https://doi.org/10.34024/prometeica.2024.31.16406

IS THERE ANY ROOM FOR DREAMS IN MATHEMATICS CLASSES?

EXISTE ESPAÇO PARA OS SONHOS NAS AULAS DE MATEMÁTICA?

¿HAY LUGAR PARA LOS SUEÑOS EN LAS CLASES DE MATEMÁTICAS?

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Recibido: 07/03/2024
Aprobado: 25/11/2024

ABSTRACT

This text intends to pursue the following aims: to state how teenagers see room for dreams in mathematics classes and how to make more room for dreams during these classes. It is qualitative research, whose theoretical framework is based on Ole Skovsmose, Paulo Freire and Emanuel Levinas, whose the main concepts are dreams, foregrounds, transcendence, unfinishedness and alterity; and the methodology is mostly inspired by case study. Data production took place with fifteen adolescents from two schools: one located in Colombia and the other in Brazil. The data discussed here is based on two discussion groups. Throughout the text, it is addressed some theoretical concepts and presented some of the data, based on students' discussions about possible room at mathematics classes for teenagers' dreams. In the sequence, it is stated some reflections, criticizing mathematics classes based on exercise paradigm, and the relationships established during these classes, which do not allow an opening space for students' dreams.

Keywords: dreams. teenagers. critical mathematics education. mathematics classes.

RESUMO

Este texto persegue os seguintes objetivos: apresentar como adolescentes veem espaço para os sonhos durante as aulas de matemática e como é possível oferecer mais espaço para os sonhos nas aulas de matemática. Trata-se de uma pesquisa qualitativa, cujo referencial teórico se baseia em Ole Skovsmose, Paulo Freire e Emanuel Lévinas, cujos principais conceitos são sonhos, foreground, transcendência, inacabamento e alteridade; e a metodologia é inspirada especialmente no estudo de caso. A produção de dados ocorreu com quinze adolescentes de duas escolas: uma localizada na Colômbia e outra no Brasil. Os dados aqui abordados são baseados em dois grupos de discussão. Ao longo do texto, são abordados certos conceitos teóricos e apresentados alguns dos dados, a partir das discussões dos alunos sobre possíveis espaços nas aulas de matemática para os sonhos dos adolescentes. Na sequência, são apresentadas algumas reflexões, estabelecendo uma crítica às aulas de matemática baseadas no paradigma do exercício, e às relações que se constituem durante essas aulas, que não permitem a abertura de espaço para os sonhos dos alunos.

Palavras-chave: sonhos. adolescentes. educação matemática crítica. aulas de matemática.

RESUMEN

Este texto persigue los siguientes objetivos: presentar cómo los adolescentes ven espacio para los sueños durante las clases de matemáticas y cómo es posible ofrecer más lugar para los sueños en estas clases. Se trata de una investigación cualitativa, cuyo marco teórico se basa en Ole Skovsmose, Paulo Freire y Emanuel Lévinas, cuyos conceptos principales son los sueños, foregrounds, la trascendencia, la incompletitud y la alteridad; y la metodología está inspirada especialmente en los estudios de casos. La producción de datos se realizó con quince adolescentes de dos escuelas: una ubicada en Colombia y otra en Brasil. Los datos aquí discutidos se basan en dos grupos de discusión. A lo largo del texto se discuten ciertos conceptos teóricos y se presentan algunos datos, a partir de las discusiones de los estudiantes sobre posibles espacios en las clases de matemáticas para los sueños de los adolescentes. A continuación, se presentan algunas reflexiones, estableciendo una crítica a las clases de matemáticas a partir del paradigma del ejercicio, y las relaciones que se forman durante estas clases, que no dejan espacio a los sueños de los estudiantes.

Palabras clave: sueños. adolescentes. educación matemática crítica. clases de matemáticas.

Introduction

Young people, even those from humble backgrounds, dream. Diving deeper into the reality of some of these young people, it is possible to see that in dreaming they find fuel to move forward in life. When society does not offer enough opportunities to live with dignity, joy and well-being, school plays a role in their lives that goes beyond providing technical knowledge; school can be seen as an important space for these young people's dreams.

Faced with these challenges, my work turned to the young students' dreams in a socially disadvantaged situation, it means, young students in situations of social and economic vulnerability. For my PhD dissertation (Soares, 2022a), I was interested in understanding how their foregrounds are constituted, and what their dreams are. And I was also interested in knowing the role of the school in relation to this topic, and mainly, if the mathematics classes would be collaborating in this process. In this text, I focus on answering, "How do teenagers see room for dreams in mathematics classes?" and to present some reflections on how to make more room for dreams in mathematics classes.

The main concepts of this work are foregrounds, alterity, be more/transcendence and dreams, in a mathematics education perspective. In a literature review, it was not possible to find works in mathematics education that theoretically related the concepts of foreground and dream, from the Freirean perspective, or even foreground and transcendence, from the Levinasian perspective. The theme of dreaming can be found in some works that involve the area of education, such as the works of Araújo (2009), Lopes (2010) and Gomes (2014), but they are not related to mathematics education. In other words, no works were found that were dedicated to the study of students' dreams in mathematics education as a central theme, or that related this theme to adolescents at social disadvantage. In this sense, in addition to judging the theme pertinent, it was understood that the proposal of this research could be unprecedented.

In the next section, I will focus on making theoretical considerations of some of these concepts. Most of these ideas are part of a paper previously published (Soares, 2022b).

Theoretical Framework

For Freire (1992), dreaming is a political act, the result of the social-historical connotation of being a person in this world. For him, dreaming is a way of making and remaking history, as people intend to transform the world beyond fitting in and adapting to it.

The origin of every person's quest and every dream, for Freire (1983), is the awareness of the 'unfinishedness'. It means it is the desire to be more. People know that they are unfinished, incomplete,

and that is why they dream, that is why they create foregrounds. Regarding this concept, I will write about it in the next paragraph.

The concept of foreground or foregrounds (Skovsmose, 2012, 2014, 2016) refers to a person's prospects, full of obstructions and possibilities, hopes and fears. This range of a person's aspirations is related to their background (D'Ambrosio, 1990), it means, their cultural environment, their life experiences, their fulfilled and frustrated dreams. Thus, the foregrounds of a person (or a group) are opaque, an uncertain concept, susceptible to change, despite the foregrounds being related to past experiences, which generate impacts and drive them in some way to the future.

Dreams are part of the foreground. For Freire, dreams are linked to the historical experiences of freedom that a being lives and has lived, to this being's view of life, and to the future perspectives that were possible to be generated, despite oppressive relationships. In Freire's words, "dreams are projects for which one fights. Their realization does not occur easily, without obstacles" (Freire, 2000, p. 54). I understand that the act of dreaming is a constitutive part of the human foreground, as it is part of launching oneself into the future, driven by the awareness of unfinishedness.

The philosopher Levinas' thought, as well as Freire's, is understood as based on the idea of the unfinished state of human being. For him (Levinas, 2007), there is exteriority: something beyond what influences people, which is not under their control, and which is never exhausted. And what is this exteriority? It is a metaphysical movement of transcendence of the human being, that turns outwards; and that can turn them to another human being. Levinas and Freire consider the being as turning toward something that they are not, toward something that overflows them. For Levinas, this is the possible and desirable movement of the being, which he calls transcendence.

Finally, from Lévinas' perspective (2007), these concepts highlight another movement through which the human beings can put themselves, during the exercise of being more: the alterity. This concept can be understood as the ability to put yourself in the other's shoes and to take responsibility for them. It is through alterity that they see the other not as a stranger or enemy, but as a being as unfinished as they are, full of multiple possibilities, despite being recognized that the other is not themselves.

And finally, regarding mathematics education, I would like to briefly talk about the exercise paradigm concept. I have already discussed this more deeply in previous texts (Soares & Civiero, 2017; Soares, 2022a). The exercise paradigm – a term used by Skovsmose (2008) – refers to the endless lists of technical exercises that are often disconnected from reality. These exercises are usually formulated by an authority outside the classroom, and it is up to the students to find the right answer. In the exercise paradigm, theory is learned by exhausting technical repetition. This paradigm, therefore, can be understood as something that goes beyond a simple methodology; it represents the way most mathematics classes take place at school, based on a type of rationality.

All these concepts are important for the analysis of the data that will come later in the text. In the sequence, I highpoint the methodological procedures that enabled me to study what students think about the space for dreams in mathematics classes, and then, I present some findings and suggestions.

Methods and procedures

This work is based on qualitative research developed in two first-year-High-School classrooms, with students aged between 15 and 16 years old at a District Educative Institution (IED) on the outskirts of Bogota, Colombia; and another at Federal Institute of Sao Paulo (IFSP), in a rural municipality in the state of Sao Paulo, Brazil. Both schools serve mostly socially disadvantaged students. The researcher had no prior relationship with these schools or the students. The main reference in the methodological field for this qualitative research is Goldenberg (2014). It is important to clarify that the intention was to gather elements from the experiences of data production in the two schools, in other to expand possibilities, and not to compare them.

The Ph.D that grounded this text is not based on a specific methodology but has some inspiration. On the one hand, it is inspired by the life history method (Nogueira, 2017), and on the other hand, by the qualitative research method called case study (Goldenberg, 2004). For this specific work, the main inspiration is the case study.

This is due to the fact that in this research we intended to carry out a section of reality, based on the in-depth study of social units, called cases, using different research techniques. (Goldenberg, 2004). Another way of conceiving this research method is that it aims to understand the 'whys' and 'how' of the unit or units studied, which are well defined, with the aim of contributing to the general understanding of the phenomenon that is the object of investigation (Da Ponte, 2006). In this type of method, it is understood that the data produced in these units are not immediately generalizable and should not be; rather, they are representative of the whole. In this work, it is understood that the cases are the groups of students investigated in each of the schools, however, as not all the intricacies foreseen in the case study were strictly followed, it is assumed that this methodology had the role of inspiring this investigation.

Regarding the procedures, in both Brazilian and Colombian schools, the data production were the same: discussion groups with students, being fifteen students in total, including participants from the Brazilian and Colombian schools, and semi-structured interviews with four of these students from each school. For this text, we will refer only to the content of the discussion groups. Data production took place between August and September 2019. Data analysis also had its own method, inspired by content analysis and life history.

The discussion groups were held after the interviews. I already had a lot of personal information about the students' life stories and their dreams, and I wanted to use this procedure to learn more about the students' understanding of school, mathematics classes, and the space for dreams.

A discussion group was held in each school, in classrooms, lasting approximately 1.5 hours each. Two subgroups were formed in each of these moments, and the discussions were recorded on audio and video. Several topics were addressed during this procedure, but the one that most closely matched the objectives of this text and complemented the discussions already started during the interviews was the one that dealt with spaces for dreams. The groups had to answer the following questions: "Do you see spaces/room at school for the discussion/fostering of teenagers' dreams? Talk about it. And in math classes?".

After the discussion groups were held, a transcription and textualization process was necessary. The analysis procedures were based on Skovsmose (2014) and also had resonance in Content Analysis (Bardin, 1995; Oliveira et al, 2003). During this stage, I observed how the concepts of foregrounds, dreams and transcendence emerged from the data. In the next section I reflect on these issues.

What room for dreams already exists in mathematics classes?

All the students who took part in the research consider that subjects at school, and mathematics in particular, present little or no space for dreams, in general. Let's see, for example, the speech of a IFSP student named Giselle:

> *Giselle: About the first part, if the school has this space, I think that schools, in general, end up not thinking much about this issue of dreams. I think the IFSP is a more open place for that, but still very closed on this. I don't think anyone (at school) really thinks about it [...]*

In her talk she demonstrates that she understands that making room for dreams implies greater opening of the school and, at this point, we establish the connections between the concepts of unfinishedness and dreams. A school that understands itself as unfinished is an open school which values freedom, and

which recognizes the importance of considering the experiences and needs of students for the movement to be more. Later, she completed:

> *Giselle: I think mathematics is the subject that gives less space for this.*

Flávio, from the same school but in the other group, didn't identify much room for dreams either. In the next excerpt, he shows how difficult it would be for him to find the spaces in mathematic classes:

> *Flávio: [...] How would it be possible to create more spaces for future perspectives in mathematics classes? I don't know because there's no way.*

As the student suggested, it seems that, in addition to reflecting on whether mathematics offered spaces for dreams, he could not see a relationship between the discipline and futures prospects. In other words, he could not see mathematics as part of building his foreground.

In IED school, in the group in which students Andrea, Jhon, Tania and Martha, a dialogue on the proposed questions took part started from a reflection on the school in general, and then focused on mathematics classes:

> *Andrea: That happens when teachers talk to us about it... but I think there are very few [teachers].*
>
> *Jhon: Fernando is the only one.*
>
> *Tania: Fernando.*
>
> *Jhon: He's the only one that says, "come here, think about what you do".*
>
> *Tania: We hardly talk about our future with them, so we don't know...*
>
> *Jhon: They are hardly interested in knowing.*
>
> *Andrea: And in mathematics classes?*
>
> *Martha: Ah... this [teacher] doesn't talk about the future.*

It is important to note that, in this dialogue, in addition to saying that teachers almost do not give room to dreams in their classes, John said this happens because they "are not interested in knowing". According to Jhon, spaces for dreams are moments of dialogue and that, in the classroom, this would occur when the teacher shows interest in the student's life, and in their prospects. This would happen, therefore, when the teacher puts himself in the student's place, in a relationship of alterity (Lévinas, 2007). Although a few students had different personal experiences with certain mathematics teachers, most of the students at the school in Bogota agreed with Jhon's opinion, including people from the other group, noting that they didn't see spaces especially in the mathematics classes. And when this space exists, they took place through teacher-student dialogues, at times in which teachers had concerns about the lives and future of students. In summary, they expressed that a possible room for dreams during mathematics classes would take place through the strengthening of personal relationships between students and teachers. In other words, this happens by alterity relationships.

On the other hand, although it was not a general point of view, a couple of students identified that mathematics definitely helps to fulfill their dreams from a technical point of view, stating that the knowledge provided by mathematics classes is essential for life. Like Martha, who said that, after all, mathematics "for a person is like oxygen".

How to create room for dreams in mathematics classes?

Some students suggested that, in order that mathematics classes to provide a space for the development of students' dreams, it would be necessary to make these classes more interesting and closer to the students' daily lives. This can be seen, for example, in the following statement:

> *Jhonatan: [...] What we expect from a mathematics class is that they teach us about life itself.*

Other students suggested that it would be interesting to open up a space in mathematics classes to talk about dreams, or to carry out activities in which this topic is problematized. I understand that, based on these last suggestions, as well as on the suggestions expressed previously – regarding mathematics classes being closer to their lives – they reflect that the classroom space can be used to approach students' backgrounds and foregrounds.

All students highlighted the importance of a good teacher-student relationship so that the topic of dreams can be discussed during class. I understand that this relationship is marked by dialogue and concern for the other. I see that the relationship that creates spaces for dreams is a relationship of alterity.

The students did not only refer to interpersonal relationships in mathematics classes, but also to the relationships that are established in class among students because of mathematics. Let's look at Isabela's perspective on mathematics classes:

> *Isabela: I think there's something about this that's inherent to mathematics: this thing of "I know, so I'm going to tell you the right answer." I think that's really bad, because... what if you get it wrong? You can get it wrong at any time, you're a human being, so you got it wrong. You can get that exercise right, and many people might get it right and... This competition thing is really complicated, and I think that in mathematics it has a lot of influence.*

As you can see, this strategy commonly used during mathematics classes, of finding the right answer (which is unique), can be harmful from the students' perspective. I identify this strategy as part of the work in the exercise paradigm. Thus, they spoke more about competition during classes, suggesting group work strategies as healthier work alternatives. See the dialogue between some IFSP students:

> *Giselle: [...] this collective thing, of everyone making mistakes together, one getting it right and helping, and doing it in a way that everyone can understand because, at that moment, everyone is on the same page.*
>
> *Isabela: That's it, trying to reach a result together and... if everyone did it together, it would be easier. I don't know, sometimes one knows how to divide, another how to multiply, and another how to add and...*
>
> *Iara: I think that's it, we have to resolve it through dialogue, and try to prepare the teachers for this competition in a healthier way.*

As we can see, spaces for dreams during mathematics classes encompass multiple aspects and amplitudes. Starting from the arguments presented by the students and with the intention of extrapolating them, I will bring some consequences of these aspects.

If we think of mathematics classes as a microcosm, at least two aspects can be considered, and both play a relevant role in the development of students' dreams.

The first aspect within the microcosm of mathematics classes would be teacher-student and student-student relationships, as well as their interaction dynamics. As the students described, the movement of being interested in the other through dialogue is fundamental to establish relationships of mutual trust, which would open room for building dreams. The way these relationships happen reveals a lot about the hierarchy that is established within the classes and about the role of each of the actors. For example, if

the professor only answers questions related to the content, or if he/she only addresses students to talk about the content, it is unlikely that an opening will arise in this relation to personal topics, such as dreams. Likewise, if the teacher always asks the class "as a whole" what the correct answer to the exercises is, or only makes individual assessments, or even works exclusively with activities with a single answer, this professional is encouraging the meritocracy that, in the classroom, reverberates in individualism, competition and self-entrepreneurship. And these are characteristics of the exercise paradigm in mathematics education. On the contrary, as suggested by the interviewed students, if the teacher encourages collaboration in the classroom, so that the success in solving an activity represents the success of the whole group, and mistakes and successes are discussed collectively and treated also as possibilities, the mathematics class environment will be more humanized and students will have the possibility to be more and to share and expand their foregrounds. And if everyone in the classroom sees themselves as unfinished as they are, the teacher-student relationship can definitely expand the boundaries of content for a mutual and genuine interest in the other and become a relationship of alterity.

Some final reflections

After analyzing data production, I conclude that mathematics classes seem to be more focused on developing technical knowledge than on dialogue with society and relationships with people. The heritage that these classes carry make their abstract and precise aspect overlap their historical and human aspect. The exercise paradigm (Skovsmose, 2001) still seems to be the prevailing one, and naturally it does not make room for the development of more humanized relationships between teachers and their students.

Technical knowledge has its important value as a promoter of dreams, but this is not enough. The approach related strictly on exercises are barely based to the aspirations or contexts of the students, and as a result they do not establish a connection with their backgrounds, much less open room for the development of their foregrounds. A mathematics that does not allow for questions or uncertainty, also does not establish relationships with the unfinishedness that is part of the students and therefore, does not connect to the human desire to be more. I this case the possibility of alterity relations is ended.

In summary, to have more room for fostering dreams in mathematics classes, it is therefore necessary to create more dialogical relationships between teacher and students, break with the exercise paradigm, and enlarge the boundaries between history, society, and mathematical knowledge. In this case, mathematics classes will be able to contribute to students' not only from a technical point of view, but also from a human point of view.

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