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Statistical literacy and dialogic acts in the education of teachers for early years of Elementary Education[1]

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ABSTRACT

This article aims to analyse the emergence of dialogic acts in situations of statistical literacy in the teacher education in the early years of Fundamental School. We base ourselves on Iddo Gal's perspective of statistical literacy and on the proposition of dialogic acts discussed in Critical Mathematics Education. The data presented refer to an excerpt from a doctoral research with reflections on Statistical Education for the exercise of critical citizenship. This is a education proposal carried out remotely with 9 teachers during four meetings that involved synchronous communications via Google Meet and asynchronous communications via WhatsApp. The results show the formation of dialogical acts associated with explorations of communication contexts. Fundamental aspects for a dialogue such as active listening, doing research, maintaining equality and taking risks collaborated for the sharing of multiple points of view to think about the teaching of Statistics from the perspective of statistical literacy.

KEYWORDS: Statistical literacy. Dialogical acts. Teacher education. Fundamental school early Years.

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Letramento estatístico e atos dialógicos na formação de professores dos anos iniciais do Ensino Fundamental

RESUMO

Este artigo objetiva analisar a emergência de atos dialógicos em situações de letramento estatístico na formação de professores dos anos iniciais do Ensino Fundamental. Nos embasamos na perspectiva de letramento estatístico de Iddo Gal e na proposição de atos dialógicos discutida na Educação Matemática Crítica. Os dados apresentados se referem a um recorte de uma pesquisa de doutoramento com reflexões sobre a Educação Estatística para o exercício da cidadania crítica. Trata-se de uma proposta formativa realizada remotamente com um total de 9 professores durante quatro encontros que envolveram comunicações síncronas pelo *Google Meet* e assíncronas pelo *WhatsApp*. Os resultados evidenciam a constituição de atos dialógicos associados a explorações dos contextos de comunicação. Aspectos fundantes para um diálogo como a escuta ativa, fazer investigação, manter a igualdade e correr riscos colaboraram para o compartilhamento de múltiplos pontos de vista para se pensar o ensino de Estatística na perspectiva do letramento estatístico.

PALAVRAS-CHAVE: Letramento estatístico. Atos dialógicos. Formação de professores. Ensino Fundamental anos iniciais.

Alfabetización estadística y actos dialógicos en la formación de profesores de los primeros años de la educación primaria

RESUMEN

Este artículo pretende analizar la emergencia de actos dialógicos en situaciones de alfabetización estadística en la formación de profesores en los primeros años de escuela primaria. Nos basamos en la perspectiva de la alfabetización estadística de Iddo Gal y en la propuesta de actos dialógicos discutida en Critical Mathematics Education. Los datos presentados se refieren a una parte de una investigación doctoral con reflexiones sobre la Educación Estadística para el ejercicio de una ciudadanía crítica. Se trata de una propuesta formativa realizada a distancia con un total de 9 docentes durante cuatro encuentros que implicaron comunicación sincrónica a través de Google Meet y asincrónica a través de WhatsApp.

Los resultados muestran la constitución de actos dialógicos asociados a exploraciones de los contextos de comunicación. Aspectos fundamentales para un diálogo como la escucha activa, investigar, mantener la igualdad y asumir riesgos colaboraron a la puesta en común de múltiples perspectivas para pensar la enseñanza de la Estadística en la perspectiva de la alfabetización estadística.

PALABRAS CLAVE: Alfabetización estadística. Actos dialógicos. Formación de profesores. Primeros años de la escuela primaria.

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Introduction

We are constantly exposed to diverse news that involves statistical data presented in different forms of representation. Reading and interpreting this information requires statistical literacy skills to understand data in different contexts.

Statistical Education from the perspective of statistical literacy involves the development of skills related to both knowledge components and dispositional components that need to emerge together (GAL, 2002). According to Gal's model (2002), teaching Statistics involves developing statistical knowledge to meet the demands of using data in various social practices.

The National Common Curricular Base - BNCC (BRASIL, 2018) recommends that Statistics education in the early years of Elementary School involves collecting and organizing data of interest to students, as well as activities such as reading, analyzing, and constructing graphs and tables, and producing texts to report data and communicate results.

Although the BNCC expands the guidelines for Statistics education, as it also includes Probability, it does not explicitly address the term statistical literacy (MONTEIRO; CARVALHO, 2021). The document also suggests that Statistics and other content areas should be articulated in an

interdisciplinary manner, while also promoting collaborative work and student involvement. However, this teaching approach requires a teacher education process from the perspective of statistical literacy (CAZORLA; GIORDANO, 2021).

We believe that dialogue-based pedagogy is essential for the development of statistical literacy skills. According to Alro and Skovsmose (2006) and Freire (2011), the way in which the learning process takes place is directly related to how communication occurs among the actors in the educational process. Communication is not merely casual conversation, but is oriented towards learning and requires certain specific qualities. The authors refer to dialogic acts to describe a form of communication that possesses certain attributes, characterized by action and reflection as key elements for dialogue, and are marked by active speaking and listening.

Dialogue imbues a sense of investigation into a conversation, as participants have an interest in discovering something that adds new experiences and knowledge (ALRO; SKOVSMOSE, 2006). Engaging in dialogue entails putting oneself in an uncomfortable situation, as it involves assuming a position of risk in which we may be confronted. Thus, through dialogic interaction, the aim is to promote a more egalitarian relationship in communication among the actors, placing the power associated with social roles in the background.

We believe that communication processes based on a dialogic perspective enhance the teaching and learning of Statistics from the standpoint of statistical literacy. In this paper, we analyze the emergence of dialogic acts in situations of statistical literacy within the context of teacher education for the early years of Elementary School. The study is a segment of a doctoral thesis and was developed based on the following research question: How are dialogic acts constituted in the communication of teachers in the early years regarding the perspective of statistical literacy?

The scope of the paper, in addition to this introduction, addresses our perspective on statistical literacy in the subsequent sections. We also investigate through reflections within the matters of Critical Mathematics Education, particularly concerning dialogic acts, followed by a discussion on the methodological approach as well as the presentation of results and final considerations.

Statiscal literacy

The use of the term Statistical Education, according to Cazorla and Utsumi (2010), has been fostered by educators' growing interest in understanding the typical issues of teaching and learning on this field of study.

The topics investigated in the field of Statistical Education mainly encompass aspects related to the development of pedagogical activities focused on statistical concepts for all levels of Basic Education. The approach of Statistical Literacy (SL) constitutes a perspective within Statistical Education, which we will discuss in more detail in this section.

Gal (2002) proposes a model of SL that aims to contribute to the exercise of citizenship by enabling individuals to critically engage in different contexts. According to this author, understanding statistical terms and concepts facilitates the comprehension of statistical information on various topics, ranging from entertainment to politics and economics, thereby enhancing individuals' performance in different social settings.

His model for statistical literacy is based on the interaction between two sets of elements: cognitive or knowledge elements (literacy skills, mathematical and statistical knowledge, contextual understanding, and critical issues) and dispositional or affective elements (beliefs, attitudes, and critical stance).

According to Cazorla and Santana (2010), one way to contribute to the development of statistical literacy is through the exploration of

activities using the investigative cycle through statistical research. These authors discuss that the investigative cycle consists of three interrelated stages: problematization of research, planning of research, and execution of research - including data collection, analysis, interpretation, and communication of the results. It is understood that the investigative cycle not only contributes to the process of statistical literacy but also supports the understanding that this approach goes beyond information processing and can be used as a structuring axis of Statistical Education.

Reading and communication are fundamental in the development of statistical literacy skills. We agree with the discussions of Carvalho, Monteiro, and Campos (2009) regarding the importance of familiarity with the language and terminology of statistics for the interpretation of graphs by consumers of statistics. These authors point out that understanding information represented by graphs requires individuals to have skills to deal with implicit aspects that are not explicitly represented and to make inferences about the data in order to fully comprehend the different pieces of information. In addition to these aspects, it is also essential to enable students to be active participants in the process of teaching and learning statistics, as is the case with working with the stages of the investigative cycle.

In this article, we consider that the mobilization of both knowledge and dispositional elements is facilitated in pedagogical environments that involve communication processes where dialogues about statistical content are established to enhance the development of Statistical Literacy skills.

Dialogic acts

Alro and Skovsmose (2006) discuss the potential of dialogic communication in the context of teaching and learning processes in

Mathematics. The term "dialogue" is defined as a conversation that possesses certain qualities for the interaction to be considered as such. The authors highlight three aspects of dialogue to conceptualize it epistemologically: conducting an investigation, taking risks, and promoting equality. They express that through dialogue, we move from a position of comfort to a context where we can be confronted and motivated. Thus, through dialogic interaction, the power associated with individuals' social roles is set aside, and a relationship of equality in communication focused on learning is promoted.

In examining communication processes, Alro and Skovsmose (2006) perceive dialogue as a process of action and reflection. They use the term "investigative cooperation" to refer to the activities developed within groups defined by the teacher, who fosters a debating environment and proposes new propositions and hypotheses. This model of investigative cooperation is composed of eight communication actions, which descriptively address the different attitudes of participants during a dialogic discussion, as presented in Table 1.

Table 1 – Dialogic acts according to Alro and Skovsmose (2006).

Dialogic act	**Description**
Stablish Contact	It is a way of being present and paying attention to others and their contributions. It involves mutual respect, responsibility, and trust in one's colleague. It makes participants open to investigation and can be perceived as an attitude of preparation for group work.
Realize	This refers to a process of approaching a subject. It means discovering something that was previously unknown or unconscious, or examining how the other person understands a certain problem, which includes questioning one's own conceptions and examining them together.
Acknowledgment	It opens paths for exploring the perspectives and ideas of the other dialogue participant. It allows both to recognize each other's perspectives.

Approach	It represents presenting arguments to express one's thoughts. It does not mean trying to convince the other person with one's own opinion, but rather being receptive to criticisms of one's positions and assumptions..
Think out loud	It can be understood as a way to share a thought and, in that sense, help the other person understand how an individual thinks, enabling the observation of whether perspectives align or not.
Rephrase	It means repeating what has already been said in other words. It can be understood as an invitation for a more profound reflection to delineate the differences.
Challenge	The arguments used can promote questioning of established knowledge or perspectives. It can be understood as an argument of refutation or questioning of the process.
Evaluate	It presupposes feedback, support, and constructive criticism. It can also take many forms, such as error correction, constructive criticism, advice, unconditional support, or praise.

Source: Alro and Skovsmose (2006).

According to Table 1, it is possible to observe that the eight dialogic acts encompass different points of interaction that can be established in communications involving student-teacher and student-student interactions. Thus, depending on the type of communication established within the dynamics of the mathematics class, we can have different levels of occurrence of dialogic acts. Regarding the work with statistics content, we believe that the development of activities of this nature should consider this dialogic perspective as a reference, so that students have the opportunity to collaborate together on the different stages of statistical research.

Regarding the particularities of the teacher's role in the development of dialogic communication, we agree with the discussions pointed out by Freire (2011), who advocates for an education focused on the exercise of citizenship. According to this author, reflecting on one's own educational praxis is a fundamental practice for teachers at all stages of Education. Therefore, the teachers should not only restrict themselves to evaluating the content to be addressed in the lessons but also examine how

communications are established. In other words, theory and practice are two fields that complement each other and are essential in the dialectical relationship. Analyzing the different conversations that unfold in the educational context helps promote the construction of a more democratic and egalitarian school.

From this perspective, the relevance of the teacher's role in promoting dialogues to enhance statistical literacy skills and the possible implications for student education can be observed.

Faustino (2018) argues that understanding the dialogue between teachers and students in the early years of Elementary School within the classroom dynamics is crucial. This author emphasizes the importance of organizing the communication context for meaningful teaching and learning processes. In contexts where the teacher's speech predominates, more vertical communication patterns are favored. On the other hand, more egalitarian contexts promote investigative cooperation, contributing to the occurrence of communications that facilitate the sharing of different perspectives, thus enabling more meaningful learning of mathematical content.

We believe that conducting investigations focused on the context of communication from the perspective of Critical Mathematics Education, combined with conceptual debates on statistical literacy, can contribute to creating learning environments guided by tolerance and respect for differences.

Method

The article presented here refers to a segment of a doctoral research, as mentioned before. At the time when the empirical study was conducted, there was an outbreak of a pandemic with the emergence and spread of Covid-19. A few months after the initial reports, in December 2019, the virus had spread across various continents, leading

to the declaration of a public health emergency of international concern. This scenario of a health crisis brought about demands and the need for adaptation from different sectors of civil society to comply with disease prevention recommendations. The implications mainly resulted in the necessity of social distancing among individuals to prevent the spread of the disease. In the educational sector, due to this pandemic context, there was a substitution of presential classes with the emergency implementation of remote teaching, which involved intensive use of *Google Meet*[4] and *WhatsApp*[5] by teachers and schools, in addition to DICT[6] tools.

The empirical research is of a participatory nature (MARIETTO, 2018), supported by a qualitative approach, in which both synchronous and asynchronous continuing education meetings were conducted. The participants in the study were nine female primary school teachers, all with a degree in Pedagogy, who were teaching remotely in the early years of Elementary Dducation at the time of the study. Out of these participants, five had completed postgraduate studies, and eight reported working in two municipal education networks in the state of Pernambuco. Only one teacher was from a private institution. It is worth noting that all participants had extensive experience in teaching in the early years of Elementary Education.

Regarding the invitation to participate in the empirical study, the teachers collaborated in the first stage of data collection through an online questionnaire. Through this form, the teachers provided their phone numbers and email addresses, as well as expressed their interest in participating in continuing education with themes related to statistical literacy. With these teachers as participants, the continuing education was conducted remotely, using WhatsApp to support the completion of some

[4] Videoconference communication platform developed by Google.
[5] Multiplatform application wich allows sending instant messages and sharing other media formats.
[6] Digital Information and Communication Technologies.

activities and mainly for asynchronous communication, and Google Meet as a platform for synchronous meetings, which took place in four sessions.

Both in synchronous meetings and in asynchronous activity moments, the central component of the actions addressed the teachers' own situations and personal and professional experiences. Another point to highlight is the foundations used for the education process, based on our master's studies (OLIVEIRA, 2016) and the institutional research education developed by Carvalho (2020).

The perspective of Statistics regarding statistical literacy, according to the ideas of Gal (2002), guided the definition of the stages of collective work, as well as the epistemological tripod of dialogue for Skovsmose: conducting an investigation, taking risks, and promoting equality is related to the right to learn. With that expressed, the stages developed during the education process are presented.

1- Creating a group on the WhatsApp application to encourage dialogue among all participants of the education and communication of general updates. It also served as a central environment for file sharing and asynchronous communication;
2- First session for introductions and discussion on the methodological approaches of the education sessions, addressing the conceptualization of Statistics, Statistical Education, and statistical literacy;
3- Reflections on the interpretation and construction of graphs and tables and their social function;
4- Discussion about the stages of statistical research and the approach of fundamental concepts that underpin this approach, such as working with the investigative cycle in the early years;
5- Discussions on the teaching of Statistics in the context of Elementary Education, addressing curriculum guidelines and pedagogical planning;
6- Reflections on the DICT and the work in Statistics;

7- Final session for the discussion on the contributions of Statistics to the promotion of citizenship, as well as reflections and feedback on the education experience conducted.

The analysis of the data was structured based on communication patterns that enhanced the dialogic actions related to teachers' statistical literacy, taking into account the interactions that occurred during the education process. The role of the researcher encompassed planning the activities, engaging in collective discussions, and mediating the debates in all meetings, thereby consolidating the research as a participant observation study. In this type of research, the researcher not only observes the intricacies of the formative process but also actively engages in mediating the debates (MARIETTO, 2018).

In the subsequent sections of the paper, we describe the dynamics of the events and present transcriptions of selected excerpts from the participants' speeches. To identify the participants, we use the code T, which stands for teacher, followed by a numbering from 1 to 9, resulting in T1, T2... T9. This method of referencing the participants aims to preserve their identities in accordance with research ethics principles, while still allowing the identification of individuals involved in the dialogues that emerged from the reported situations.

Results

During the education meetings, we observed that the dialogues were associated with communication patterns that encompassed topics related to understanding the meaning of Statistics, statistical literacy, and reflections on teaching and learning processes with this content.

The procedure for conducting the meetings involved the strategy of sending a message in the WhatsApp group the day before each session, providing the access link to Google Meet and confirming the agreed-upon time and date for the synchronous meeting. Specifically, regarding the

synchronous communications that took place on WhatsApp, we found that the emergent dialogic acts were more intentional. In fact, the act of establishing contact was the only one that emerged on its own. However, in the asynchronous communications within the same environment, the dialogic acts emerged in an associated and spontaneous manner, based on a particular context of discussion.

In this paper, the presented results correspond to excerpts from the synchronous communications in the four successive meetings. This selection was based on the observation that synchronous moments enhance the emergence of communication patterns and reflections on statistical literacy, compared to asynchronous communication. The dialogues that emerged were associated with communication patterns encompassing topics related to understanding the meaning of Statistics, statistical literacy, and reflections on the teaching and learning of Statistics.

We initiated discussions and reflections on the concept of Statistics and its social function. Below, we present some excerpts from these dialogues concerning Statistics, in which five of the teachers expressed their viewpoints, while the others, although engaging in active listening, chose to remain silent.

> T1: We work with the matter of data. We collect some data and then we analyze and research them. We interpret them, see what the results are, and then we can transform them into graphs. I mean, putting the results into graphs.
> T2: I think Statistics is related to everyday life. Wanting to know what is happening in society to make a sample. It is a sample, a bit of what society wants, what society has to say.
> T4: I think it is like we are representing reality. I think Statistics is more about understanding reality.
> T5: Yes. Understanding everyday life, right? What is happening in our daily lives.

> T6: In this case, Statistics is also essential for us to exercise citizenship, right? Because it is a form of information that we use daily not only within the school but also in our society, right?

Analyzing the teachers' comments, it is noticeable that they position themselves by relating Statistics to data production and processing, as well as to understanding everyday life and reality. We observed that during their arguments, the teachers displayed some uncertainty, expressing their points of view as if they were thinking aloud, drawing on their prior knowledge.

In their dialogues about the meaning of Statistics, we identified dialogic acts of *approach* and *thinking out loud*. This analysis stems from the fact that the teachers stepped out of their comfort zones to express their views, presenting their perspectives, and, in the dynamics of the exploration process, they began to incorporate new ideas as they verbalized them to the group.

Regarding the debate about these teachers' professional experiences related to the content of Statistics, six of the participating teachers reported having already experienced some pedagogical activity with their students. We highlight the statement of T1, who shared specific details with the group about a situation when addressing the work with Statistics with their 2nd-grade students.

> T1: I enjoy working with Statistics with children, and I see that they also really like it. I think it is quite interesting for them. Even for children who sometimes do not like Mathematics very much, I always say, 'Oh, this is also part of Mathematics'. One interesting thing is that you do the research, create graphs, and they always find it very interesting. Especially if it is a topic that is meaningful to them. I worked with my students on how the city of Recife was and what they would like to change in the city, what their ideal city would be like. So they conducted a survey

> with their families, and then they came to the classroom. They started sharing what they found, and I wrote it on the board. Then we counted the data that came from home, we transformed it into a table, and then we also transformed it into a graph, right? A bar graph, and we saw what were the difficulties that the population felt the most. After that, we conducted another survey to find out what needed improvement. We already knew what the difficulty was, now we needed to know what needed improvement and what could be done. And then they [the students] did it again, and we made a graph about it, and they presented it later. I do not know if it is correct, if that is really how it works, but it was a really great experience. The class and the families participated a lot, the children interacted a lot. We discussed each piece of data that was brought to the classroom, the difficulties, and also what we could contribute, for example, to the theme of pollution, streets, and the city.

It is evident that T1 experienced a statistical research activity with their students in which the data production was carried out by the students themselves in collaboration with their families. This activity included stages of the investigative cycle, from defining the topic to data collection, organization, and analysis. T1's reflections were based on contextualized themes related to the students' reality, considering the city's infrastructure problems and potential improvements. By conducting this activity, T1 provided students with an opportunity to engage with statistical concepts related to real-life situations outside the school environment. T1 also mentioned facilitating student reflections on both the urban infrastructure theme and the stages of statistical research.

Although T1 occasionally expresses some uncertainty about the work done, she demonstrates an understanding of the concepts related to the stages of

the investigative cycle and emphasizes the importance of contextualizing different topics that are familiar and of interest to the students.

In this excerpt from T1's speech, we can identify the coexistence of two dialogic acts: *establish contact* and *approach*. By sharing her experience of teaching statistics with the group, the teacher established a connection with everyone, fostering a relationship of trust among colleagues. At the same time, T1 presents her arguments and takes a position.

Furthermore, regarding the teaching of statistical concepts, we highlight the following dialogue about the teacher's work and the students' conceptual difficulties.

> T6: I think we can work with the children regarding the types of fruits they like the most, colors, sports, games, and activities. I believe it is within our daily context to work with statistics.
>
> T4: In the activity notebooks, there are some activities with graphs related to seeing what they like the most. I noticed that some children have difficulty understanding the graph. No matter how simple it was, they could not follow the graph. I observed that they marked the boxes in the opposite way. Instead of marking from bottom to top, they marked from top to bottom. Some children have difficulty, and that is why it is really important for us to always address this topic.
>
> T6: Yes, exactly, I also always notice that. Initially, they always mark from top to bottom. So, it is something that we always need to emphasize.
>
> Researcher: I did not understand what you specifically mean by marking from top to bottom, could you explain?
>
> T1: I did not understand either. What do you mean by marking from top to bottom?
>
> T4: It is because the graph has, let's say, the vertical and the horizontal axis. So, on the horizontal axis, we had the children's names, and on the vertical axis, we had the quantity of fruits. They were supposed to mark or color ten boxes from bottom to top.

But they marked and colored from top to bottom. They do not have that notion yet.

T6: I understand what T4 is trying to say. They are columns. Each column has a student's name. Next to the column, each little square has the name of the fruit or game or color, whatever is being discussed in that class. So, for example, if someone likes apples the most, how many children like apples? Then you color the quantity of apples. Do you understand?

T1: Ah, I see... you are talking about bar graphs, right?

T6: That is right, bar graphs.

T1: There are five boxes, and they color five, but instead of coloring from bottom to top, they color from top to bottom. Now I understand.

T4: Exactly.

T6: It is because for them, there is no order, and we always have to guide them when we work with it, like with addition, right? I think that is what she was talking about.

T1: This has never happened with my students, that is why I could not understand.

T2: It is easier when it is a table, but when it comes to graphs, that is when students have this difficulty. That is why I also did not understand the bottom to top, top to bottom issue, but after the explanation from the girls, I understood what they were saying.

In this dialogue, it is evident that the teachers recognize the importance of teaching Statistics, evaluating their involvement with this topic positively, and reflecting on their pedagogical practices. They express the difficulties students face in understanding conventions related to reading and constructing bar graphs. During the dialogue, gestures were also used to aid communication, and we believe that this strategy also contributes to understanding what is being communicated.

In this dialogue, we identified the simultaneous occurrence of several dialogic acts: *stablish contact, reaolize, acknowledgement, approach, rephrase* and *evaluate*. The teachers engage in a collaborative dialogue with

the group, seeking mutual support and demonstrating an open stance in sharing their experiences regarding the topic. Curiosity is also observed in their evaluation of the other participants' perspectives.

The teachers demonstrate their understanding of the arguments presented in the debate by explaining the focuses brought up during the conversation, highlighting the dialogic act of recognition. For example, at one point, T1 did not grasp the argumentation of T6 and T4, who mentioned that their students, instead of coloring the boxes from bottom to top, did it in the opposite direction. T1 recognized what was being discussed, as evidenced by the statement: "Ah, I see... You are talking about bar graphs, right?" This remark by T1 was important for the participants to position themselves and reformulate their perspectives to also incorporate the idea of bar graphs since, until that point, the arguments about the type of graph were still being discussed in a general manner.

At another moment during the education, prompted by the researcher's actions, the dialogic act of challenge emerged when she raised a question about statistical literacy, as follows.

> Researcher: And do you teachers consider yourselves statistically literate?
> T1: I do not think I am completely there. Because there are some graphs that are difficult to analyze, but I think I am, to some extent. Because we are always seeing graphs on television, in magazines and such, and usually, I can interpret and analyze them correctly. But there are more difficult graphs that become complicated. I have noticed that some graphs are incorrectly presented. We, ourselves, cannot interpret them sometimes because of the lack of data that is not provided. Because a graph should have some record of what was analyzed, right?
> T6: That is exactly what T1 said. I think statistical literacy should also be about that. The social function of statistics, how it is experienced in everyday life, right?

> T2: It is about reading and handling data, right? The student has to understand what they are going to do. In fact, we see graphs all the time in reading, for example, in science.
> T5: Sometimes, it is difficult for the child, and we have to work on it a lot. If you observe, every book and every subject have them, right? So it is very interesting to always work on it in various ways. I consider myself literate (in statistics) when it comes to understanding and answering questions, I always do very well.
> T4: No, I have some difficulty. There are graphs that are very complex, I think. Some are easy to understand, but there are very complex graphs.

Analyzing the excerpts from the debate, we perceive that the concept of statistical literacy was highlighted in the teachers' dialogues through remarks about everyday situations that foster reading and interpretation of statistical data. When explaining their understanding of statistical literacy, the teachers intertwine professional and personal circumstances in their arguments. They raised concerns about potential data manipulation by the media, as well as considerations about the teaching and learning processes of statistics content. When challenged by the researcher, the teachers engaged in the act of *approach* to contribute to the proposed dialogue, as well as *challenge*.

Another aspect brought up by the teachers during the meetings relates to the difficulties students face in engaging with activities on this subject, as well as the teachers' own mentioned insecurities in working with this topic, as evidenced in the following debate, which focused on working with data analysis.

> Researcher: And which graph do you think is the most common?
> T1: It is the bar graph. I even worked with them [students] showing that there are also line graphs and pie charts, which are often called pizza charts, right? So that they can understand that

these two forms exist, but usually the bar graph is used, especially in textbooks.

T3: They [student] often cannot read the graph because they do not understand what they read, they cannot read it properly, they still cannot fully comprehend what is being asked. That is the biggest difficulty in reading the graph for the student. So the teacher has to intervene and try to develop in them the ability to understand and analyze this data better.

T4: I agree too. Indeed, it is the lack of reading skills that they have, so they cannot answer the graph. The problem lies in reading itself.

T1: When I do it collectively, they can analyze it, they can understand it. They can do it correctly. But when they have to do it on their own, there is this difficulty because they do not read it, they do not understand what they are really reading. That is, those who understand, those who are truly literate.

T3: I think the easiest one, for sure, is the bar graph, right? It is easier. I think even for less literate people too.

T4: Yeah, definitely. The bar graph is much easier for us to understand. I think even children, when we explain it to them, they get it more quickly.

T1: I think that IS because it is the one we see the most in our daily lives, it is the most commonly used. Since it is something we frequently encounter, we think it is easier. But the line graph and pie chart are also quite clear, right?

T2: As my colleague mentioned, it is a matter of familiarity. The more you practice, the easier the understanding becomes.

In this dialogue, we identified the emergence of the dialogical acts of *realize* and *approach*. At this stage of the education, the teachers were already feeling comfortable expressing their viewpoints and sharing their experiences regarding the work with Statistics. In the debate, the teachers made remarks that indicate the implementation of activities related to data

treatment involving specificities with the representation of data in pie and line graphs. In this sense, they refine the idea that bar graphs allow for better understanding by both students and teachers, in addition to being the most commonly used.

One of the challenges pointed out by the teachers is related to the fact that reading and interpreting graphs activities are to some extent linked to the students' level of literacy. T1, when commenting on this issue, also highlights the difference observed in the students' performance depending on the type of dynamics used to work on the topic, whether individually or collectively. According to T1, in a collective setting, there can be a perception of advancements in student learning. It was also mentioned that bar graphs and column graphs are the ones that present less difficulty.

In the discussions mobilized regarding the pedagogical work with Statistics with students in the early years, the teachers expressed positions based on actions that aimed at both formation and the exercise of citizenship, as evidenced in the following excerpt.

> Researcher: Do you think that working with the construction and interpretation of graphs and tables is enough? Do you think it is possible to integrate statistics with other sciences? What should be taught to children in the early years regarding statistics?
>
> T1: It is not enough to solely work with the construction and interpretation of graphs and tables, right? As we have discussed, we should go beyond the interpretation of graphs and tables. We need to truly understand the context and problematize the situations related to the topics being addressed. We should also consider the children's prior knowledge and what they already know. Based on that, we can raise questions, encourage them to think and help them reflect on what is being worked on or experienced.
>
> T4: Generally, statistics is integrated with other sciences, right? Especially for children, it should be connected to their daily lives and social context. When it comes to teaching statistics to children

> in the process of literacy, we should start by asking them if they have seen any graphs or tables, perhaps on TV. If they say they do not know what a graph or table is, we can show them an image and ask if they have seen something similar before.
>
> T8: I believe that we should question and problematize the students, and contextualize these graphs and data. We should stimulate their curiosity and help them understand and learn about statistics, how it works, and what the graph is conveying. It is important to engage them in problematizing and contextualizing the concepts.

In this dialogue, we observe the researcher stimulating a debate on the pedagogical work with statistics content. T1, T4, and T8 share their views on the topic, developing arguments that demonstrate the emergence of the dialogic acts of *approach* and *realize*. These three teachers present their perspectives to the group, with ideas that reflect a critical stance towards working with statistics in the early years. They actively listen, acknowledge the conceptions brought by other colleagues in the process, even though they understand that their view on the topic is not the only or absolute truth. In this sense, we identify a communication in which the sharing of perspectives is done in an equitable manner, a fundamental aspect of dialogic communication, according to Alro and Skovsmose (2006).

The teachers position themselves by making comments that emphasize the importance of pedagogical work that takes into account the students' context and prior knowledge. According to the teachers' dialogues, when working on the interpretation of statistical graphs, it is essential to create situations that enhance problematizing questions, helping students mobilize their critical competencies through reflections and inferences based on the data. In addition to recognizing the importance of constructing and interpreting graphs, the teachers also highlight the social function of these statistical representations.

Conceptual aspects are also a point of reflection for the teachers, who value and emphasize the need for students to understand the elements that make up a statistical graph, such as the title, numbers, categories, and, most importantly, the context of the data. The interdisciplinary nature of pedagogical practice is evident in the remarks of T1, T4, and T8, who highlight that working with statistics in the early years should align with other content areas.

Lastly, we perceive that during the communication process, the teachers recognize the fundamental role that the teacher plays in the process of educating for citizenship, even though they argue that the implementation of pedagogical practices structured on democratic values and that also take into account the students' interests is necessary. Thus, considering the ideas presented through the proposition of activities with statistics content, the teachers evaluate the task of educating their students as active agents in the process of social transformation.

Final considerations

During synchronous meetings, the teachers expressed themselves whenever they deemed it appropriate, with the initial communications not being restricted to the researcher, exhibiting a spontaneous nature that facilitated the joint occurrence of different dialogic acts. However, asynchronous communications were considered of fundamental importance for promoting dialogues with the teachers on different occasions, but mainly for facilitating the continuation of synchronous activities. On the other hand, it was noted that the initiation of conversations in the WhatsApp application often came from the researcher, which facilitated the occurrence of the dialogic act of establishing contact in all meetings.

Specifically, regarding dialogic acts, it can be observed that during the communications, they do not appear in isolation; on the contrary, they emerge simultaneously with other dialogic acts depending on the context of the conversation. When reflecting on different perspectives on the concepts of Statistics, statistical literacy, and teaching and learning processes related to working with these contents, the teachers interact dialogically, displaying a sense of proximity with the other participants and contributing particularly to the sharing of experiences within the group.

By observing the particularities of communication within this context of continuous education with synchronous interactions, it was found that active listening and equality among participants constituted essential elements for dialogue to occur in different moments of interaction. Furthermore, the attitude of closeness among group members from a perspective of equality fostered an environment of exchanging experiences, where each person could learn from one another and position themselves in a way that enabled the occurrence of dialogic acts through the recognition, perception, and sharing of their understandings.

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