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The Statistic on Secondary School: in pursuit of contextualization

A Estatística no Ensino Médio: em busca da contextualização

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Abstract

Through a case study, we seek to understand how statistics education has been approached in secondary school classroom, and how it provides to the students a contextualization of content and a critical perspective of the contemporary world. The empirical materials were developed through a qualitative approach via observations on the class environment, interviews with teachers and focus groups with students from the third year of secondary school. Then, it was systematized and studied according to the Content Analysis. Although the students can establish some relation between statistics and daily life, the results from this study indicate the way it has been approached in the classroom does not allow them to understand their concepts critically, since it is not approached in a contextualized way.

Keywords: Contextualization; Statistics Education; Secondary School.

Resumo

Este trabalho, caracterizado como estudo de caso, busca compreender como a Estatística vem sendo abordada em sala de aula no Ensino Médio, de forma a propiciar aos estudantes a contextualização dos conteúdos e uma visão crítica sobre o mundo contemporâneo. Em uma abordagem qualitativa, os dados produzidos foram obtidos por meio de observações no ambiente de investigação, entrevistas com professores e grupos focais com alunos da 3ª série do Ensino Médio, os quais foram sistematizados e interpretados de acordo com a Análise de Conteúdo. Os resultados obtidos permitem considerar que, por mais que os estudantes consigam estabelecer algumas relações entre a Estatística e o cotidiano, a maneira como ela vem sendo abordada, em sala de aula, não possibilita que compreendam seus conceitos de forma crítica, visto que ela não é trabalhada de modo contextualizado.

Palavras-chave: Contextualização; Educação Estatística; Ensino Médio.

Introdução

It is very common to come across a large amount of information represented, concisely, by means of graphs, tables and diagrams, whether in newspaper reports, magazines, news programs or in product instruction manuals. These need to be interpreted

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and demand from the citizen, a critical analysis to be understood, in order to be transformed into knowledge that can interfere in their experience in society. Because it is present in people's daily lives, Statistics - a science that makes it possible to organize and study data - requires training that will lead them to critical, political and social development in the face of the information that surrounds them. In this sense, we agree with Magalhães (2015), when he affirms that the understanding of Statistics and its basic concepts is essential for the understanding of problems, for the evaluation of situations and decision making so that, thus, it can assist in the constitution critical and participative citizen.

It is necessary to recognize, however, that the understanding of statistical concepts and their applicability in everyday situations is not yet part of the daily life of the majority of the population, who cannot understand the relationship between these concepts and the world in which they live. In view of this, it is evident the importance of contextualization for the attribution of meaning to scientific knowledge, bringing it closer to the student's prior knowledge, in the personal, social and cultural spheres (Ramos, 2002). In this way, contextualization can be promoted at school, making it possible to formalize concepts and establish meaning in the student's learning process. Thus, according to Vasconcelos (2008, p. 49),

> [...] to contextualize is to present in the classroom situations that give meaning to the knowledge that we want to be learned, through problematization, rescuing previous knowledge and information that students bring, thus creating a context that will give meaning to the content, that is, to lead you to your understanding.

Therefore, one of the objectives of the school institution is, or should be, to provide learning that leads to the constitution of a critical citizen, who effectively participates in the world of work, in the social, cultural and political relations of society, in a critical and autonomous way. Statistical knowledge can help students to expand their critical and autonomous capacities, as well as apprehend other mathematical concepts traditionally worked in the school environment (Lopes, 2008).

Based on the above, this article aims to understand how Statistics is being worked on in the high school classroom. Thus, the question that guided the study was: does the Statistics being worked on in the classroom in High School provide students with contextualization of the contents and a critical view of the contemporary world?

The development, assumptions and concepts of Statistics

Statistics is a part of human knowledge that arose from the need to manipulate data and extract information that was of interest to the population. Thus, its main objective is to obtain, organize and analyze statistical data with the intention of describing and explaining phenomena, in addition to establishing correlations, in order to produce useful and faithful information to the available data.

It is possible to understand that Statistics can help the population in the most diverse situations encountered in everyday life, and this has occurred since antiquity, since the need

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to count, quantify and count has always existed in the life of the human being. Etymologically, the word Statistics comes from the Latin *status*, which means State. Memória (2004) presents Statistics with reference to the treatment of quantitative data of interest to the State, which directly reflects its origin, as evidence, observed in this work and in Lopes and Meirelles (2005), shows the use of Statistics around 5,000 a. C., in census surveys carried out by the Egyptians.

In Brazil, Statistics has guaranteed its space since the imperial period, with the development of administrative activities, but it was only in 1934, with the creation of the National Statistics Institute, that four years later its name was changed to the Brazilian Institute of Geography and Statistics (IBGE), that Statistics has gained space and recognition in the country, due to the absence of a qualified body that would articulate and coordinate statistical research in a standardized way.

As for its presence in the educational field, it was only after 1997, with the establishment of the National Curriculum Parameters (NCP) (MEC, 1998), that Statistics effectively became part of the national curriculum (Duarte & Almeida, 2014). The contents of Mathematics of basic education in the NCP appear grouped in the blocks Numbers and Operations, Space and Form, Quantities and Measures, and Treatment of Information, and the notions of Statistics and Probability are included in this last block. In the National Curriculum Parameters for Secondary Education (MEC, 1999), and later in the NCP + Secondary Education (MEC, 2002) and in the Curricular Guidelines for Secondary Education (CGSE) (MEC, 2006), curricular documents that deal with the Brazilian high school curriculum, the statistical contents are covered in the Data Analysis and Probability axis.

These curricular documents, now complemented with the National Common Curricular Base (NCCB) (MEC, 2018) are intended to promote the student's contact with Statistics, from the beginning of their school life to the end of high school, so that they can understand the main mathematical ideas implicit in statistical representations, to develop skills that make it possible to understand the purpose and logic of statistical investigations, as well as the research process and the development of skills that enable it to produce and enjoy cultural, social and economic assets. Thus, these documents address the importance of working with Mathematics and Statistics related to the student's social context, so that, based on the contents worked in the classroom, they can understand the world, developing their citizen responsibility.

With the concern of working on the applicability of the concepts of Statistics in daily life and intensifying research in the area, between the years 1970 and 1980, researchers stopped some movements at a global level, seeking to elucidate how the approach of Statistics in basic education occurred, and if these contents had a political and ethical dimension regarding their use in the classroom. These movements, according to Campos, Wodewotzki and Jacobini (2013) were the basis for the creation of what we know today, such as Statistical Education, an area of pedagogical activity that emerged in 1990, with the

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intention of investigating ways to solve the difficulties found in the teaching of Statistics, regarding its methodological concepts and procedures. Statistical education is understood as:

> [...] a research area that aims to study and understand how people teach and learn Statistics, which involves the cognitive and affective aspects of teaching-learning, in addition to the epistemology of statistical concepts and the development of teaching material methods etc., aiming at development of statistical literacy (Cazorla, Kataoka & Silva, 2010, p. 22-23).

Discussions and debates about Statistical Education are intrinsically linked to the pursuit of critical, political and social development of students, who deal with Statistics and with the understanding of its applicability in everyday situations. In this sense, Campos, Wodewotzki and Jacobini (2013, p. 25) emphasize the importance of contextualized statistical education, in which:

> (...) the understanding of the basic concepts of Statistics must precede the calculation. Before using forms, students must realize the usefulness, the need for a certain statistic. (...) the student must, first, understand the context in which such study will be carried out, the objectives of the project and how the statistical techniques will contribute to the inference of the results.

We agree with the authors on the relevance of an educational work in which Statistics is contextualized, disassociated from ready-made formulas and mechanical exercises. When addressing, in the classroom, aspects of Statistics related to daily life, it is possible to promote their direct relationship with the social, as contextualization allows the individual to understand the world in which he lives, which is one of the main aspects of statistical education.

In line with this understanding, Statistical Education proposes a work based on three approaches: statistical literacy, statistical reasoning and statistical thinking. According to Andrade (2008), these approaches provide the student with the possibility of abandoning the study of Statistics based only on the memorization of formulas and carrying it out based on investigation, application, reflection and criticism.

Literacy is configured as an ability to read, understand, interpret, analyze, write and evaluate texts. As Campos (2007, p. 35) "refers to the study of arguments that use statistics as a reference, that is, the ability to argue using statistical terminology correctly". Complementing this idea, Garfield (1998) sees statistical literacy as the understanding of statistical language, which includes its terminology, symbols, the interpretation of graphs and tables and the understanding of statistical information present in newspapers and other media.

Thus, it is clear that it is not enough for individuals to know how to use formulas and build graphs, it is also necessary to interpret the information contained therein. It is possible to infer that a citizen is statistically literate when he is able to evaluate and interpret statistical information based on data and phenomena of a situation, in addition to discussing, exposing his understanding of certain data and critically analyzing the conclusions he reached (Sá, Silva & Samá , 2015).

The reasoning, originated from the Latin *ratiocinium*, is the act or effect of reasoning,

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a chain of judgments or thoughts. And reasoning, in turn, means using reason to know, making calculations, deductions, etc. Statistical reasoning is defined by Garfield (2002) as the way in which an individual reason using statistical ideas, giving meaning to this information through data interpretations, graphical representations, table constructions, in order to arrive at interpretations and inferences about the results obtained.

We recognize that developing statistical reasoning is not easy, because, according to Sedlmeier (1999), it is rarely taught, and when it is, it is almost always unsuccessful. Thus, one of the ways for the teacher to assist students in the development of this reasoning is to encourage them to verbally describe the entire statistical process that is being analyzed and to promote activities that help them to develop it.

As for statistical thinking, Mallows (1998) states that it is necessary that we initially consider it as a way of relating quantitative data with concrete situations, taking into account the presence of variability and uncertainty to show that, in fact, the data can say about the problem in question. For this author, statistical thinking occurs when mathematical models are associated with the context of the problem in focus, that is, when the situation under analysis is identified and an appropriate choice of statistical tools is made for its description and interpretation.

Therefore, statistical thinking encompasses an understanding of why and how statistical investigations are conducted, including the recognition and perception of the investigative process, that is, how models are used to simulate random phenomena and, also, how, when and why statistical tools can be used. With this, the individual can understand and use the context of a problem to evaluate investigations and reach conclusions (Andrade, 2008; Campos, 2007).

By following the development of Statistics nowadays, it is possible to recognize how large this area is and its countless contributions to the increase of teaching and learning in the classroom. In addition to providing the student with the development of literacy, thought and statistical reasoning, other elements are added that are fundamental for the acquisition of autonomy and the critical exercise of citizenship. Therefore, statistical education facilitates dialogue with other areas of knowledge, enables the process of interdisciplinarity, bringing benefits inside and outside school life for the subjects involved.

The methodological path of the research

This research is characterized as a case study that, according to Yin (2005), aims to understand the complexity of social phenomena, preserving the holistic and significant characteristics of real life events. It follows a qualitative approach, which works with "the universe of meanings, motives, aspirations, beliefs, values and attitudes, which corresponds to a deeper space of relationships, processes and phenomena that cannot be reduced to the operationalization of variables" (Minayo, 2001, p. 21). Thus, the choice of this approach is justified by observing that, through the description of the data constructed in our insertion in the *locus* of research, it would be possible to analyze the relationships established between

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the participating subjects, the contents taught in the classroom and the world in which these subjects live.

The scenario that composes the research is composed of two state schools in the city of Anápolis - GO, both belonging to peripheral neighborhoods of the city, which offer places for Elementary School II and High School for an average of 600 to 1000 students. These schools were called X and Y to protect their identities. The subjects participating in the investigation were three teachers who taught Mathematics in the 3rd grade of High School (P1 and P2, from school X, and P3, from school Y); and three classes of students enrolled in the 3rd grade of high school (named A, B and C). Class A belongs to school X and is governed by P1; it works at night and has 26 frequent students. Class B also belongs to school X and is governed by P2; it works at night and has 28 frequent students. Class C, on the other hand, belongs to school Y and is governed by P3; it works in the morning and has 26 frequent students.

For data collection and production, we made observations. The type of observation carried out in the three classes is defined by Lakatos and Marconi (2013) as non-participating observation, in which the researcher has full contact with the community or studied reality, but does not integrate with it; witnesses the facts, but does not participate in them; he doesn't get involved in situations, playing the role of spectator. To complement the observations, we used a field diary to record all the information, trying to describe in detail the occurrences throughout the classes.

Concomitantly, we conducted semi-structured interviews with the three participating teachers. In the semi-structured interview, the researcher, "intending to delve into a specific phenomenon or question, organizes a script of points to be contemplated, being able, according to the development of the interview, to change their order and even to formulate questions initially planned" (Fiorentini & Lorenzato, 2007, p. 121). In the planning of the interviews, we seek to understand the teachers' view on the teaching of Statistics, considering both the conceptual aspects and their relationship with daily life, as well as the organizational aspects, related to the planning and teaching methodologies used by them.

In order to apprehend the students' opinion, we opted for the focus group, since it is one of the most complete procedures in the questions: gain of time, capture of emotions, ease in the expression of ideas and experiences among a certain group. As approached by Westphal, Bógus and Faria (1996), in the focus group we have the possibility to listen to several subjects at the same time, in addition to observing the characteristic interactions of the group process, obtaining a variety of information, feelings, experiences and representations of small groups on the topic. With this instrument, the intention was to understand how students conceive Statistics in their lives and whether statistical concepts, worked on during classes, allowed them to infer about everyday matters. It should be noted that both forms of data collection were scheduled in advance and recorded on audio, lasting approximately 20 minutes.

Content Analysis, based on Bardin (2011) was used in the research, aiming to

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understand the characteristics, structures or models that are behind the messages, unveiling them critically. The analysis categories of this research were established a *posteriori*, that is, they emerged from the data, as they were explored.

Thus, we established categories related to the teachers 'view (the teaching methodology of Statistics and student learning; links between the statistical content and situations of the students' daily lives and the construction of concepts; and statistical contents and their selection) and to the students' view (the relationship between statistical content and everyday life, Statistics in everyday life and the mastery of concepts; and the meaning of statistical content for training). The data were presented dialogically, in the light of explanatory theories that served as support for our interpretations.

Data Analysis

In order to understand in depth, the views of the subjects of this research on the teaching and learning of Statistics in High School, we present the analysis of the data obtained below.

The teachers' view

By developing a differentiated pedagogical work in the classroom, the teacher, by contextualizing the concepts he worked on, provides a meaningful learning to his student, who starts to interact with the content that is being worked on, leaving the condition of passive spectator and becoming build his own knowledge. When asked about how Statistics worked in the classroom and whether the way they approached this topic made it possible for students to construct statistical concepts, teachers gave the following answers:

> Often, when putting the subject on the blackboard, I cite examples proposed in newspapers and I also speak of the statistics used by means of communication, so I think that the statistics reaches the majority and becomes of great interest to the student (P1).
>
> I think most do. In terms of the test, which was a question that I was a little surprised [...] most of the questions were Statistics, and they got it all right. [...] I was even happy that they got a higher score in my story in this two-month period (P2).
>
> I imagine that I am managing to mediate the construction of these concepts [...] they took a test, but not an evaluation only with these concepts, but at least they are managing to apply it to the tests (P3).

Professor P1 comments on the use of news reports, magazine and newspaper articles, understood as resources for teaching the content of Statistics, and says that, through them, it reaches the majority of students. Authors such as Magalhães (2015), Santana (2012) and Lopes (2010) discuss the presence of Statistics in printed and television reports and the importance of this type of work, which mobilizes students significantly, bringing these statistical concepts worked in the classroom of the contexts that run through their lives.

However, we did not observe this type of approach in any of the classes taught by teacher P1. Through his answer, he possibly recognizes the functionality of this type of

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approach but ends up not working that way in his classes, perhaps because he has to have a little more time to plan and put into practice a contextualized Statistics class.

In a way, the answers of P2 and P3 converge, as they believe that the way Statistics are working enables students to construct these concepts, and this is verified through the tests applied during the two-month period. Regarding the use of the test as a learning tool, Sant'Anna (1995, p. 10) presents the duality as to how to apply this instrument and the role of those involved in the evaluation process:

> Depending on how the tests are prepared, how they are applied, the environment, the emotional state of the students or the teacher, how the students are asked to participate, the judgment of the teacher, will constitute a harmful weapon. When applied continuously, with permanent feedback, with an incentive character for expired stages and an indicator of new horizons or new open doors, they are a stimulus for the realization of knowledge and self-realization of those involved in the process.

Thus, the assessment should be presented to students as a resource that allows them to perceive their growth. Based on an assessment that is critical, this instrument should contribute so that they know how to deal with the problems presented on a daily basis and enable them to take conscious initiatives. In addition, it is necessary that the evaluation is not concentrated only on tests, but also on other methodologies proposed by the teacher, taking into account the entire path of construction of the students' learning.

P2 used only this assessment tool to verify the learning of his students and makes it clear that he considers that the apprehension of the concepts is totally related to the high marks obtained by the students in the tests. Luckesi (2001) discusses this concept of "the higher the grade, the greater the learning" and points out that it cannot be fully taken into account, since only one test as an evaluative instrument ends up not matching what, in fact, the student learned throughout the learning process. The author defends the idea that the teacher should not fail to consider an assessment that is formative, that is fundamental to the student's growth and learning about what he was taught. Thus, the teacher should not consider that the results of the tests are above his daily observations, that is, his continuous evaluations during the classes, since the test cannot be the only instrument capable of qualifying the student's performance, as it has classificatory, standardized and centralized character (Luckesi, 2001).

As much as P3 also mentioned that he can see the construction of statistical concepts by students from the application of tests, we observed that he did not use only this assessment instrument during the two months. In some classes, he asked students to conduct research on the types of graphs, a concept related to the content of Statistics. However, the students' research was collected, and no comment was made on it; he did not explain to the students the purpose of this work, nor did he use it for the following classes.

Another question posed to teachers during the interviews was whether they considered that students were able to establish relationships between the concepts studied during classes and daily life. All were emphatic and answered yes. P1 justified himself by

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saying that he sees "the interest of the majority in solving problems related to statistics". However, this was not noticed during the observations of the classes. In fact, the students were, more and more, dispersed and little participatory, and the teacher, in each class, explained a different concept and proposed mechanical exercises, not addressing problems related to Statistics, present in everyday life.

When stating that his students were able to relate statistical concepts to everyday life, P2 exemplified his response with a contextualized situation, in which the concepts studied in the classroom could be used: "if you were a shoe seller, for example, you need to do the average profit, the average shoe that will arrive at your store ". According to him, this was the form of interaction he had with his students during classes, however, such a contextualized approach did not occur during the observed classes, contrary to the idea proposed by the Curriculum Guidelines for Secondary Education (MEC, 2006), that contextualization must be seen as one of the instruments for the attribution of meanings by the student throughout the teaching and learning process, providing articulations of concepts with social practices. P3 justified his answer based on the research proposals made by the students during their classes. At a certain moment in the classroom, we observed that P3 asked students to do research on the types of graphs and even research related to the number of hours and days dedicated to studies for ENEM, but then these findings from the students' research were no longer worked on in class, and students have not received *feedback* on this.

Another question that we sought to know from the teachers, during the interviews, was related to the preparation of the bimonthly plan: what were the contents of Statistics that they prioritized and why this choice was made. The responses were varied:

> Regarding Statistics, I think the percentage is important, the student has to know how to analyze and build graphs and tables, work on subjects related to mean (which is a daily issue), median and mode. For the 3rd year students it is of great importance by ENEM (P1).
>
> I prioritized, as you observed in my classes, the median, the mode and the mean, because these are issues that fall most in ENEM (P2).
>
> The question of prioritizing the contents, in fact I received the matrix with the contents that is the formal curriculum, and I put all the contents that were there, because I think that the curriculum that is there is the minimum. [...] I wanted to bring the concepts first, I tried to work well with the concepts of sample, population, research [...] (P3).

As we can see in the excerpts, P1 considers it important to work on the percentage, because, even though it is not a specific concept of Statistics, it can be used as a tool to enable the understanding of many of its concepts. In addition, the analysis and construction of tables and graphs were also highlighted, concepts that were worked out quickly in his classes.

Malara (2008), when dealing with the construction of graphs and tables in the classroom, emphasizes the importance of working without haste, as such a task is not easy to be performed. According to the author, teachers devote very little time to teaching the construction of graphs and tables, as they believe that this task is simple and in fact it is not.

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At that moment, students will have to deal with data taken from a certain context, distinguish the reference of that data in a set, that is, if it is a sample or population, calculate relative, absolute and percentage frequencies, recognize the result obtained from these frequencies, among other situations.

Statistical thinking is developed by students when they relate statistical data to concrete situations. According to Mallows (1998), when associating them to the context of the problem in question, we seek to choose which statistical tools are necessary for its description and interpretation. Thus, it is possible to understand the why, the relationships and variations, in addition to the exploration of the data contained in texts, tables and graphs.

Both P1 and P2 say they prioritize subjects related to mean, mode and median in their classes, but they did it in different ways. P1 worked on measures of central tendency very quickly, in just two classes, and then moved on to other subjects, while P2 worked only on these concepts during the second quarter. Lopes (2010) discusses the importance of working with data interpretation in the classroom, an action necessary to obtain results from these types of centrality measures, in which the student, equipped with the ability to analyze and critically relate the data presented with everyday situations, he comes to understand these concepts in a practical way. According to the author, it is in high school that these concepts should be deepened, since initial ideas about them have already been worked on in elementary school and a more analytical study of the data to be worked should be considered.

The data obtained in this research shows that this action based on experiments, observations and analysis of measures of central tendency, as directed by Lopes (2010), was not taken into account by any of the three participating teachers, since they worked on these concepts through the mechanical application of their formulas, not discussing the results nor looking for the meaning of its significance in the students' context. Professor P3 states that he prioritized statistical concepts and followed the curriculum matrix that was delivered to him, as he considers it as a minimum requirement for learning.

According to Lopes and Macedo (2011), mathematics curricula in Brazil are still formatted, in general, within an academic perspective, which does not allow more space for dialogue between everyday realities and the contents that are contained in them. Statistics in the reference curriculum of the state of Goiás still follows these patterns, with little openness for cultural and everyday dialogicity.

It is necessary to recognize that P3 worked on all the concepts listed in the curriculum, starting with the statistical concepts, as described in his speech. He also worked on the concepts of frequency, tables, graphs and measures of central tendency; however, most of them were worked out of context. In our understanding, this problem could be minimized if the three teachers worked on the curriculum considering different epistemologies of their conceptions, that is, that they were based on the reality of their students, taking this prescribed and imposed curriculum as a raw material for recreation and contestation. (Moreira & Silva, 2005).

As to the reason for choosing the concepts of Statistics to be worked on in the

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classroom, only P1 and P2 responded, and both justified their importance due to ENEM. According to Andriola (2011, p. 119), this test presents information that allows the student to "interpret, infer, deduce, compare, judge, apply and solve the problem presented, failing to focus exclusively on knowledge of school content, as the entrance exam did ". Thus, the issues present in ENEM require the student to interpret and be able to relate content from different disciplines, which characterizes this test as interdisciplinary.

It should be noted that none of the three teachers worked on the dispersion measures. Although these are proposed in all guidelines and curricular guidelines for secondary education (MEC, 1999; 2002; 2006; 2018), dispersion measures are not part of the reference curriculum for the state of Goiás. Perhaps this is one of the reasons why they have not been addressed by participating teachers. The other reason may be the fact that Statistics is present in a single academic term, together with the Financial Mathematics content, not having enough time to teach all of these contents. However, working with measures of variability is extremely important in high school, since such measures allow students to make comparisons between the variation of statistical data to be considered, establishing their relationships and inferences with the context.

The students' view

It is a fact that we are surrounded, all the time, by information conveyed by different means of communication, many of which are presented and elaborated through statistical knowledge. In addition to information, many daily actions require Statistics, such as organizing objects in spreadsheets, average audience at a given event, among others. Magalhães (2015, p. 41) argues that Statistics is present in the media, in academia and in several other social areas, and it is essential for understanding problems, making decisions and evaluating situations.

Knowing about the presence of Statistics in our daily lives and its importance for understanding the world, we asked students from the three classes that participated in the focus group, in which everyday situations they could see the contents of Statistics worked in the classroom.

> As I also said, in my service I work in the sales statistics sector, there I work a lot with tables [...] (Student of class A).
>
> I return to the subject of my service, where you can see Statistics in a lot of things there, [...] and if I put something wrong it is because I did not pay attention to the tables [...] and the values that were in it (Student of class B).
>
> I think Statistics is very present at this point where there has to be a balance of people in a place, something that is selling more, then there are statistics, or to have control over a situation, or something, Statistics is very useful (Student of class C).
>
> I can see a lot in newspapers and magazines, there you can see a lot of statistics (Student of class B).
>
> For me, who like football, one point that Statistics makes more use of is the game table, which we realize that there is a lot of statistics there (Student of Class C).

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Through the speeches of the first two students, we found that they can see Statistics in a specific situation in their daily lives: their own work. This perception is consistent with the research by Rosetti Júnior (2007), who states that Statistics is increasingly present in the world of work and in the corporate world. Statistical language, in operational routines, increasingly requires professionals to have knowledge for the correct interpretation and production of reports, diagrams, flowcharts, tables and graphs.

The last three speeches denote students' visualization of Statistics in research related to balance sheets, sales, controls, sports games table and newspaper and magazine articles, in which statistical data on a given subject are presented and possibly analyzed later. In this line of reasoning, Santana (2012) and Rosetti Júnior (2007) emphasize that information that contains statistical language is present in our daily lives in the most diverse ways, which are often of interest to the citizen. Even though they are not aware of being in contact with events in which Statistics is present, many individuals end up dealing with its concepts in situations they have affinity with, such as in sports activities or research linked to the media. We also question students about what statistical concepts they think they learned, among all those they studied. It was possible to notice that the responses of the students in the same class were similar.

> I learned mode, median, to read graphs, the teacher did not teach how to build graphs, but I already knew from having learned them before, and tables (Class A student).
>
> I think I really learned only mean, which in fact I already knew a little (Class B student)
>
> What I think I learned a little more was taking data from a table and recognizing graphs (Class C student).
>
> I was able to understand what mode and median is and know the types of graphics. (Class A student).
>
> I only learned mode (Class B student).

When analyzing the responses of the first two students, we note that they have already had the opportunity to study some concepts related to Statistics at other times in their school lives. This is entirely possible, due to the interdisciplinary nature of Statistics and the statistical concepts being worked on since elementary school, as described in the PCN (MEC, 1998). The other three students claim to have learned only a few concepts worked on in the classroom, not all of which were mentioned by the teachers.

The data of this research demonstrate that the measures of central tendency are one of the main notions worked by the teachers in the classroom, due to the use of rules and formulas being easy. However, when they are worked mechanically and simply replaced in formula, it becomes a monotonous exercise for students, who do not even know the real meaning of being using that formula to solve a certain type of exercise (Malara, 2008). Through the observations, we verified that these concepts were worked on by the three teachers in this way, leading students to only remove the data from the statement, when it existed, replace it in the formula and find a result. Thus, they were not prompted to understand the real reason for making those calculations, nor were they led to understand the

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meaning of the result they found.

As for the issue of problem solving involving central tendency measures and the collection, organization and representation of data, it is seen that statistical literacy could be explored, as well as statistical reasoning, allowing the student to reason from statistical ideas , in order to find meaning in using concepts when relating data, making calculations and interpreting results.

Another question asked to the students during the focus groups, was if they thought that the studied statistical contents were essential for their formation and why. The manifestations were as follows:

> Yes, because it is something that will be part of my training in public, entrance exams, and what will have a lot of these Statistics subjects (...) (Class C student).
>
> No, it could have been better, to have gone deeper, because we will need much more than that to go to college (Class B student).
>
> Yes, even though I think that what we studied was important for my education, I agree that the content could have been a little more in-depth (Class B student).

Class C student talks about the importance of having learned these contents as they are required in public and entrance exams. This refers to the fact that statistical concepts are increasingly present in these types of tests, not only in questions in the area of Mathematics, but also in other areas of knowledge, such as Biology, Chemistry, Physics, etc., which qualifies the interdisciplinary character of Statistics (Campos, 2007; Lopes, Coutinho & Almouloud, 2010).

The superficiality with which the contents were approached, reported by the last two students, was also verified by us during the observation of the classes in class B. In addition to working only with the measures of central tendency, Professor P2 approached the content in a very simple way, without any contextualization or application in everyday situations, with many related and standardized exercises, many times even without a statement, as previously described.

Santana (2016) discusses this way of teaching statistics, in which procedures, techniques and algorithms based on repetition and resolution of standard exercises are privileged. According to the author, Statistics ends up, in most cases, being worked on superficially by teachers, when they mistakenly believe that they are concepts that do not demand students' reasoning, as a simple substitution in formulas is enough, no further study is necessary.

Final considerations

Statistics has gradually gained a large space in the social and educational environment, providing valid tools for investigative work in the educational field, which permeates the social field. When observing it nowadays, it is seen that its contribution goes beyond the walls of schools, given that recognizing it in everyday situations requires citizens to develop critical, political and social aspects for a better understanding of the world.

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After a thorough analysis of the data obtained, it was possible to verify that the link between the statistical content present in the curriculum and the students' reality is little proposed by teachers. These, using a traditional methodology in their classes, worked on statistical concepts in a tight way, often using only the textbook, exercises based on ready-made formulas and totally disconnected from the students' context. This way of proceeding significantly hinders the construction of this knowledge, contrary to what Statistical Education proposes. However, if these statistical contents were contextualized, they would enable students to develop literacy, understanding and interpreting the data worked on, in order to learn to reason and to statistically think about the interpretations and inferences about the data inserted in the context.

It was possible to verify that the students understand and recognize the importance of contextualizing the contents, as they realize that a work carried out along these lines allows a better understanding of the statistical concepts and their significance in their lives. Although some students affirm the essentiality of what was worked for their training, we conclude that the way Statistics has been approached in the classroom does not allow students to understand, infer and critically apply their concepts. Even though there was one or another attempt by teachers to work on these concepts in order to lead students to an understanding of their own daily lives, they were not approached in a contextualized way, making it difficult to recognize them in practical situations and making reflections about this applicability unfeasible.

In this work, we mention certain situations in which teachers could have acted differently. For example, they could have taken statistical education approaches into account in their classes in a contextualized way. Even though we recognize the importance of pedagogical work that rescues the interest of students, and that teachers could be mediators of this action, we cannot fail to take into account the devaluation, the work overload, the pressure of the system and the precarious training of these professionals, circumstances that affect the teaching practice. However, it is necessary to understand that these teachers may not have had contact with these approaches in their education and, for economic or temporal reasons, are unable to invest in continuing education. These issues go beyond the will of these professionals, they permeate educational policies related to training, working conditions and the recognition of their role in relation to education.

Therefore, the realization of contextualized and meaningful teaching for students, which leads them to attribute meaning and significance to statistical content, demands an educational policy that values teaching work. A policy that recognizes teachers as participants in the development of the curriculum and that guarantees professional training that redirects their epistemological conceptions, so that more problematic, dialogical, dynamic and attractive classes are proposed for the learning of Statistics in High School, providing the protagonist student in that process.

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