ZETETIKÉ

Understandings about graphs by field school teachers

Compreensões sobre gráficos por professores de escolas no campo

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Abstract

Interpretation of statistical data presented in graphs is associated with competences that must be developed by citizens during their schooling. In Brazil, the Field Education contexts are challenging since it demands the consideration of contextual specificities. This article discusses aspects of a research that investigated comprehension about graphs that of field school teachers. The research data came from interviews and workshops on statistical literacy. The results obtained from the interviews suggested some gaps in relation to the concepts of Field Education, as well as evidenced difficulties regarding the interpretation of graphs. The workshops seemed to be important education venues for statistical literacy, as teachers were encouraged to enrich their pedagogical practice.

Keywords: Statistics education; Field education; continuing teacher education; Final years of elementary school.

Resumo

A interpretação de dados estatísticos apresentadas em gráficos vincula-se a competências que devem ser desenvolvidas pelos cidadãos no decurso de sua escolarização. No Brasil os contextos de Educação do Campo são desafiadores uma vez que essa modalidade de demanda que sejam consideradas as especificidades dos contextos campesinos. Este artigo discute aspectos de uma pesquisa que investigou as compreensões sobre gráficos que professores de escolas no campo evidenciaram a partir de entrevistas e oficinas de formação continuada sobre letramento estatístico. Os resultados obtidos das entrevistas evidenciaram algumas lacunas em relação às concepções de Educação do Campo, bem como evidenciou dificuldades quanto a compreensão dos gráficos propostos para interpretação. As oficinas de formação mostraram-se como espaços importantes de formação para o letramento estatístico, pois os professores sentiram-se incentivados a enriquecer sua prática pedagógica.

Palavras-chave: Educação Estatística; Educação do Campo; Formação continuada de professores; Anos finais do Ensino Fundamental.

Introduction

The insertion of statistical graphs in social communication situations seems to be frequent, which demands adequate interpretations in different reading contexts (Monteiro, 2005). In this sense, the graph is a cultural tool that can expand human capacity in the

organisation of information and statistical data (Monteiro, 2005, 1998).

Salcedo (2017) emphasises that the understanding of information presented in statistical graphs is linked to competences that should be developed by citizens during their schooling. The National Mathematical Curriculum Parameters for Elementary Education (MEC, 1998) highlight the importance of teaching about graphs since the first stages of schooling. Therefore, pedagogical actions that address the interpretation of graphs are relevant in a perspective that can "mobilise previous knowledge and experiences, and negotiate the different meanings that emerge in an interpretative situation" (Monteiro & Selva, 2001, p. 4). In this sense, it is important that teachers learn in their pre-service and in-service how to teach about graphs.

The Brazilian school system is quite complex and involves several contexts in which the teaching and learning processes are developed. An important aspect of this diversity is related to the differences that are established between urban and rural school contexts (Monteiro, Leitão & Asseker, 2009), even though contemporary theoretical approaches the rural and the urban in a continuous and not in a dichotomous way (Wanderley, 2004).

Since the Brazilian colonial period, the population living in the countryside has had access to compensatory education, due to the widespread belief that a minimum of schooling would suffice (Arroyo, 2007). From the 1990s onwards, institutionalised initiatives began to emerge aimed at forwarding policies related to *rural education*, involving segments of organised society. These initiatives were the result of demands from social movements linked to field (peasant) peoples that made visible the precarious conditions of rural areas. Nowadays, despite important advances, *field education* continues to present challenges that range from problems of physical structure to the lack of pedagogical proposals that are consistent with the reality of the field.

This article discusses aspects of a master's research that aimed to analyse the understanding of graphs by public field school mathematics teachers in the final elementary years. This article aims to present the analysis of research results on how the participants understand the statistical information in graphs, as well as what their understanding of statistical literacy and *field education*. The article also analysed participants' reflections on the relevance of statistical education and on the interpretation of graphs under the statistical literacy perspective. These reflections were developed during teacher education workshops. The study was related to a broader research project entitled *Statistical Literacy in Field Education: challenges and possibilities for teacher education*, which was supported by the Federal University of Pernambuco (UFPE) and partially funded by the National Development Council Scientific and Technological (CNPq).

Field Education

Field education is characterised as an educational project whose authors are the peasants together with their organisations and experiences. This education has the role of educate critical people in order to build the development of the field (Santos, Paludo &

ZETETIKÉ

Oliveira, 2010). Caldart (2012, p. 18) states that the primordial feature in the movement for field education:

> [...] it is field people's struggle for public policies that guarantee their right to education, and an education that is in the field and from the field. In: the people have the right to be educated in the place where they live; From: the people have the right to an education thought from their place and with their participation [...].

The guarantee of educational policies to provide an adequate education was made explicit in the Law n. 9.394 (1996), the Guidelines and Bases of National Education. The article 28 established the need for adaptations of curricular contents and methodologies, as well as adjustments in the organisation of school calendar considering the specificities of the field population.

The 1st National Conference on Field Education was held in 1998. This conference enshrined the specific term of this modality and suggested methodologies and curricular contents that could rescue the cultural values of field people. This central focus of public policies for field education was ratified with the Operational Guidelines for Basic Education in Field Schools (MEC, 2002).

The publication of Decree nº 7352 (2010) constituted the official legitimation of field education policies and the National Programme of Education in Agrarian Reform (Pronera). Molina (2012) states that this legislation marks the state's obligation to institute forms of expansion and qualification of Basic and Higher Education to field population. In article 4, item V of the decree, there is a clear assistance to educational institutions with regard to the Union in guaranteeing technical, material and financial resources for field schools. Furthermore, in item VI, a professional education for field schools is defined. Although the establishment of legal provisions was an important step in demanding the right to education of field people, this law was insufficient to guarantee it.

A series of government initiatives attempted to guarantee field education. Within the scope of the ministry of education, the Program for Supporting Teacher Education's Degrees in Field Education (Procampo) was implemented, linked to the Secretariat for Continuing Education, Literacy and Diversity (Secad). This programme allowed the implementation of Degree Courses in field education in several Federal Institutions of Higher Education (IFES) throughout the country. These courses for pre-service field teachers are challenged to build pedagogical proposals that can offer a better articulation between knowledge areas in field contexts. Based on this need to field teacher education, this article discusses statistics education linked to field education.

Statistics education

In contemporary social contexts knowledge about statistics is very important because it is not only part of individuals' daily life, but it also related to other different knowledge areas which deal with collection, organisation and interpretation of data (Cazorla, Kataoka & Silva, 2010). Therefore, statistics "allows us to understand many of characteristics of today

ZETETIKÉ

complex society, at the same time that it facilitates decision-making in a daily life where variability and uncertainty are always present" (Lopes, 2010, p. 51).

The National Curriculum Parameters (PCN) for Elementary Education highlight that the learning of statistical content provides "the development of specific forms of thinking and reasoning to solve certain problem situations that involve random phenomena, interpreting samples and communicating results through statistical language" (MEC, 1998, p. 134). Giordano, Araújo & Coutinho (2019) state that the most recent Brazilian official document, the National Base Common Curriculum - BNCC (MEC, 2017) brought advances in relation to the PCN, as it expanded the prescription of probability and statistics topics from early childhood education to the end of high school.

According to Cazorla, Kataoka & Silva (2010), statistics education presents itself as an area that seeks to understand how people teach and learn statistics. One of the main objectives of this area is to contribute so that students can develop statistical and probabilistic thinking, providing essential skills to critically analyse the statistical information that is presented in different daily situations (Lopes, 2010).

Campos, Wodewotzki and Jacobini (2013, p. 23) argues that the term literacy "reminds us ability to read, understand, interpret, analyse and evaluate written texts." Furthermore, these authors emphasise that statistical literacy is related to argumentation based on the use of statistical terminology.

Ben-Zvi and Garfield (2004) claim that statistical literacy includes basic and important skills that can be utilised to understand statistical data or research results, such as organising data, constructing and interpreting different types of data representations, and understanding of concepts, vocabulary and symbols.

Gal (2002) proposes a statistical literacy model involving two types components: cognitive and dispositional.

Table 1 – Statistical Literacy Model

Knowledge elements	Dispositional elements
Literacy skills	Beliefs and Attitudes
Statistical knowledge	Critical stance
Mathematical knowledge	
Context knowledge	
Critical questions	

Statistical Literacy

Source: Gal (2002)

Gal presents a statistical literacy model which is based on two interrelated sets. Therefore, a statistically literate person is aware of trends and phenomena of social and personal relevance, being able to read and interpret the statistical messages exposed, making

decisions about these phenomena critically evaluating.

For Gal (2002), statistical literacy is a broad area that involves not only formal knowledge and skills, but also beliefs, habits, attitudes, awareness and critical perspective. For Gal, statistical literacy involves the ability to interpret and critically evaluate statistical data in different contexts, as well as the ability to discuss and communicate their reactions to such information. Therefore, who interpret the data are based on their knowledge of statistics but are influenced by their opinions and feelings.

Teachers and the Interpretation of graphs

Lopes, Silva, Vaz & Fraga (2012) argue that basic education in Brazil still faces several challenges regarding the promotion of statistical education for its students. An important challenge in teaching of graphs both in Brazil and in other countries refers to the type of pedagogical approach that is developed by teachers. Ainley (2000) states that, in conventional classroom environments, the teaching of graphs is segmented into a succession of tasks related to various subskills or conceptual terms, such as scale, axis design and plot points. Perhaps the greatest challenge to develop a satisfactory teaching of graphs is caused by the fact that teachers still having insipient knowledge about graphs. In a study on the interpretation of media graphs among Brazilian teachers in the early years (Monteiro & Selva, 2001), the analysis of results revealed that some of participants did not know basic notions related to the graphs. During the interviews, all teachers recognised the need to learn more about graphs. The majority justified this situation because of the absence of specific approach this topic during pre-service and in-service teacher education. More recent studies on interpretation of graphs confirm that the teaching of statistics concepts in early years teacher education is still incipient (Szymanski & Martins, 2017, Martins & Carvalho, 2018).

It would be simplistic to say that the previous experiences of teachers in a specific area could directly influence their approaches to teaching topics in the same area, because teacher education is complex and involves numerous specific processes (Monteiro & Pinto, 2004). However, it is reasonable to predict that teaching about graphs in schools could improve if teacher education courses offered opportunities in which teachers could learn how to approach graphic representations in a meaningful way for students (Ainley, Pratt & Nardi, 2001). In this sense, teachers should know how to plan actions that: direct attention to relevant elements; encourage certain initiatives and discourage others; promote negotiation of meanings; maintained an adequate articulation of activities and conceptual issues (Ben-Zvi & Arcavi, 2001, Nemirovsky & Tierney, 2001).

Methodology

The study had qualitative approach and the participants were teachers from public schools in a municipality located in the north forest zone of Pernambuco. The teachers taught in classes in the final years of elementary school, each in a different school that was in a rural district. The main economic activities in the municipality are related to trade in goods and

services, and agriculture with emphasis on the planting of sugar cane.

Interviews. In the first stage of this research study, five interviews were conducted with teachers between the months of August and September 2017. Each interview lasted approximately 50 minutes, having been recorded on a digital voice device. The semi-structured script included questions regarding continuing teacher education, the concept of field education and teaching about graphs. Table 2 presents the list of questions.

Table 2 - Interview questions

- Did you attend any in-service teacher education this year?
- What contents are /were covered in this continuing teacher education?
- How is this continuing teacher education carried out?
- What do you understand about field education?
- Have you heard about field education?
- What have you heard about field education?
- Based on what you know about field education, how would you define it?
- Do you teach statistics in your classroom groups?
- What do you think about to teach students about statistics?
- If you do not teach: Why do not you teach about statistics?
- If the teacher works: What statistics contents do you approach with your class?
- How do you approach this content?
- Do you work with graphs?
- What types of graphs do you use in the activities you propose?
- Do you think that this teaching about statistics considers aspects of field education?
- Do you think, for example, teaching about graphs could promote the development of students' statistical knowledge in order to better understand their own reality? Why do you think that?

Source: study archives.

As part of interview, it was proposed tasks for the teacher to interpret two graphs related to field contexts. In this interview stage, three types of questions were asked. Firstly, an introductory question which provided a reading and an understanding of information expressed by the graph. Secondly, specific questions which focused on verifying the understanding of information presented. Thirdly, general questions whose answers would demand a critical reflection on statistical data. Figures 1 and 2 show the two graphs used in the interviews.
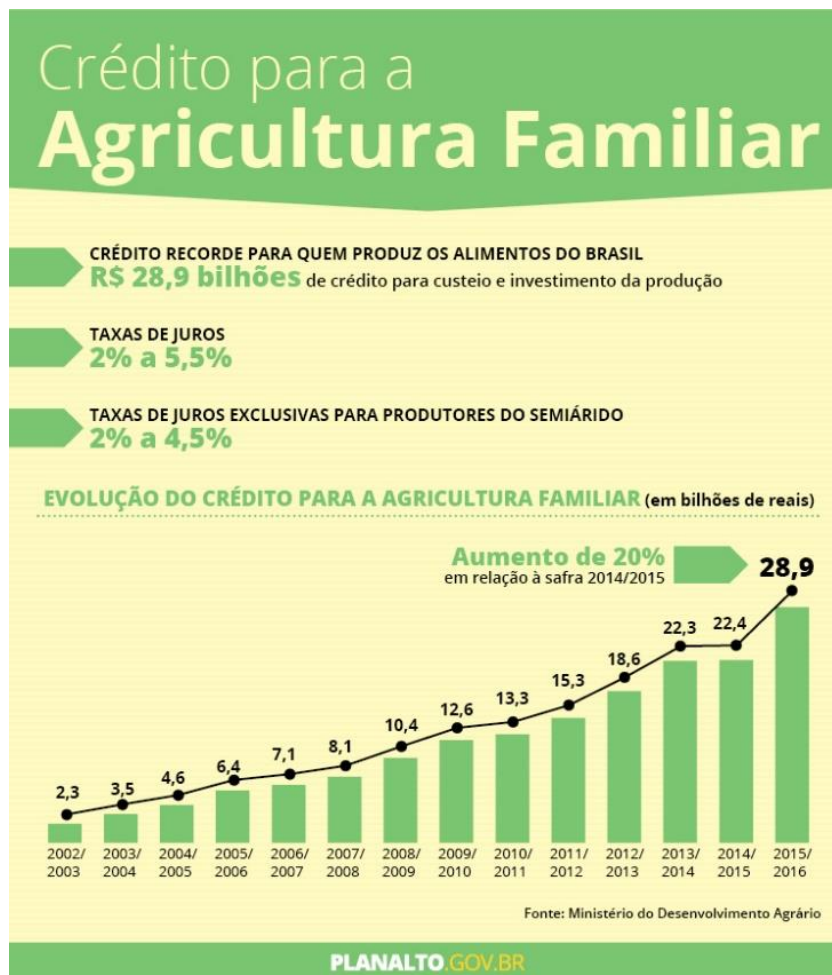
Figure 1 - Graph about credit for family farming
Source: Portal Planalto (2015)

a) What can be seen from reading the graph?

b) How much was the percentage increase in credit for Family Farming in 2015/2016 compared to 2014/2015?

c) Does your answer confirm what the graph labels say?

d) What other reflections could you make from the statistical data presented by this graph?

Figure 1 was from news article whose title was: "We have as a great challenge to produce increasingly healthy foods". This article was published by *Portal Planalto* on June 24, 2015. It is a bar graph that correspond to time intervals (years). The numbers presented in each column are in line with the quantitative values (billions) related to the evolution of credit destined to field productions. The graph variables are year, percentage, and evolution of credit for family farming.
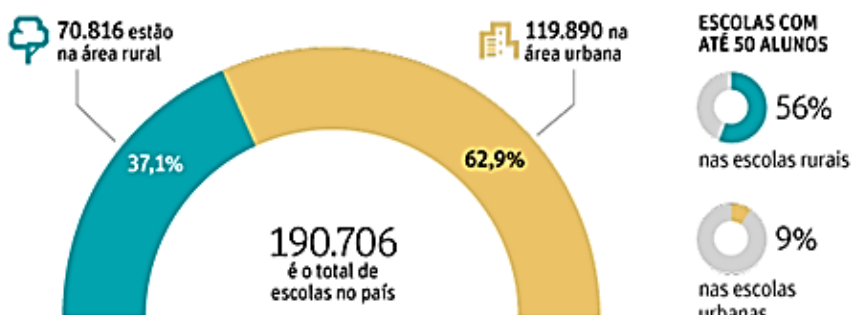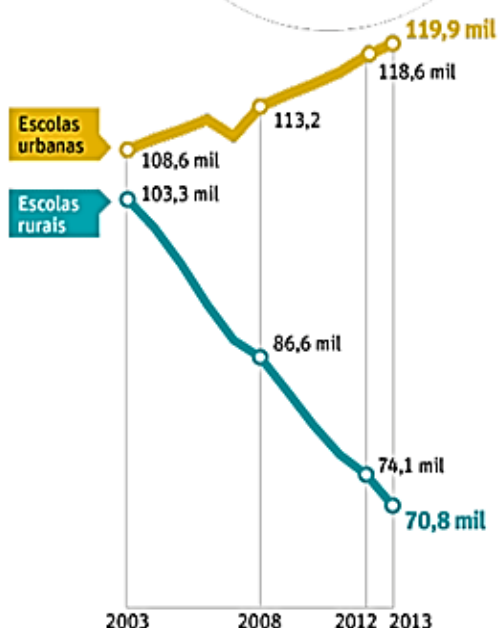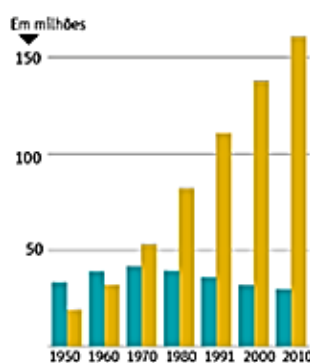
Figure 2 - Graphs with statistical data on rural schools in Brazil.
Source: Cancian (2014).

a) What can you know from the reading of this graph?

b) What reflections could you make about reducing the number of educational institutions in field areas?

c) Can it be inferred that the close down of schools stimulates the rural exodus?

d) Could you make any other reflections about this graph?

Figure 2 was associated with an newspaper article entitled "Brazil closes, on average, eight schools a day in rural region", published in the *Folha de São Paulo* on March 3, 2014. The questions focused on the line graph on data about the decrease numbers of rural schools

and increase numbers of urban schools. This graph subtitle is "Evolution in Brazil".

The interviews were transcribed, and the protocols were generated, in which fictitious names were assigned to the participants to protect their identity.

Teacher education workshops. In the second stage of the research, teachers were invited to participate in continuing teacher education workshops in order to study aspects of statistics education related to field education. The group met in three occasions, each one lasting 2 hours, between the months of October and November 2018.

The first meeting aimed to enhance the discussions regarding field education, since the analysis of the interviews had made explicit that teachers do not know about it. In the second workshop meeting, it was addressed statistical education and the interpretation of graphs related specifically to field education contexts. The third meeting was designed to plan intervention activities based on BNCC curriculum guidelines associated with the perspective of statistical literacy.

In the second workshop we propose a discussion of the text entitled "The role of statistics to reading the world: statistical literacy" (Cazorla & Castro, 2008). In addition, it was proposed to interpret four statistical graphs on themes of the social and economic context of field. Figure 3 was one of the graphs proposed for interpretation.
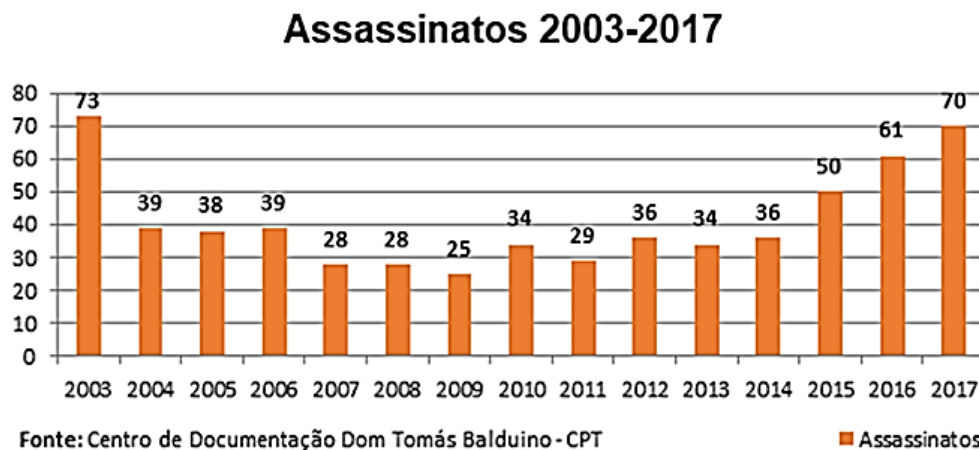
Figure 3 - Activity 1: Graph - Murders in field areas

Source: *Assassinatos 2003-2017* (2018).

a) What can you know from the reading of this graph?

b) Regarding to the data about the murders of field people presented in this graph, what analysis can you do?

c) What is the percentage increase in the number of murders in field areas between 2015, 2016 and 2017?

d) Regarding the average number of murders over the past 15 years, what reflections could you make?

The bar graph presented in this research task, exposes the number of murders in field areas recorded from 2003 to 2017. The data were extracted from a publication from Dom Tomás Balduino Documentation Centre of CPT (Land Pastoral Commission). This sector has the function of collecting, organising and disseminating data dealing with the violation of human rights in field areas.

Results of the interviews

Due to space limitations, we present in this section analysis of interviews with participant teachers Arnaldo, Cláudia and Lourenço.

Responses to initial questions. At the time of interviews, Arnaldo and Cláudia had a temporary contract in the municipal school system, having seven years of experience teaching in the final years of elementary school. Both teachers did not live in the community where they worked. Lourenço has more experience in education, with 27 years of career, had a permanent contract and teaching in classes from 6th to 9th grade. Lourenço stated that was living field areas during his youth.

The three teachers did not take a postgraduate course and, at the time they participated in the research, they did not have the opportunity to have in-service teacher education in a systematic way.

Regarding the questioning about the concept of field education, Arnaldo and Cláudia stated that they had no knowledge about it. Lourenço answered the question based on what field education for him could be and not what it actually is, as this following excerpt from his interview protocol:

> Lourenço: *I lived a good part of my youth in the countryside, I have properties, relatives and work, right?* [...] *There should be agricultural schools in our region, as in other cities in Pernambuco.* [...] *A school for farmers' children.*

When we asked about the teaching of statistics, Arnaldo and Cláudia mentioned the importance of teaching in this area, the reading of graphs, emphasising the approach to statistical content in student' everyday situations. They specified that they taught about bar and line graphs in classroom. Arnaldo stated that students have difficulties in other types of graphs, as it indicated on this excerpt of his speech:

> Arnaldo: *Most of time I teach bar graphs, because their* [students] *difficulty is great,* [to] *analyse another type of graph, mainly sector graphs, the difficulty is great! In this graph, they need to know other topics, percentage, then it becomes more difficult.*

Lourenço stated that he did not teach his class group about statistics. He said that when he eventually taught, it was generally, and he utilised bar graphs to introduce content related to students' context.

Regarding how the contents of Statistics are approached, Arnaldo and Cláudia claim to teach about statistics and probability through the exploration of situations and problems

that arouse curiosity for the development of thought and logical reasoning, as we can see in these excerpts from their speeches:

> Arnaldo: *The content I teach curricular contents related to probability and graphs. I present an electric bill; then I start working on a graph in relation to the question of amount of energy spent.*

> Cláudia: *I'm still going to begin teaching about statistics and probability section in the seventh year. They will see several types of graphs, I will also ask them to observe in their daily lives, from their day to day, issues about electricity bill, water bill ... I will bring more to their social life to try...* [what] *I already tried to introduce* [with] *graph issues...*

The interpretations of graphs. In this subsection we present extracts from interview with teachers and our analysis regarding their interpretations during interviews. Initially, we asked each teacher to read a graph shown in Figure 1, with the title "Credit for family farming". Lourenço made the following comment:

> Lourenço: *It deals with family agriculture, with investment made. And what I liked was the percentage of interest, it is good, right?*

When the researcher asked him about the percentage of credit for family farming, Lourenço responded:

> Lourenço: *Approximately 20% increase, which is a very significant amount. Wow! If a percentage of these increased every year, it would go a long way* [laughs]. *The countryside people would be privileged!*

In addition to describing the increase in percentage value presented in the graph, Lourenço exposed his feelings in his speech, as he revealed his satisfaction about the figures.

The analysis of participants' statements, it was identified their difficulties to interpret the percentage increase which the graph presents, as we can identify in the following interview extracts:

> Researcher: *How much was the percentage increase in credit for family farming in 2015-2016, compared to 2014-2015?*

> Arnaldo*: It is 6.5%.*

> Cláudia: *In the case of 2015, it was 28.9%; 2014, in the graph,* [it] *is here 22.4%, you want to know what the increase is? Wait a minute. It's going to be 5 ... isn't it? ... It's not ... Compared to the two, right? It's not what, it's not the increase here, is it? It gives 5 ... [inaudible excerpt].*

When asked to express other reflections based on statistical data related to the graph, Lourenço demonstrated his considerations and analysed of presented data. As exemplified on this following excerpt of his speech:

> Lourenço: *There was an evolution in the data here, right? From 2002 to 2016, regarding investment in the application of resources. Now, moreover, I would like to see it in practice. It is that, if there was a technician in this area to serve these families, it could be more appropriate, because, when receiving these investments, the*

ZETETIKÉ

families do not have the technical knowledge to apply and develop their production. This evolution can be increasing or present losses for some!

The responses of Arnaldo and Cláudia seems to be related to difficulties to understand statistical data, as these following extracts demonstrate:

Researcher: *What other reflections could you make from the statistical data presented by this graph?*

Arnaldo: *It is about investment here that was a... you are talking here [about] a record credit, which allows agriculture to develop, right? Because, if there is no investment in credit, there would be no such growth, even if the difference we saw here is not the value that says here, which is between 2% and 5.5%, the difference that is 6.5% , even so there was a growth.*

Cláudia: *No. It went well, it was well explained, thus, the question of graph attributions.*

Participants' analyses about graph related to "evolution in Brazil" (Figure 2) also seemed point out difficulties in make reflections about the themes, as we can infer from the following excerpts:

Researcher: *What reflections could you make about reducing the number of educational institutions in the field?*

Arnaldo: *From what I analyse here in the graph, this part, when talking about rural exodus, has everything to do with the facility that we have today in taking students from rural schools to towns.*

Cláudia: *I think it has a big drop here, right? At the field school as he says, right? Rural exodus.*

Researcher: Can it be inferred that the cause of the extinction of schools stimulates the rural exodus?

Cláudia: *It stimulates. Actually… ask the question again!*

Researcher: *Can it be inferred that the cause of the extinction of schools stimulates the rural exodus?*

Cláudia: *I think it stimulates, but to explain with my words now, why… [laughs] ...*

In the other hand, Lourenço's speech about the reduction of rural school indicated familiarity with the theme, as it is exemplified by this following excerpt:

Lourenço: *A causa dessa redução é exatamente a falta de assistência aos alunos da área rural, à comunidade, às escolas. E isso representa uma migração das pessoas da área rural para a urbana...*

Lourenço's reflection expressed the importance of knowledge about the context to which the data refer, as it can offer elements for those who interpret to better understand the

statistical data. A reader unfamiliar with the context related to data might have difficulties in making inferences, as well as proposing reflections or detecting possible errors in the study (Gal, 2002).

The analyses of results suggested that reflections on statistical data were expressed only by one of teachers. Some misunderstandings about the themes were presented, they had difficulties to mobilise knowledge elements necessary for the interpretation of the data presented. Arnaldo and Cláudia seemed that did not understand relationship between the percentage values. Furthermore, they did not say much about their opinions, they highlighted the year and the percentage value without considering the percentage that is explicit in the graph. It could be expected that teachers could interpret easier the statistical data related to field topics. On the contrary, they felt intimidated, and we can infer that one of the reasons for this was the fact that they did not know about the context. Considering these results, we plan to develop teacher education workshop with teachers about the concept of field education and aspects related to statistics education.

The workshops. The first workshop was held in October 2018 in the municipal education secretariat building. The purpose of this meeting was to deepen knowledge and enhance discussions about field education. The five teachers with whom the interview participated of this first workshop. The pedagogical coordinator attended this meeting. She introduced all, and together with the teachers defined the agenda of next meetings and agreed that a voluntary participation. We request the authorization of the filming, but it was unanimous the choice for only audio recording.

We started the first workshop with the presentation of video entitled *Education in the Amazon* (2013) and the discussion of text *For a field education: traces of an identity under construction* (Caldart, 2002).

In the context of the discussions about the video, the teachers reflected on the pedagogical experiences of alternation reported by teachers working in communities in the state of Amazonas. Professor Lourenço commented on the video:

> [...] For 15 days, no matter what the holiday, it's just study. Even though it is tiring, the days are very profitable for the student and to be used later in society, in the place where they live. The important thing is this! It is the student to be prepared to stay, have knowledge and skills to work. And what is learned is not only for the student, they passe on helping those who need it who have no opportunities.

Arnaldo added:

> I agree! The video also shows the speech of a teacher who deals with the issue of textbooks, which is not adapted to student's reality. If the books were adapted to each region, our work would be very good! Our Mathematics book here in our region deals with activities that concern situations in other regions, such as, for example, there are problem situations that deal with a reality in the region of São Paulo state. This is our real situation!

Teachers' speeches presented their opinions about the pedagogical experiences shown in the video. Arnaldo's reflections focused on the concern about the availability of textbooks in field schools, especially to bring mathematics content closer to student's reality.

In the continuity of this first meeting, an excerpt from Caldart's text (2012, p. 263) was discussed, in which the author makes some notes on field education, emphasising its fundamental features as a political and pedagogical conception:

> *Field Education was not born as an educational theory. [...] Field Education reaffirms and reinvigorates a concept of education from an emancipatory perspective, linked to a historical project, to struggles and a long-term social and human construction. Its protagonists have exercised the right to think about pedagogy from its specific reality. The school has been a central object of the struggles and pedagogical reflections of Field Education [...].*

Continuing the reflections on the reading, Cláudia presented her perceptions on one of the main ideas from the author:

> *In order to build a project that is combining all of this, as it says in the text, education that combines with culture, with caring for the land, has many points that will be difficult for it to happen in an organised way. Especially because it will depend on countless points that must be transformed. The struggle for our student to remain in the environment in which he lives, as many leave to complete their studies and do not return due to opportunities that they do not find in the place where they live.*

Caldart (2002) argues that the construction of an education project aimed at field people must be understood with an education for the development of values that takes root, but does not firm people in the place where they live. In addition, the author stresses that it is an education designed with the intentionality of the individual's development in the political, social, economic and cultural aspects.

The second workshop took place on November 6, 2018. In this meeting were attended by three participants. Lourenço did not participate in the second meeting. The aim of this meeting was to expand the reflections on statistics education, statistical literacy and to develop activities about interpretation of graphs.

We started the activities with the resumption of debate that took place at the previous meeting on field education fundamentals. Then, we proposed discussions on an article entitled: *The role of Statistics in reading the world: Statistical Literacy* (Cazorla & Castro, 2008). The article addresses a necessary integration of statistical and probability concepts in basic education, according to the National Curriculum Parameters. At the beginning of discussions, teachers presented their point of view regarding the definition of statistics, as highlighted by their statements:

> *Arnaldo: It is a branch of mathematics that deals with studies on information, which can influence some situation.*

> *Cláudia: Statistics is the branch of mathematics that we use in the study of tables and graphs.*

Regarding the information contained in the article of Cazorla and Castro (2008), Cláudia said:

> *Cláudia: The text talks about the intention of who produces the information. I think the most critical moment is the fact that the population does not know how to read the information through the graph; and [this is where you go wrong. Even at school, if we display the statistical graph full of information, drawings, then it becomes more difficult to understand. There is a great difficulty in reading graphs, knowing how to interpret, and that is why the population do not know much about it.*

In this perspective, Arnaldo complemented the discussion by saying:

> Arnaldo: *And one of the points that caught my attention in the text are the pitfalls of graphs that even for us, teachers, go unnoticed too, due to lack of attention or even they can bring something that we may not understand, some information, percentage.*

Teachers' statements show concern with the dangers in statistical information. Lopes (1998) considers that the teaching of statistics contributes so that the school, assuming the role of preparing students for the world, involves them in statistical research processes, allowing him to carry out his reflections and conjectures, formulate hypotheses, in order to assist you in reading the world.

After the discussions, it was proposed activities to interpret graphs. In this article present some aspects from the teachers' interpretation of Activity 1 as shown in Figure 3. The graph was made available in printed material as well as displayed on a slide. For our analysis, we based on the elements of the statistical literacy of Gal (2002).

Regarding the second question asked according to the Activity, we can transcribe the following dialogue:

> Pesquisadora: *Com relação aos dados referentes ao número de assassinatos dos povos do campo apresentados no gráfico, qual a análise que você pode fazer?*
>
> Arnaldo: *Após 2003, houve um aumento e queda não muito alto de assassinatos, mas, a partir de 2015, foi crescendo, e quer dizer que nos próximos anos, que é claro, a violência está em alta em todo lugar; e, com esses dados que estão apresentados no gráfico, podemos dizer que o número irá crescer ainda mais de mortes no campo. Esse número alto de mortes se dá por uma violência muito grande, que afeta a população. Usuários de drogas, outra coisa, a segurança não chega à zona rural, é preciso ter mais um olhar. Aqui mesmo, a zona rural está crescendo muito! E são muitas vítimas, principalmente, jovens!*

Arnaldo's speech reflects on aspects of a more general context related to the quantitative data presented.

The following extracts refer to the responses of Arnaldo and Cláudia to a question that refers to specific relationship between percentage values presented in the graph:

> *Researcher: What is the percentage increase in the number of murders in the field areas between 2015 and 2017?*

ZETETIKÉ

Arnaldo: From 2015 to 2017, the difference is 20 murders and in my calculations, it is, humm... 40%.

Cláudia: From 2015 to 2016, the percentage increase is 18%, in a total of 61 murders. And, from 2016 to 2017, it is 12.85% over a total of 70 murders.

Responding to a question regarding a specific relationship between data presented, the teachers utilised calculation procedures. A mistake was made by Cláudia, a fact that can be justified by the context of interpretation. In this sense, it seems to be an evidence of mathematical and statistical knowledge mobilisation.

The following excerpts refer to their answers to a question which demands a reflection on the results presents.

Researcher: Regarding the average number of murders in the last 15 years, what reflections could you make?

Arnaldo: As I said, for example, here, our region is growing, the number of young people is great! They need change, our young people have no opportunities and they are looking for other ways. The probability is to increase this average, which is approximately 42 murders in the field.

Cláudia: Calculating here, the average is 41.33 deaths per year in the field. Now look, is the information that is here complete on this graph? Perhaps there are more numbers of murders that may not appear on graph.

The interpretation strategies utilised by the teachers were based on obtaining the average value referring to the graph data. Gal (2002) emphasises the basic knowledge and ideas related to descriptive statistics. This author shows that the percentage and measures of central tendency are generally observed in the representation of statistical data in many of graphs published by media. Therefore, teacher´s interpretations associated to their *mathematical* and *statistical knowledge*. As for the questioning of professor Cláudia about possible errors in the presentation of the statistical information present in the graph, the participant showed signs of a *critical stance*.

Final considerations

The results from interviews suggest teachers´ lack of knowledge about some theoretical concepts and practical approaches on field education, which might be a consequence of the absence of teacher education to enable them to teach in field schools. Furthermore, when asked to interpret the statistical graphs, some teachers had misunderstandings about the themes related to field context. They also had difficulties to mobilising knowledge elements necessary to understand the data presented in the graphs.

On the other hand, we consider that continuing education workshops promoted an interactive environment of knowledge, exchange of experiences and opportunities for the initial reflection on statistical literacy and the concept of field education. Our analysis suggested that in the participants' interpretations of graph, they mobilised critical-reflexive elements as well as expressed their affective reactions to the statistical graphs. Furthermore,

in this scenario, teachers felt encouraged to enrich their pedagogical practice by carrying out activities for the teaching of statistics, in promoting learning in students' social context.

Our findings reveal the importance of creating new spaces for continuing education for teachers who work in schools located field areas. It is essential that these teacher education situations promote discussions based on pedagogical approaches for the teaching of statistics based on statistical literacy and field education perspective.

Acknowledgements:

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