who worked at that time with those changes.

Researcher: From the early 2000s, those resolutions pointed to an increase in internship timeload and to the inclusion of mandatory requirements to specifically comply with some laws. And basically, only those things changed in those curricular versions. Why didn't you take the opportunity to make other changes?

Inês: Because we didn't have the strength to do anything else. The curriculum was not good, but it was already

much better than it had been back in the 1980s. And there was no other way: the change was mandatory, by law. The internship timeload had to be increased. We could no longer certify anyone in the *licenciatura* in mathematics with the internship timeload we had.

Úrsula: At first, I was against this structure of timeload increase. I was a little worried because the timeload was increased to 2,800 hours. The internship timeload increased by another 100 hours and the academic, scientific, and cultural activities were included, with 200 hours. It was a lot. There was already a draft project indicating 400 hours of teaching practice as a curricular component across the programme's module. I thought we didn't have to have 400 hours of internship.

Researcher: But teaching practice as a curricular component is only found in the most recent reformulation protocols. Right?

Úrsula: Yes, but there was already that discussion. It was not mandatory.

Researcher: So, do you see teaching practice as a curricular component and the insternship as similar things?

Úrsula: No, but I think they could keep 300 hours of teaching practice or cut it down to 250. Because the internship involves learning a little about the structure of the schools, learning how to work the educational part, putting together everything theylearn in philosophy, psychology, the way they will deal with the students. This contact with the student is independent of whatever content they may be addressing, and the main basis of the mathematical content will be in this practice as a curricular component.

Researcher: In this last curriculum of 2008, where you consider that the practice as a curricular component is?

Úrsula: So, I try to see it as a set of models that already covered, for example, what the student sees in school education. So, for example, Finite Mathematics is one of them, there are also the three modules on Fundations, Evolution of Science, Mathematics at School and, finally, Laboratory, which was the only module included in 2008.

Inês: At that time, between 2001 and 2008, we people from Mathematics Education let Úrsula leading the *licenciatura* in mathematics, so that we could take care of the creating of PEMAT's masters' programme. And she handled this process alone. Right?

Ana: Yes, it was like that. So far, I haven't said anything about this issue because at that time I was in administration positions out of IM. But I think that any discussion about the *licenciatura* in mathematics must start with this group of lecturers from PEMAT, from the *Projeto Fundão*, and then expand this discussion in IM's council.

Changing Priorities and the Leading Positions of the Licenciatura in mathematics

When asking about the curricular changes of 2001 and 2008 to lecturers Elis and Olga, who were already retired in that period, the researcher drives his question to the context of the discussion on such changes in the *Projeto Fundão*, an extension action in which they still work. The lecturers' negative answers about the involvement of the members of the *Projeto Fundão* in the curricular reformulations of the *licenciatura* in mathematics in the 2000s, the argument centred on Elis as responsible for the agency of this debate in the past, and the prioritisation of actions in in-service teachers education reveal a possible alienation of the lecturers linked to mathematics education from the licenciatura in mathematics at IM-UFRJ. This alienation is confirmed. throughout the dialogue, by Inês and Ana, both lecturers linked to the area of mathematics education, and who were still in service at IM-UFRJ when those changes took place. The justifications presented consisted of pointing out the tiredness of the lecturers who had been working in the *licenciatura* in mathematics, and their efforts to open a masters' programme, which led to the creation of the Graduate Programme in Mathematics Education at UFRJ (PEMAT).

Thus, some space has been given in for new actors to assume leading positions in the *licenciatura* in mathematics. Úrsula, the only lecturer participating in the research that we did not associate to one of the areas, becomes director of the programme and responsible for the actions in the curricular changes of the *licenciatura* in mathematics at the UFRJ in the early 2000s. This switch in the programme's director, justified by some of the research participants, demonstrates shifts of priorities by the group of lecturers from the area of mathematics education. At that time, establishing mathematics education at the *stricto sensu* graduate level became the priority of those lecturers' action, taking into account, among other factors, the experience with in-service education actions in the *Projeto Fundão*. In our interpretation, such shifts in priority may have hindered structural changes in the curricular matrix of the *licenciatura* in mathematics towards a model that would move even further from the 3+1 variants (Moreira, 2012) and also from the integrative logic that had been promoting a quasi-trichotomy (Fiorentini & Oliveira, 2013).

In the dialogue we restored above, the moment in which there is greater interaction between the researcher and Úrsula shows the concentration of decisions about curricular changes in the figure of this lecturer. In this moment, it we can see the participant's disagreement with respect to the laws that recommended the changes, especially regarding the increase in the supervised internship timeload. We also highlight the mention to the inclusion of practice as a curricular component, which was already present in draft projects and resolutions of the early 2000s (Brasil, 2002; 2005), defined as "the set of training activities that provide experiences of the application of knowledge or development of procedures specific to the exercise of teaching" (Brasil, 2005) and recommended from 2015 as a necessary element for the new curricula of *licenciaturas*. In our interpretation, the participant's utterance about the practice as a curricular component reveals some anachronism in relation to the legal prescriptions for teachers' pre-service education at the time, as well as a view that overlaps the practice as a curricular component and the teaching practice present in the supervised internship. These aspects had already been noticed in information on the creation of the evening classes, present in official documents of the *licenciatura* in mathematics of UFRJ (Costa Neto & Giraldo, 2019).

Thus, we interpret that the shifts in the priorities by the group of mathematics education lecturers in IM-UFRJ, which led to a switch of the *licenciatura* in mathematics' director, drove the group away from the discussions that culminated in the 2001 and 2008 curricular changes, either based on the understanding of what the laws and resolutions stated, or in inner debate spaces, such as the *Projeto* Fundão could have been. Finally, an

utterance from Ana, a mathematics education lecturer, who was still in service then, stresses the importance and concern that structural changes in the *licenciatura* in mathematics should start with actions by lecturers who currently work in the PEMAT and the *Projeto Fundão* – with which we also agree.

CONSIDERATIONS

As a closure for the presentation of the restored dialogues, we wish to establish connections between the episodes, which are intrinsic to the answer we intend to formulate to the question stated at the beginning of this paper: *How do negotiations and actions among lecturers who see themselves as mathematicians or as mathematics educators take place in the context of a* licenciatura *in mathematics?* These negotiations occur, even in different periods, in a scenario characterised by the imbalance between the areas involved: on one side, actors from a research area that is consolidated and acknowledged in the field of exact sciences, and is hegemonic in the institution; on the other side, protagonists of a still incipient process of consolidation of a new research area, which is related to school teachers education, in dialogue with the field of human sciences. This imbalance is evident when a group considers it unnecessary to address a given mathematical topic because it is associated with school syllabus.

This scenario, although seemingly dichotomous, acquires even more complex contours, that are revealed in what is implied in some utterances. The lecturers affiliated with mathematics education have been recognising the professionalisation of and the orientation to teaching practice in school as constitutive aspects for mathematics teachers education (Tardif, 2013; Nóvoa, 2009) since the 1980s. However, this recognition, reified in the creation of some modules and in curricular changes, is not enough for the lecturers identified as mathematicians to understand the need to address these aspects in the *licenciatura* in mathematics. Thus, we ask ourselves: *Which actions should mathematics educators carry out so that negotiations with mathematicians with respect to the* licenciatura *in mathematics would take place within a frame of balance between the areas?* Obviously, the search for this answer can trigger broader investigations. However, we try here to outline paths to answers through elements raised in the episodes.

The creation of the evening classes of the *licenciatura* in mathematics at UFRJ, as well as the justifications and positions of those who were in charge of this process, the investment of lecturers linked to Mathematics Education in their education at the doctoral level in this area, and the process of creating a

graduate programme in mathematics education at IM-UFRJ could be sufficient actions to answer the question we state in the previous paragraph. However, other actions, intertwined to those ones, may have prevented the approximation between mathematicians and mathematics educators towards pre-service teachers education, such as: the mechanism for timeload distribution of evening classes, which allowed departments and lecturers to bypass the work in the *licenciatura*; and the absence of lecturers from the area of mathematics education as directors of the *licenciatura* in mathematics in the period of creation and first years of existence of the graduate programme in mathematics education.

In this context, the disputes seem to be related to what constitutes the knowledge necessary for the pre-service mathematics teachers education (Ball et al., 2008), as advocated by Moreira and Ferreira (2013) when pointing out the clash between two stances: one that is supported by the personal views of mathematicians, who exercise another profession, considering academic mathematical knowledge as central (or unique) reference knowledge in teachers education; and another that considers teachers' mathematical knowledge as plural, with specific aspects emerging from school mathematics, but which was in an initial process of systematisation and theorisation. However, there are indications that those disputes are situated in more strategic goals: such as the preservation of political terrain, where the education of prospective teachers is placed in the background, and suffers the side effects of disputes over space, either in carring out research at the institution or in hiring new lecturers.

As some authors have already observed (Lopes, 2013; Gabriel, 2013), the complexity of the disputes we discussed in this paper can be evidenced by the displacement from a local terrain, the *licenciatura*, into a more general one, which is the preservation of fields and professional actions. However, the episodes we analysed here allow us to observe the micropolitics that involves the relationships between lecturers, departments, and graduate programmes in the same institution. Thus, when trying to answer the research question stated in this paper, based on the specific data analysis design we adopted, we intend to allow (re)readings, different from those we did here, even contradicting our arguments and interpretations. We understand, therefore, that the construction of dialogues as we did in this context, is only possible to be done one single time. Any attempt to use the data we produced to analyse this same research question, either with the methodology we used here or with another one, either written by ourselves or by other researchers, will not be carried out in the same conditions and, therefore, will not lead the same results. Thus, we are not concerned about obtaining closed answers on the actions and negotiations of

mathematicians and mathematics educators in the context of the *licenciatura* in mathematics of UFRJ, since we tell (part of) one of the as many stories as possible, through our lenses.

AUTHORSHIP CONTRIBUTIONS STATEMENTS

CDCN conceived the idea presented and VG helped him in the choices concerning the theoretical paths. Both worked in the scripts design and in the data production. CDCN adapted the methodology to the context, and carried out the data analysis. Both authors actively participated in the discussion of the results, reviewed, and approved the final version of the paper.

DATA AVAILABILITY STATEMENT

The data supporting the results of this study will be made available by the corresponding author, CDCN, upon reasonable request.

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