

**Documentos para ensinar matemática em turmas de
EJA-Campo: um olhar para a produção de professores(as)
à luz da Abordagem Documental do Didático**

**Documents for teaching mathematics in YAE-Field classes:
A look at teachers' production in light of the
documentational approach to didactics**

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ABSTRACT

The article presents an analysis of documents from one male and one female teacher who teach mathematics in YAE-Field classes in the Agreste Pernambucano, as well as the relationships they establish with local rural people. It is based on the documentational approach to didactics and employs a reflective research methodology to generate data through the following instruments: semi-structured interviews, video production, resource mapping, and observation of plan preparation and classroom activities. The analysis reveals, on the one hand, that teachers have a repertoire of varied resources for teaching, both remotely and face-to-face, with the potential to promote different relationships between mathematical content and local rural people. On the other hand, it is clear that they need access to continuing education in field education, mainly to contribute to the expansion of the schemes of use mobilized for teaching mathematics.

KEYWORDS: Documents produced by the teachers, Resources for teaching mathematics, Yae-field, Remote teaching.

RESUMO

O artigo traz uma análise de documentos de uma professora e de um professor para ensinar matemática em turmas de EJA-Campo no Agreste Pernambucano, bem como das relações que

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estabelecem com o campesinato local. Apoia-se na Abordagem Documental do Didático e utiliza a Metodologia de Investigação Reflexiva para produzir os dados por meio dos seguintes instrumentos: entrevista semiestruturada, produção de vídeos e mapas de recursos, observação da elaboração de planejamentos e de aulas. A análise revela, por um lado, que os(as) professores(as) dispõem de um repertório de recursos variados para utilizar no ensino remoto e no presencial, com potencial para promover diferentes relações entre os conteúdos matemáticos e o campesinato do lugar. Por outro lado, fica evidente a necessidade de eles(as) terem acesso à formação continuada em Educação do Campo para contribuir, principalmente, com a ampliação dos esquemas de uso que mobilizam para ensinar matemática.

PALAVRAS-CHAVE: Documentos do(a) Professor(a), Recursos para ensinar matemática, Eja-campo, Ensino remoto.

Introduction

Historically, in Brazil, Youth and Adult Education (YAE) was organized in both the countryside and the city around temporary programs and projects that required little from teacher education. While the purpose was, on the one hand, to reduce illiteracy rates, on the other, it was to meet the demand for a workforce for industrialization. Regarding the rural population, formal teaching initiatives for young and adult learners focused on reading short texts, signing names, and performing calculations involving addition, subtraction, division, and multiplication. The conception of education that underpinned this teaching reflected the predominant social organization in the country, imprint of the colonial processes that anchored an aristocratic society based on large landlordism and slavery, and ignored the right of rural people to a full, human, and emancipatory formation. In this sense, Ribeiro (2012, p. 299) points out that:

There is a need to take into account the colonization process and, related to it, the slavery regime, the latifundio, and the predominance of extractive and agricultural production aimed at export. This social formation did not require workforce qualification. Thus, a part of the elite looked down on the schooling of the popular strata, particularly peasants.

Faced with this reality, the popular classes organized in community groups and social movements, and, with the contribution of some intellectuals committed to emancipatory education, mobilized to live educational experiences that manifestly represented the longing of the population, in an organic movement that became known as popular education. Souza (2021, p. 73) points out that "[...] Popular education materializes as the central conception of the education of the oppressed, that is, the education of populations impoverished by capital or what is conventionally called 'non-formal education'." It is marked by the protagonism of the educational subjects who, through their educational practices, questioned proposals for formal education characterized by temporality and shallowness, aimed solely at training

labor required for the industrialization and urbanization of the country, mainly from the 1960s onwards.

Freire (1987) points out that popular education represents the experiences that confront the forms of subalternization and the hegemonic social logic reproduced by YAE programs and projects. With its approach to education *with* people—not *for* them—popular education brought to light a conception of education based on ideals of freedom, solidarity, appreciation of life, human emancipation, and political education as a means of liberating people from a social logic that puts profitability above life. Thus, it caused a profound movement of rethinking education and resisting the tyranny, repression, and violence of the military dictatorship that persecuted, tortured, and killed people who fought in defense of democracy.

The strength and power of popular education, as emphasized by Lima, Hage, and Souza (2021), are seeds that germinated, grew, and bore fruit in adversity. One of these fruits is the Movimento por uma Educação do Campo [Movement for a Field Education], which continues to flourish under the leadership of popular social movements and trade unions in the field (Santos *et al.*, 2020). Field education is nourished by the struggle of rural workers for the right to land, for food sovereignty, and for an inclusive corporate project grounded in equity and social justice. This process requires a unique school that recognizes the identities, cultures, ways of life, and production of the peoples of the field, waters, and forests. These are, therefore, the bases of the field school. For the authors:

The concept of field school is intrinsically linked to the struggle for the democratization of the land and presupposes a human and omnilateral education. These are virtues learned from popular education that presuppose and propose an education rooted in realities and guided by the aspirations of freedom, human emancipation, equality, and happiness. These concepts from popular education are being implemented in the educational processes in field schools (Lima; Hage; Souza, 2021, p. 9).

Therefore, the relevance of the field school lies in its potential to promote dialogue within its territory, in the exchange of knowings, and in the lived experience of didactic-pedagogical and sociocultural practices that favor intervention in different realities. It constitutes a space of struggle and socio-political and cultural propositions that prioritize the human dimension of students, teachers, family members, and all the people who form the school community. YAE-Field is therefore based on these references to teach young and adult people in the field and to educate teachers who teach various areas of knowledge, including mathematics, as expressed in our research object.

Within this theme, we developed a thesis in the publication phase that documents teachers who teach mathematics in YAE-Field classes in the Agreste Region of Pernambuco. For this purpose, we considered the documentational approach to didactics (DAD) (Gueudet; Trouche, 2008, 2015), for which a document is the union of a resource that teachers select, build, or use to teach, associated with the scheme of use they mobilize. When choosing the research object, we consider, on the one hand, the uniqueness of teaching in the context of YAE-Field and, on the other hand, the close relationship between the teacher's documentation and their initial and continuing education in mathematics and field education.

The specific education of teachers in the field has long been a central demand of popular social movements and a recurring theme in debates across various spaces, including the Academy. This requirement begins with the recognition of the importance of initial and continuing education for these teachers, as articulated in the rights and interests of rural subjects, thereby breaking with the historical perspective of rural education (Lima, 2018). Decree n.º 7.352 of November 4, 2010 (Brasil, 2010), providing for educação do campo [field education] policy and the Programa Nacional de Educação na Reforma Agrária (PRONERA) [National Program of Education in Agrarian Reform], recognizes this right when it establishes, in its article 2, the "[...] development of policies for the education of education professionals to meet the specificity of rural schools, considering the concrete conditions of production and social reproduction of rural life;". It also recognizes the need for resources, including textbooks, that take into account the different realities of the territories in which the schools are located.

Silva and Lima (2021), Silva and Lima (2023a), and Silva and Lima (2023b) present analyses of the resources selected, constructed, and/or used by teachers who participated in the research, and of the relationships between these resources and the productive activities developed by the students of YAE-Field. We also considered the realities that marked teaching processes during the COVID-19 pandemic, given that the research data were collected during the return to face-to-face teaching after remote teaching.

In the communication paper we published in the Proceedings of the IX Seminário Internacional de Pesquisa em Educação Matemática (IX SIPEM) [International Seminar on Research in Mathematics Education] (Silva and Lima, 2024), we aimed to analyse documents produced by Teacher Jitirana (female) and Teacher Guarujá (male), fictitious names, who participated in the research, and their

relationships with the local peasantry, which contemplates the place of belonging of the school and the students. This article is, therefore, an enlarged version of said communication paper.

Thus, we first present the structuring elements of the DAD, then outline the methodological approach we used to collect data from teachers, and present the main results of the research.

Documentational Approach to Didactics

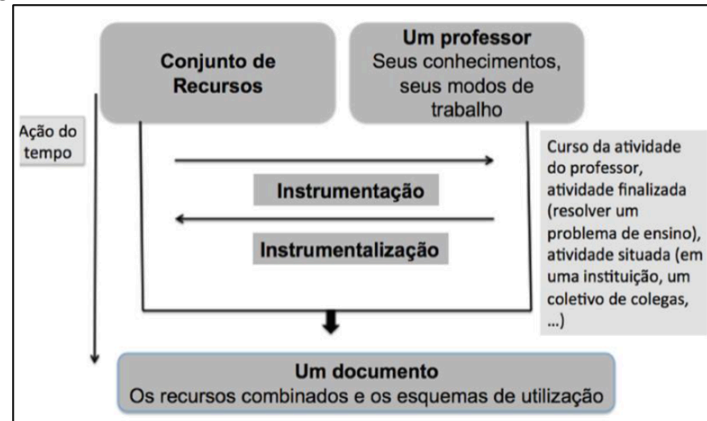
Within the scope of the DAD, the term "resource" refers to a variety of materials available to teachers for planning their classes and teaching. This notion was drawn from Adler's (2000) work, in which a resource feeds the teaching activity. In DAD, as Bellemain and Trouche (2019, p. 117) state, "[...] teachers' knowledge is not considered here as resources [...]". However, everything external to teachers' knowledge that guides the teaching activity, such as textbooks, school programs, digital applications, activities, or students' productions, is considered a resource.

The resources teachers have at their disposal constitute their system of resources, which not only represents one set but also involves the relationships among them. Bellemain and Trouche (2019, p. 118) emphasize that "a teacher's resource system is a living entity, structured in relation to their activity (according to teaching levels, types of activity, etc.)".

From this perspective, the teacher selects, builds, or modifies a resource according to the teaching objective and the schemes of utilization it mobilizes. As Gueudet and Trouche (2015, p. 8) emphasize: "[...] teachers, in their documental work, have a set of resources of various natures, which will originate, for a certain class of situations, during a process of documental genesis, a document". Hence, a document is a composite entity constituted by resources and utilization schemes, and is represented by Gueudet and Trouche (2015, p. 6) as follows: document = resource + utilization scheme.

The documental genesis results, therefore, from the work carried out by the teacher from their utilization schemes and is represented by Gueudet and Trouche (2015) by the following scheme:

Figure 1 - Schematic Representation of Documental Genesis



Source: Gueudet and Trouche (2015, p. 8).

To understand a teacher's documentation, in addition to identifying their resources, it is necessary to observe how they use them because, through the identifiable regularities in their activity across different contexts and with the same objective, the elements that allow us to infer the mobilized utilization schemes emerge. For Gueudet and Trouche (2008, p. 7), "[...] the essence of a utilization scheme is a psychological construction, a set of operational invariants, whose elements can be inferred from the use of resources."³

The identification of the utilization schemes mobilized by the teacher requires monitoring the documentation work in the spaces where it can occur, for example, during planning classes both at school and outside, as well as in the classroom during teaching. Based on the DAD assumptions, we proposed the data production procedures outlined below.

Methodological Trajectory

The research data, of a qualitative nature, were produced based on the *reflective research methodology*, which is specific to the DAD and is characterized by the following principles:

The principle of a wide collection of material resources used and produced during documentation work; the principle of long-term monitoring; [...] the principle of monitoring everywhere (inside and outside the classroom) [...]; the principle of reflective monitoring of documentation work, in which the teacher's view of their own work is widely requested; the principle of confrontation, from the point of view of the teacher with their documentation work and the materiality of this work (materiality arising, for example, from the collection of material resources or even from the teacher's practices in their classes) (Trouche; Gueudet; Pepin, 2020, p. 8).

³[...] l'essentiel d'un schème d'utilisation est un construit psychologique, un ensemble d'invariants opératoires, dont certains éléments vont pouvoir être inférés de l'usage des ressources.

This methodology allows teachers to reflect on their teaching practice *and, thus, contributes to* their professional development, *as it constitutes* a formative activity. *The teacher's documentation process is, in itself, also formative.*

Thus, we adopted the reflective research methodology to study the documentation work of the participating teachers, Teacher Jitirana and Teacher Guarujá, which we present in this article. Based on the methodology principles, we used the following data collection instruments:

Semi-structured interview 1: Held at school to obtain information on teachers' professional formative profiles, experience with mathematics teaching, and their resources, and how they used them in remote teaching and when they returned to face-to-face classes.

Presentation of resources: We asked the teachers to record a video presenting the resources available at the school for teaching mathematics and how they used them during class planning and in their lived experiences.

Schematic representation (map) of the resources: It consisted of the teachers' construction of a scheme or map of their resources and the explanation of their mutual relationships. First, however, we provided some examples to guide our request better.

Conversation circles with YAE-Field students: Used to collect data on the local peasantry, on students' realities, especially regarding their productive activities.

Observation of the construction of lesson plans: Identification of documents produced by teachers during this activity.

Semi-structured interview 2: Carried out after observing the construction of the class planning to obtain more information, for example, about the students, the contents worked, and the process of selection and/or production of resources;

Class observation: To identify the utilization schemes mobilized by the teachers and complement the data obtained through the other instruments.

It is worth mentioning that before starting the data production process, the terms of agreement and trust between researchers and participants were signed, in compliance with the ethical procedures required in scientific research.

Considering the emphasis of previous publications (Silva and Lima, 2021, Silva and Lima, 2023a, Silva and Lima, 2023b, Silva and Lima, 2024), as well as the objective and specificity of this article, we will focus the analysis on the data that

allowed us to characterize two documents, one produced by Teacher Jitirana and another by Teacher Guarujá.

Research Findings

To organize the data, we used the following aspects: characteristics of the local peasantry; education and professional experience; Teacher Jitirana's and Teacher Guarujá's resources for teaching mathematics; and documents and relationships established with the local peasantry.

Characteristics of the local peasantry

Although the communities in which Teacher Jitirana and Teacher Guarujá taught in YAE-Field classes have their own characteristics, they share some aspects, such as the short distance that separates them from the cities, 8 km and 5.2 km, respectively, and are easily accessible. The productive activities in both are predominantly agricultural, mainly the planting of corn, beans, and vegetables, and the breeding of animals such as chickens, goats, sheep, and cattle. Residents of both communities work on farms, smallholdings, or in the city.

Professional education and experience

Both teachers attended the mathematics teaching degree, have a *lato sensu* specialization in mathematics teaching, and participated in continuing education on YAE. However, only Teacher Jitirana participated in a continuing education course on field education. She also holds a degree in biology with a specialization in biology teaching. During the research development, Teacher Jitirana had been working as a mathematics teacher for 25 years and at the YAE-Field for six months, while Teacher Guarujá had ten years of experience in mathematics teaching and had been working at the YAE-Field for one year.

It is noteworthy that both have a degree in mathematics and specialization in mathematics teaching, given the history of a lack of specific education for teachers to teach YAE, especially in classes located in peasant territories. However, it is also noteworthy that these formative courses do not always promote a dialogue between school curriculum knowledge and knowings derived from the sociocultural practices of rural subjects, their identities, and the complexity of the territories, or with the cultural and social diversity of different peasant contexts.

To address this distance, the Cursos de Licenciatura em Educação do Campo (LEdoC) [Field Education Degree Courses] emerge as a fundamental tool for

promoting specific and integrated initial education in the realities of peasant territories. As Lima (2018, p.54) emphasizes, these courses "[...] can contribute to disrupt teaching in basic education and in the education of teachers constituted from the perspective of rural education". Faced with the still-limited availability of LEdoC, many rural teachers, including teachers Jitirana and Guarujá, who are already in office, did not have access to this education process. In this scenario, continuing education in field education emerges as a real need to bring such teachers, among other education professionals, closer to the struggles of social movements in the field for a socially referenced, democratic, inclusive, and quality education grounded in the principles of equity and social justice.

Teacher Jitirana's and Teacher Guarujá's resources for mathematics teaching

As we said, the production of the research data occurred upon the return to face-to-face teaching after the remote teaching experienced during the pandemic. As a result, teachers Jitirana and Guarujá also presented the resources they used in remote teaching, as can be seen in Chart 1:

Chart 1 - Teacher Jitirana's and Teacher Guarujá's Resources

Type of Education	Teacher Jitirana	Teacher Guarujá
Remote	Computer; Internet searches; Google Meet platform; WhatsApp app; Video Calls; WhatsApp groups; Textbooks; Mathematical activities printed on paper; Relationship with students' realities	Planning; Computer; Internet searches; Blogs with content about YAE; Mobile phone (smartphone); Videos and audios; Video calls; WhatsApp app; WhatsApp groups; Mathematical activities printed on paper
In-person	Board; Computer; Internet searches; WhatsApp app; WhatsApp group; Textbooks; Activities proposed by the teacher; Play dough; Toothpicks; Cardboard boxes; Product packaging of different formats; Magazines; Mathematical games	Planning; Board; Computer; Internet searches; Blogs with content about YAE; Activities proposed by the teacher; Printer; School yard

Source: Research collection

Due to the unique nature of remote teaching, resources were primarily digital, including internet searches, cell phones (smartphones), and WhatsApp. For Teacher

Jitirana, this modality was challenging, mainly due to the precariousness of internet access and the difficulties of YAE-Field students in having the necessary equipment for the class, as shown in the following extract from her speech:

Teacher Jitirana: *When we were in the remote, we had one more... a very great difficulty because they [YAE-Field students] are older. Here we are in the countryside, and the internet here is terrible. The community... the internet here is very bad. In addition, they are very needy; they cannot buy a smartphone, a device with internet access.*

Teacher Guarujá also highlighted the precariousness of internet access as one of the challenges of remote teaching:

Teacher Guarujá: *It was horrible. First thing is the following..., you try to group enough students for class, right? Even remotely. And the other one is that you try to keep in touch with these students and encourage them to participate in the activities. This was one of the most difficult parts, not to mention access to technology and the internet. Where they live, the access is horrible.*

To overcome these difficulties, both teachers used printed mathematical activities as their main resource. The activities were researched on the internet and in textbooks, and sometimes modified to bring them closer to students' realities:

Teacher Jitirana: *I took it from a book, searched the internet, and used it within their context, centered on them [...]. I changed, changed the statement, you know? To make it easier to understand, I would put some examples from their reality there, when we talked about... When I posed problems, I would often go back to the agricultural situation right there to see if it was simpler.*

We noticed that, to bring mathematical activities closer to students' realities, the teacher used situations related to agricultural work. We believe that this relationship can potentially promote reflection and discussion from a critical perspective, as recommended by field education and critical mathematics education (Silva et al. 2019). It contributes, on the one hand, to the appreciation of the productive activities developed by the students of YAE-Field and, on the other, to the construction and/or reinvestment of mathematical knowledge that such activities involve.

In the return to face-to-face teaching, the predominant resources became the board, the textbook, mathematical games, and everyday objects (magazines, product packaging, toothpicks, etc.). However, some digital resources, such as WhatsApp, continued to be used for communication and sharing activities with YAE-Field students who did not return to classes immediately.

Documents and relationships established with the local peasantry

Teacher Jitirana planned a class on polyhedra and round bodies to help students identify the elements of those figures and identify them in everyday objects. To this end, she selected the following resources: a summary of the content produced from internet research; playdough, sticks, and product packaging in different formats; and two mathematical activities on polyhedra and round bodies. The intention to relate the mathematical contents with elements of the students' realities was a regularity that we identified both in the teacher's speech and in the teacher Jitirana's class, as shown in the following episode:

Teacher Jitirana: *I brought here very common objects we have at home, ok? Look, a shoe box, look..., a milk carton, a soap box, a glass, look at the shape of my glass. I brought it here too..., let me see what this is..., packaging of... potatoes, and here I also brought another box of soap, okay? So, all these boxes here, I believe they are very common in our daily lives, true or not?*

Student: *Yes!*

Teacher Jitirana: *True! But if... What do these little boxes have to do with our theme yesterday? Could it be that everything in these little boxes, all these little boxes, is a polyhedron?*

Students: *No.*

Teacher Jitirana: *No? And who could tell me here one that is not a polyhedron? Teacher, I don't know, but I think it's that one... Which one do you think that is not?*

Student: *Milk? The milk carton?*

Teacher Jitirana: *The milk carton. Why the milk carton? Can I throw my milk carton on the floor? Yes! What is going to happen?*

Student: *You can, but it will turn over.*

Student: *Turn over.*

Teacher Jitirana: *It will turn over. Will it turn over in all its dimensions, in all its parts?*

Student: *No, it turns to one side only.*

This episode shows the beginning of the class, when the teacher presented the students with product packaging and, based on it, explained the polyhedra and their elements (faces, vertices, and edges) and round bodies. In this way, the teacher sought to relate the geometric content taught to students' everyday objects, which is a choice also used in other moments of the class we observed.

Teacher Jitirana: *Yeah. I'll get some objects for you to see... Look here, can you see that cylindrical shape? If I throw it, it's going to roll over, see? Not this one; if I throw it, it does not roll over, look..., it will stop. They have distinct shapes. The same thing [happens] with this*

one, look here... if I throw it, it will not roll like the other. So, we're still missing two names here. What are the missing names?

Student: *This one.*

Teacher Jitirana: *You have already put the name cylinder here. There is one missing... the cone.*

Student: *The cone.*

Teacher Jitirana: *A name is still missing. We already have one, two, three, four. There is one missing. Look here, what is this name here? Cube, the one Ms [student's name] did.*

The dialogue between the teacher and her students shows that she used packaging, an everyday object, as a resource to help them understand the properties of some geometric solids. The teacher's choice to teach this content from a planning perspective suggests the following utilization scheme: associating geometric solids with everyday objects. The operative invariant is, therefore, the relationship between mathematical concepts and the student's use of everyday resources.

Teacher Guarujá, in turn, planned a class on measuring the perimeter of plane geometric figures. For the class, he selected the following resources: a whiteboard to make notes on the content to be taught, such as calculating the perimeter of a rectangle, and a tape measure to measure the perimeters of classroom objects. To justify the choice, he argued that the official YAE-Field curriculum is very complex for the class's level of development and, therefore, sought to "adapt" it by adding simpler content. The teacher also highlighted the importance of relating the content covered (calculation of the perimeter measurement) and students' realities, as shown in the following excerpt from the interview:

Teacher Guarujá: *As a perimeter, in my opinion, for them, is something that... it may be that in everyday life they see it, right, as they live in the countryside, the people putting up fences; the people, for example, digging a well, then the issue of volume appears there. So, I believe that they will associate this situation with perimeter and then area.*

As the teacher did not explain what the "adaptation" of the curriculum consisted of, based on his answers, we believe that he referred to the relationships he sought to establish between the mathematical content and aspects of the realities of the peasantry and the students' lives. An example of this can be found in the excerpt from the class we observed:

Teacher Guarujá: *We will recall what a perimeter is, right? Look, let's go. Let's imagine here, let's even use my desk here... not my desk, right, the school desk, right? Let's imagine that this desk here, this desk, has a rectangular shape. We will work here with the units of measurement, right? But before we work on units of measurement, I*

would like to know if you know what this is [he holds up a measuring tape].

Student: *A measuring tape.*

Teacher Guarujá: *What is it?*

Student: *A measuring tape.*

Teacher Guarujá: *What is this for?*

Students: *To measure.*

Teacher Guarujá: *To mea...*

Students: *Measure.*

Teacher Guarujá: *Do you know what we are going to measure?*

Student: *My father uses it all the time.*

Teacher Guarujá: *Measure what?*

Student: *My father uses it all the time.*

Teacher Guarujá: *Wow, that's wonderful. This is really for measuring, right? When we talk about perimeter, guys, we have to understand..., or at least stop and think, what a perimeter is, right? I'll give you a general idea. For example, this format here, look [pointing to the desk], is a rectangle, right, in relation to the angles, there are four right angles, but, anyway..., perimeter, guys, it is this, look..., I'm going to ask a question here, and you will observe and say what happens. What did I do here? Did I make a...?*

Students: *A square.*

Teacher Guarujá: *Measure what?*

Students: *A square.*

Teacher Guarujá: *No, calm down... no, calm down. I outlined it, right? I outlined something. An outline.*

Without analyzing the teacher's teaching methodology and strategies, we highlight his choice to use the desk surface as a resource to introduce perimeter teaching. Then, he presented a tape measure and asked the students if they knew the object and its purpose. Using this resource, the teacher sought to teach the mathematical content, bringing it closer to something he considered to be part of the realities of the students of the YAE-Field Class, as shown in the following extract:

Teacher Guarujá: *Imagine you are there, now, for example, at home, at home now. Let's suppose that in front of your home, there is a yard that belongs to you, but lately, there have been some minor problems with the neighborhood. What's the little problem? You have plants in your house, a "vegetable garden", and the animals are entering there and starting to trample on it.*

Student: *Breaking the stems.*

Teacher Guarujá: *Yes. What happens is that, to avoid problems with the neighborhood, we're going to fence it. To fence it, what do I need?*

Student: *Mesh.*

Teacher Guarujá: *Made of what?*

Student: *Mesh.*

Teacher Guarujá: *The mesh is also valid, very good. Of what?*

Students: *Stakes.*

Teacher Guarujá: *Made of stakes. What else?*

Students: *Wire.*

Professor Guarujá: *Wire and what else?*

Students: *Clamps.*

Teacher Guarujá: *So what are we talking about? Of pe... pe...*

Student: *Perimeter.*

Teacher Guarujá: *We started with the idea of a yard at your home, and to avoid problems with the neighborhood, we need to fence that land. So what is it that we need again?*

Students: *Stakes, wire, clamps.*

Teacher Guarujá: *This [student] said something else.*

Student: *Netting.*

Teacher Guarujá: *Netting. See, but to fence that environment there, what do I need to do?*

Student: *To measure.*

Teacher Guarujá: *Measure what?*

Student: *To measure.*

We note that the teacher chose an activity that involved the construction of a fence to protect a vegetable garden from animals. Even though this is a hypothetical situation, building fences is a common activity among local peasants. Thus, the students identified with it and started to mention the items necessary for such construction: mesh, wire, stakes... The teacher pointed out that to build the fence, it would be necessary to measure the perimeter of the garden plot and, thus, sought to establish a relationship between the mathematical content and the students' realities. The teacher's choices led us to infer that he mobilized the following utilization scheme: relating perimeter calculations to everyday objects and situations. And as an operative invariant: the relationship between the contents and aspects of the student's daily life.

Based on these analyses, we proposed a characterization of the documents produced by Teachers Jitirana and Guarujá, as follows:

a) Teacher Jitirana's document.

Combined resources: board, summary of content printed on sheets of paper, product packaging of different formats, mathematical activities, sticks, and playdough; *inferred-utilization scheme:* associating geometric solids with everyday

objects; *operative invariants*: the relationship between students' mathematical content and aspects of their daily lives.

b) *Teacher Guarujá's document*.

Combined resources: board, classroom teachers' desk, tape measure, and two mathematical activities; *inferred-utilization scheme*: relating the calculation of the perimeter measurement to everyday objects and situations; *operative invariant*: the relationship between students' content and aspects of their daily lives.

Relationship between the documents and the local peasantry

Teacher Jitirana's choice to modify the activities she found in internet consultations and textbooks to incorporate elements of community-developed agriculture—production of corn, beans, and vegetables, and work on farms and small landholdings—points to a concern in relating mathematics teaching to the local peasantry.

Even if the resources that make up the observable part of Teacher Jitirana's documentation do not have characteristics that refer to the local peasantry, the utilization scheme, the unobservable but inferred part, brings elements of real life. In fact, in one of her speeches during the first interview, the teacher justified her use of examples from students' realities, such as agricultural work, as it is a striking characteristic of the community that hosts the YAE-Field class in which she teaches. Thus, both the teacher's speech and her planning and the observed class pointed to regularities that allowed us to infer the utilization scheme she mobilized: associating geometric solids with everyday objects and using material resources favor students' understanding. Establishing this type of relationship is fundamental when thinking about teaching in field education contexts, as pointed out by Molina and Freitas (2011, p. 26–27):

It is relevant to incorporate the materiality of students' real lives into pedagogical work, from which the possibility of resignifying scientific knowledge opens up, which, in itself, is already the product of collective work carried out by hundreds and hundreds of men and women over the centuries.

The document Teacher Guarujá produced to teach how to measure the perimeter of plane geometric figures includes the following resources: a board, a teacher's desk, a tape measure, and two learning environments. The analysis of their answers and the activity of constructing a fence allow us to infer the following

utilization scheme: relating perimeter calculations to everyday objects and situations, and simplifying the content, both of which favor students' understanding.

The analyses of the documents produced by teachers Jitirana and Guarujá reveal elements of the local peasantry in the communities where they teach in YAE-Field classes. This occurred through relationships built between the content covered and everyday objects (matchbox, bottle, coffee dripper, product packaging of different shapes) or through productive activities, such as planting watermelons or fencing a vegetable garden. However, we observed that, although present at some points in the classes, the relationship between mathematical content and the local peasantry was predominantly promoted through teachers' speeches rather than in terms of students' identities and explanations of their experiences. In line with Molina and Freitas (2011), we consider this one of the challenges faced by teachers in field education contexts.

Final considerations

We presented an excerpt from a thesis that scrutinized the documentation of teachers who teach mathematics in YAE-Field classes, based on the documentational approach to didactics (DAD). This is the analysis of documents produced by Teacher Jitirana (female) and Teacher Guarujá (male), participants in the research. In the analysis, we also sought to identify the relationships they established with the local peasantry, taking into account the specificities of the YAE-Field and the young and adult students who live and work there.

The results of the research are close to those found in previous stages already published (Silva; Lima, 2021; Silva; Lima, 2023a; Silva; Lima, 2023b) regarding the variety of resources that teachers had to teach mathematics, both in remote and face-to-face teaching. The analyses presented here move forward to focus on the documentation that results from combining such resources with the utilization schemes mobilized by teachers. They reveal clear efforts they made to ensure teaching in YAE-Field classes, even in the face of adverse situations such as the COVID-19 pandemic.

In fact, the resources used in the classes and the mobilized utilization schemes favor the establishment of relationships between the taught content and students' places of belonging and realities. However, such relationships do not seem to be the keynote of teaching work in the investigated context, if we consider students' potential experiences, their identities, and the specificities of the YAE-Field.

One hypothesis for results like these is the need to implement continuing education programs grounded in the principles of field education for teachers who teach mathematics, particularly in field education contexts. Although we must recognize the existence of successful experiences in continuing education for teachers in rural areas, such as the Programa Escola da Terra (Lima, 2018) [Program School of the Land], it is also pertinent to highlight the need to expand these actions to specific educational and sociocultural contexts, such as the YAE-Field classes.

We consider that the education of in-service teachers constitutes a way to move towards the horizon of field education's struggles and demands. It provokes reflection and generates movements and concerns that contribute to the improvement of socially referenced teaching and that consider the realities of different territories and educational contexts.

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