

The opinion survey as a methodology for teaching statistics in basic education: NEPSO¹

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ABSTRACT

This article brings reflections on a project developed with a group of students in the final years of elementary school at the Pedagogical Center of the Federal University of Minas Gerais, conducted by a teacher in training and guided by two teachers from the institution. We highlight the pedagogical actions produced for the teaching and learning of statistics in Basic Education, especially those related to the treatment of information, which were made possible using the NEPSO methodology - Our School Research Your Opinion. This methodology aims to provide students with experiences and processes of scientific research. For this, we developed a work with 14 students with the theme “sports”, whose interviewees were students at the University. After the interview phase, the results were tabulated, processed and then the students built several analytical charts. We highlight the double potential of the development of this work, both for the students and for the teacher in training.

KEYWORDS: Opinion Poll; Teaching Statistics; Teacher training; Elementary School; NEPSO.

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A pesquisa de opinião como metodologia para o ensino de estatística na educação básica: NEPSO

RESUMO

Este artigo traz reflexões acerca de um projeto desenvolvido com um grupo de estudantes dos anos finais do Ensino Fundamental do Centro Pedagógico da Universidade Federal de Minas Gerais, conduzido por uma professora em formação e orientado por dois professores da instituição. Destacamos as ações pedagógicas produzidas para o ensino e aprendizagem de estatística na Educação Básica, em especial aquelas relacionadas ao tratamento da informação, que foram oportunizadas utilizando-se a metodologia NEPSO - Nossa escola Pesquisa Sua Opinião. Essa metodologia tem o intuito de propiciar aos estudantes vivências e processos de uma pesquisa científica. Para isso, desenvolvemos um trabalho com 14 estudantes com o tema “esportes”, cujos entrevistados eram estudantes da Universidade. Após a fase de entrevistas, os resultados foram tabulados, processados e, em seguida, os estudantes construíram diversos gráficos analíticos. Destacamos a dupla potencialidade do desenvolvimento deste trabalho, tanto para os estudantes quanto da professora em formação.z

PALAVRAS-CHAVE: Pesquisa de Opinião; Ensino de Estatística; Formação docente; Ensino Fundamental; NEPSO.

La investigación de opinión como metodología para la enseñanza de la estadística en la educación básica: NEPSO

RESUMEN

Este artículo trae reflexiones sobre un proyecto desarrollado con un grupo de estudiantes de los últimos años de la enseñanza fundamental en el Centro Pedagógico de la Universidad Federal de Minas Gerais, conducido por un profesor en formación y guiado por dos profesores de la institución. Destacamos las acciones pedagógicas producidas para la enseñanza y el aprendizaje de la estadística en la Educación Básica, en especial las relacionadas con el tratamiento de la información, que fueron posibles gracias a la metodología NEPSO - Nuestra Escuela Investiga Tu Opinión. Esta metodología tiene como objetivo proporcionar a los estudiantes experiencias y procesos de investigación científica. Para ello,

desarrollamos un trabajo con 14 estudiantes con el tema “deportes”, cuyos entrevistados eran estudiantes de la Universidad. Después de la fase de entrevista, los resultados fueron tabulados, procesados y luego los estudiantes construyeron varios cuadros analíticos. Destacamos el doble potencial del desarrollo de este trabajo, tanto para los estudiantes como para el docente en formación.

PALABRAS CLAVE: Encuesta de opinión; Enseñanza de la Estadística; Formación del professorado; Escuela primaria; NEPSO.

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Introduction

This article is based on a project conducted with students in the 3rd Cycle of Human Formation (7th, 8th, and 9th grades of elementary school) at the Pedagogical Center (CP) of the Federal University of Minas Gerais (UFMG), in a diverse curriculum course called Differentiated Work Group (GTD). In this course, students are divided into small groups, and the instructors are pre-service teachers, guided by faculty members of the institution. The "Our School Researches Your Opinion" (NEPSO) project was carried out in this course with the aim of introducing students to methods of scientific research and, at the same time, contributing to the training of future teachers, monitors at the Pedagogical Center of UFMG.

An important point to consider for conducting the Differentiated Work Group (GTD) is the broad heterogeneity of the classes, which can consist of students from the entire 3rd cycle (7th, 8th, and 9th grades), with students from different grade levels at the same time, and a reduced number of students. For this GTD, the class consisted of 15 students, with 4 students from the 7th grade, 6 from the 8th grade, and 5 from the 9th grade, ranging in age from 12 to 15 years. In total, 16 sessions were held, each lasting 1 hour and 20 minutes, always on Mondays. During these sessions, all project steps were developed, including the definition of the research topic, topic qualification, population identification, sample definition, questionnaire

development, planning and execution of fieldwork, data tabulation and processing, analysis and interpretation of results, and presentation of results.

The Our School Research Your Opinion program historically began in 2001 as a result of a partnership between the Paulo Montenegro Institute – a non-profit organization linked to the Brazilian Institute of Public Opinion and Statistics (IBOPE) – and the Non-Governmental Organization Ação Educativa. Various hubs, both in Brazil and around the world, collaborated as partners in promoting this methodology. In Minas Gerais, the partnership was established with the Faculty of Education (FaE) at UFMG. Currently, NEPSO is independently developed by educators who believe in the pedagogical potential of this methodology. The Pedagogical Center is one of the schools that believes in this methodology and contributes to its dissemination.

The Official Page of the "Nossa Escola Pesquisa Sua Opinião" Program presents practical guides published by the Paulo Montenegro Institute regarding the implementation and practice of the project. These guides provide a clearer and more objective elaboration, describing the stages of the process and data collection and analysis techniques. The page also offers suggestions and adaptations for applying the methodology in different school contexts. It's important to emphasize that the main focus of this article is to describe the experience that took place in the Pedagogical Center class in 2022.

Taking as a premise Article 205 of the Brazilian Federal Constitution of 1988, which states that education must provide students with "[...] the full development of the individual, their preparation for citizenship, and their qualification for work," we consider that the purpose of developing pedagogical practices aimed at the holistic formation of these students becomes a mission (and at the same time a challenge) for teaching professionals in the field. In this context, the NEPSO methodology can be seen as a tool that enables the construction of a citizen-focused education committed to the comprehensive development of students.

The use of NEPSO in various projects in basic education schools is based on the premise of turning students into researchers, giving them exposure to research methodologies and data analysis commonly applied in different scientific fields. Additionally, it expands the school experience to other settings, as one of the project's stages, which involves the actual questionnaire administration, is not limited to school spaces. This provides students with the opportunity to experience different contexts and contrasting opinions, creating a favorable environment for the development of critical thinking and the enhancement of their sociocultural repertoire.

It was in this environment that the proposal to implement the NEPSO methodology at the Pedagogical Center of UFMG was developed. The Differentiated Work Groups (GTDs) are disciplines included in the curriculum of the Pedagogical Center, but they aim to break free from the limitations of the "traditional" curriculum by promoting themes and dynamics not covered by the curriculum. In this sense, this discipline became a fertile ground for the development of the proposal, as it provided an appropriate space to address subjects and activities that are usually considered extracurricular.

Based on this proposal, the objective of this work carried out with the students is to provide investigative activities in which they are the protagonists, as they experience what it means to be a researcher and engage in scientific inquiry through the development of an opinion research using the NEPSO approach. Regarding the research that the students conducted, the chosen theme was "Sports," with the intention of analyzing people's opinions on this topic.

We aim to encourage the students to follow the methodologies and analyze the research results later, with discussions about how and why we are experiencing these processes. The methodology applied in NEPSO showed signs of enabling the development and exercise of citizenship by the students.

The development of students' autonomy was a key point in implementing this methodology because it was not only desired but also

necessary. The students needed to discuss among themselves and reach a consensus on the topic, the questions, the target audience to be considered, and the organization of interviews and data analysis. For the teacher trainees, who led the discipline, the main task was to guide and support the students in decision-making and provide direction to the ideas that emerged. This resulted in significant engagement between the students and teachers in the classroom, which was well-received by both parties.

According to Orsolon (2009), the learning process is more meaningful when students take center stage rather than being mere listeners of the content. We observed that with the NEPSO methodology, students could participate more actively in classes, engage in discussions, and collaboratively devise ways for their data analysis.

Implementing NEPSO can promote autonomy and freedom for students by providing them with experiences of scientific research. Students have the freedom to choose the topic and questions that will be used in the interviews, following the methodology's guidelines. In the case of the proposal described and analyzed here, the topic "sports" was chosen through a vote. After selecting the topic, teacher trainees brought in videos related to sports in the context of health, economics, and leisure to inspire students in constructing the questionnaire. The questions were also discussed in the classroom, combining the students' curiosity with the teachers' experience in scientific research. The questions and their possible answers were defined, prioritizing closed-ended questions, meaning those with multiple-choice answers to facilitate the subsequent data analysis.

In the end, the project was presented to other classes and schools, and the research results were showcased at a Regional NEPSO Seminar held in late 2022 at the Auditorium of the Faculty of Education at UFMG. The event was attended by the institution's teachers, teacher trainees, and students who participated in the project. Additionally, other individuals who had also developed projects using NEPSO as a methodological strategy for opinion research were present.

Methodological aspects

For the realization of this research, the students from the Pedagogical Center who participated in this GTD chose students from the School of Physical Education, Physical Therapy, and Occupational Therapy (EEFFTO) and the Faculty of Humanities (FAFICH) at UFMG as their target audience. In addition, research was conducted within the Pedagogical Center (CP) itself to compare the data obtained in these different settings. The intention is to analyze the responses obtained by the students and other participants to compare their answers.

A "mixed" research approach was conducted, involving both qualitative and quantitative data. Questions related to which institution the interviewee attends, which semester they are in (in the case of EEFFTO or FAFICH students) or school year (in the case of CP students), age, and gender identification were asked to characterize our sample. Subsequently, questions related to the habits and opinions of the participants about sports were asked.

The surveys were separated according to the profile of the interviewee group. For undergraduate students, we asked about their age, gender, and their course of study. For the students at the Centro Pedagógico, we asked about their age and the grade they belonged to. For the undergraduates, the restriction was that the interviewee should be enrolled in a course in the building where the survey was conducted, in order to divide the survey into a group of EEFFTO and FAFICH students. For the students in the Elementary School, the survey was conducted only with students from the 5th grade onwards, as it was suggested by the students themselves that students below this grade level might not have a well-developed opinion on the subject yet. It is important to emphasize that the entire survey was defined by the students, not by the teachers in training. They were the ones who determined the questions to be asked, the locations where the interviews would be conducted, and the desired target audience for building the sample.

After characterizing our sample with identification questions, the students chose to ask questions about the frequency and opinions regarding sports participation, the impact of criticism on athletes' performance, and public and private investments in different sports.

The first question was "Does knowing that practicing sports is good for your health motivate you to participate?" with answer options "Yes," "No," and "I didn't know that practicing sports is good for health." Next, there was the question "How often do you practice sports?" with frequency ranging from "I don't practice" to "I practice 5 times a week or more," gradually. The following question was "Do you think practicing sports can be harmful to health?" with answer choices "Yes" or "No." The fourth question was "To what extent do you think criticisms affect the lives and performance of athletes?" with options "Does not affect," "Affects a little," "Affects somewhat," and "Affects a lot." The fifth question was "How often do you watch sports?" with frequency options including "I don't watch," "I watch a little," "I watch somewhat," and "I watch a lot. In the sixth question, students wanted to know if "Do you prefer practicing sports or watching others practice?" and the options were "I prefer to watch," "I prefer to practice," and "I have no preference" for those who equally like watching and practicing sports. The penultimate question asked for the interviewee's opinion on "Do you believe that investments in sports are evenly distributed?" with responses "Yes" or "No." The last question was "Do you believe that financial conditions can hinder the practice of sports?" also with responses "Yes" or "No."

Data Collection – Interviews

To conduct the field research, which involved conducting interviews, the students were taken to the buildings of the School of Physical Education, Physiotherapy, and Occupational Therapy (EEFFTO) and the Faculty of Humanities (FAFICH), respectively, to collect responses to the questionnaire. The students were divided into pairs, and each pair received five printed

sheets with the questions to be asked on the day at EEEFTO and six sheets on the day at FAFICH, totaling 30 and 36 responses, respectively. To maintain a more equal distribution among participants, the teachers in training asked half of the class to interview only women and the other half to interview only men on each of the days. This division was done to avoid having one gender dominate the research sample, as students could choose anyone randomly, as they saw fit.

Regarding the Pedagogical Center's audience, the students were supposed to interview a total of 40 other students. However, due to technical issues in which some students lost their questionnaires, we only had 35 responses in total.

In the end, we had to exclude two responses because the students made the mistake of asking people who were not enrolled in a course in the building where the research was conducted. This left us with a total of 100 responses, with 30 collected at EEEFTO, 35 at FAFICH, and 35 at the Pedagogical Center. The selection of interviewees was left to the students, making it clear that the same person could not answer the same questionnaire twice, and they were required to interview undergraduate students who were present on the day of the interview at the location.

Results

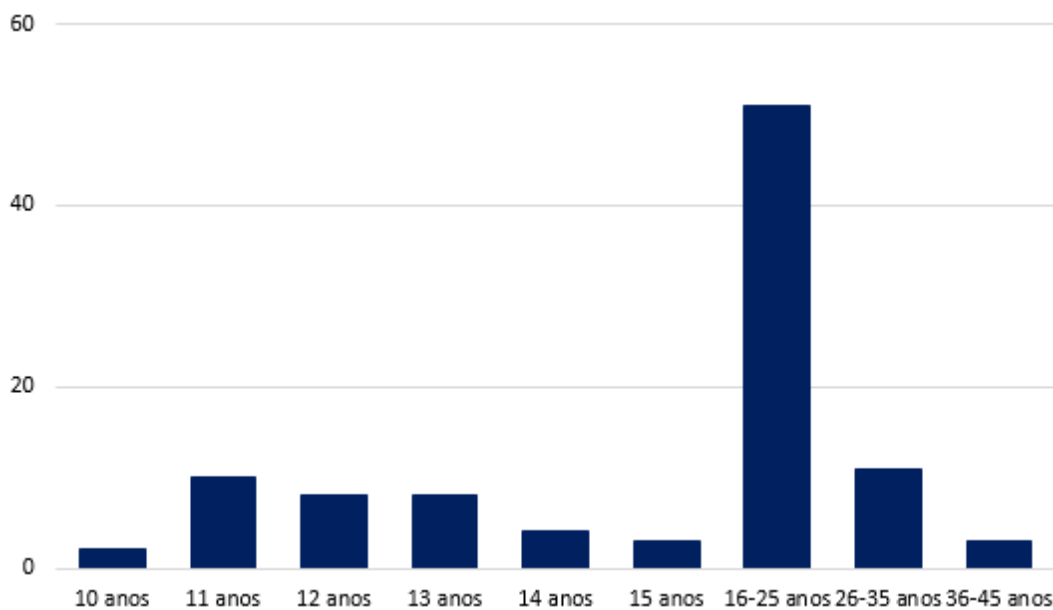
After the data collection, the students first created analytical bar and pie charts with only one variable using Excel software. These charts were constructed to facilitate the visualization of the data collected in the field research. Here, we present some of the charts created by the students and the data obtained during the research. The first chart created by the students outlines the research, indicating that 35% of the interviewees are FAFICH students, 30% are from EEEFTO, and 35% are from the Pedagogical Center.

We considered it important for the students to create various charts because, according to the BNCC (Brazil, 2018), students at this level of education should be able to construct research reports, including the population being surveyed.

The second chart created by the students presented the distribution by gender of the interviewees. In this chart, 48% identified as male, 50% as female, and 2% preferred not to identify their gender.

The third parameter used to classify this sample was based on age groups. As seen in the chart constructed by the students, the majority of the interviewees fall within the age range of 16 to 25 years. The students justified this fact by explaining that 70% of the sample consisted of undergraduate students.

GRAPH 01: Distribution of Participants by Age Group.



Source: Self-prepared, 2022.

Just like the data from the research framework, the students used Microsoft Excel to create single-variable charts for all opinion questions. All these charts were employed to discuss and analyze the results. Here are the results obtained from the opinion questions.

The first question was "Does knowing that practicing sports is good for your health motivate you to practice?" The students found it interesting that none of the respondents answered that they didn't know that practicing sports is good for health. Therefore, the results were divided between "Yes" and "No," with 88% responding "Yes" and 12% responding "No."

The second question was about the frequency at which the respondent practiced a sport in a week, with the options being "I don't practice," "I practice once a week," "I practice twice a week," "I practice three times a week," and "I practice 5 times a week or more." The highest result obtained was approximately 30% of the participants, who reported practicing sports 5 times or more per week, followed by those who practiced 2 times, representing 20% of the sample. Those who practiced 4 times a week represented 10% of the total, 3 times a week was 15%, and those who did not practice at all were 18%. Practicing once a week had the lowest percentage of participants, about 7%.

The third question in the survey aimed to understand whether the respondents believed that practicing sports could be detrimental to health. The response options were only "Yes" and "No." The vast majority of respondents answered that they did not believe that sports could be harmful to health, with 64% of the responses. The remaining 36% believed that practice might not always be beneficial in some circumstances.

The fourth question sought to analyze whether the respondents believed that criticism would impact the lives and performance of athletes. The response options were "does not impact," "impacts little," "impacts somewhat," and "impacts a lot." Among the responses, 50% of the respondents believed that criticism impacts the lives of athletes a lot, 30% chose "impacts somewhat," 14% believed it impacts little, and 6% argued that it does not impact.

The fifth question pertained to how often the participant watches sports, with response options: "I don't watch," "I watch a little," "I watch somewhat," and "I watch a lot." The options "watch a little" and "watch a lot" were tied with 35% of the responses, while "I don't watch" represented 18% of the respondents, and "watch somewhat" accounted for 12% of the respondents.

The sixth question asked whether the person preferred to play sports or watch others playing, accepting the options: "I have no preference," "watch," and "play." As a result, the majority of respondents, 68%, stated they had no preference, while 23% preferred playing sports, and 9% had no preference.

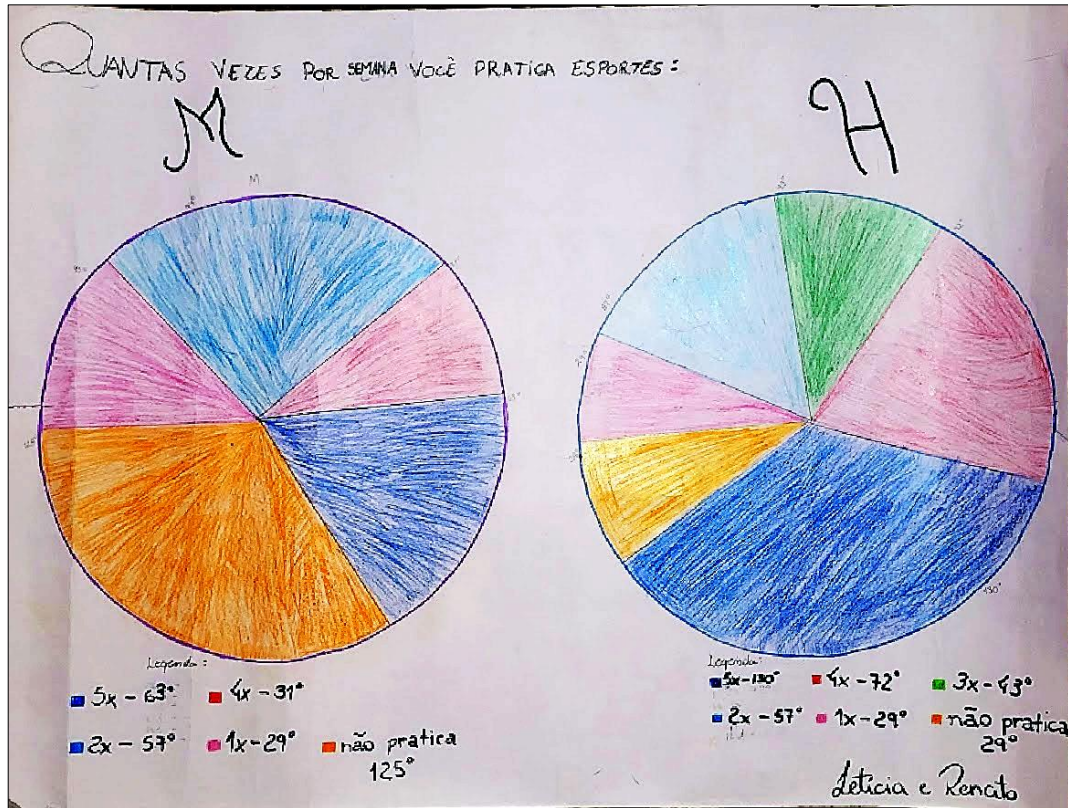
The seventh question inquired about investments in sports, asking whether the respondent believed that investments in sports were distributed fairly and only accepted "yes" and "no" as answers. To this question, 84% of the respondents answered "no," indicating that they did not believe investments were fairly distributed, while 16% answered "yes."

Classroom Results

The result of the work conducted by the students in the classroom was that each pair of students was responsible for creating a graph that analyzed a characteristic of the sample (gender, age, where they study) and one of the opinion questions. We considered this activity important because, as recommended by the National Common Curriculum Base, statistics education should emphasize data collection and organization through various representations such as graphs and tables. In this regard, students were responsible for creating a larger paper graph with the support of the teacher trainees. This part was crucial for the students to get hands-on experience and construct the graphs. They had the opportunity to apply concepts learned in mathematics classes, such as proportionality, angle measurements, and the use of tools like rulers, squares, and compasses.

The manually created graphs by the students contained two variables. Our goal was for them to practice mathematical skills related to constructing graphs different from those produced by the software used to create single-variable graphs.

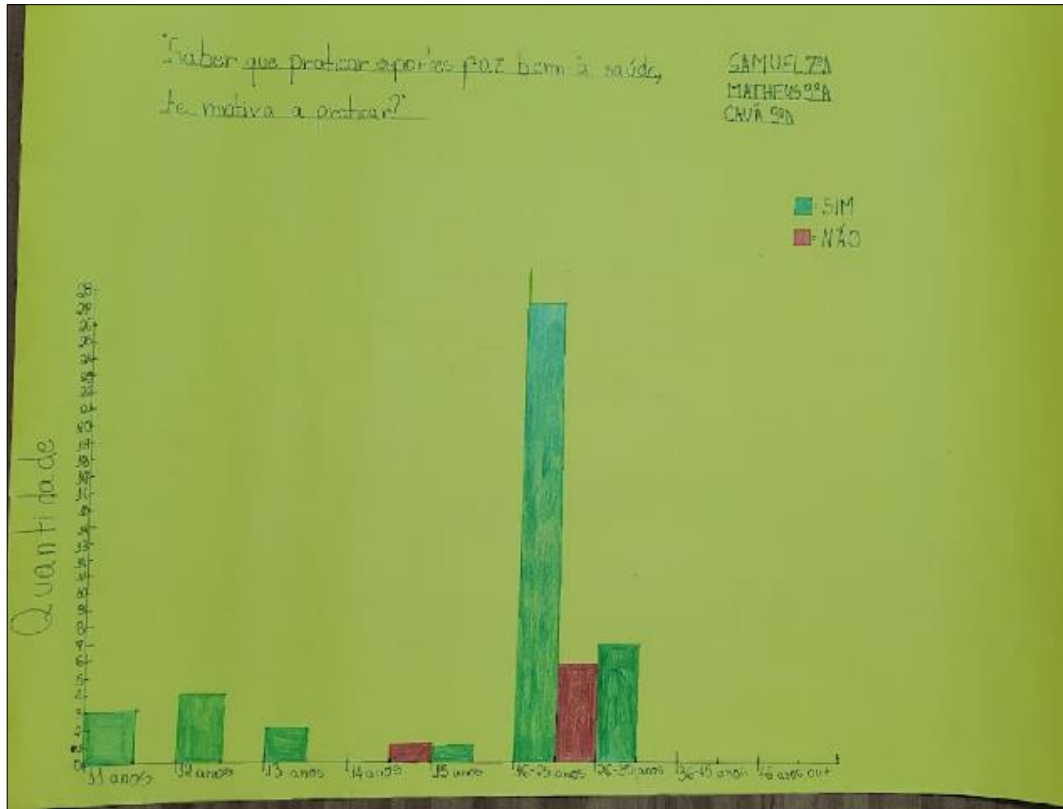
GRAPH 02: How many times a week do you practice sports?



Source: Prepared by the students themselves, 2022.

This graph, created by a pair of students, analyzes the gender of the participants and the frequency with which they engage in sports per week. This duo observed that men engage in sports more frequently per week than women. The next graph was constructed by analyzing the age range of the participants in relation to their opinion about whether knowing that engaging in sports is good for health. It can be observed from the graph that the majority of respondents answered "yes" to this question.

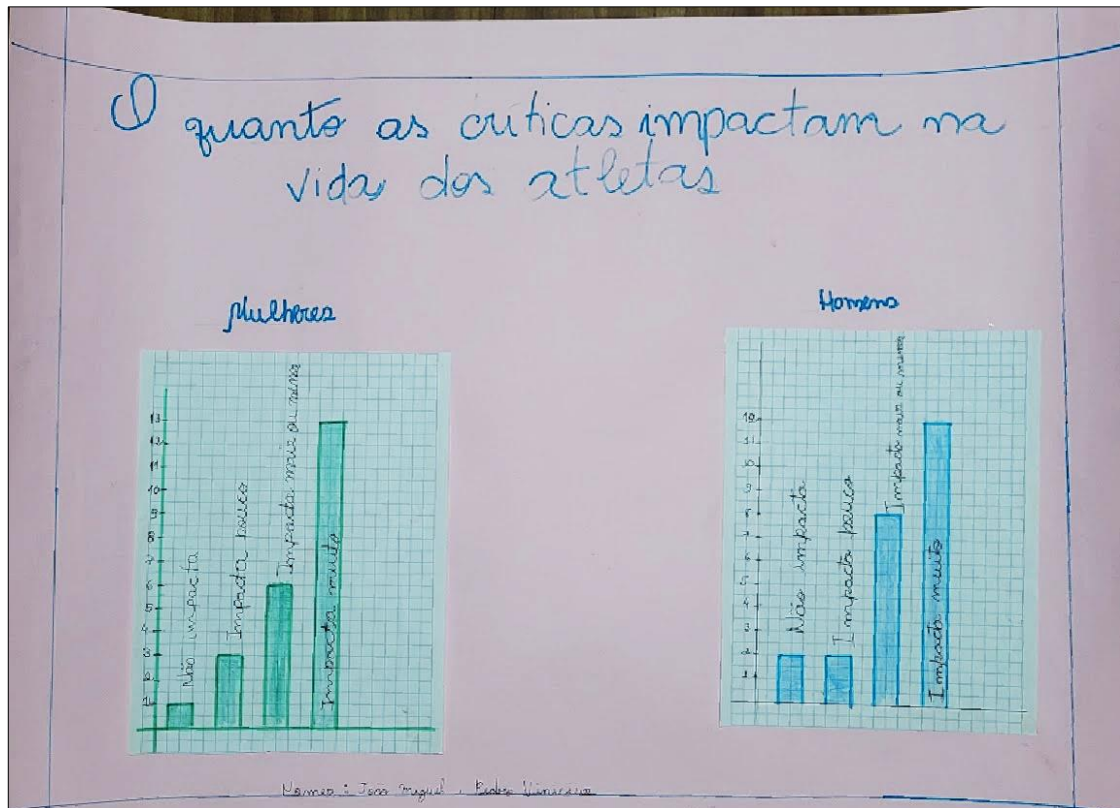
GRAPH 03: Knowing that practicing sports is good for your health encourages you to do it?



Source: Prepared by the students themselves, 2022.

The following graph was created by comparing the opinions of men and women regarding the impact of criticism on the lives of athletes. It's important to note that regardless of gender, both agree that criticism significantly impacts the lives of athletes.

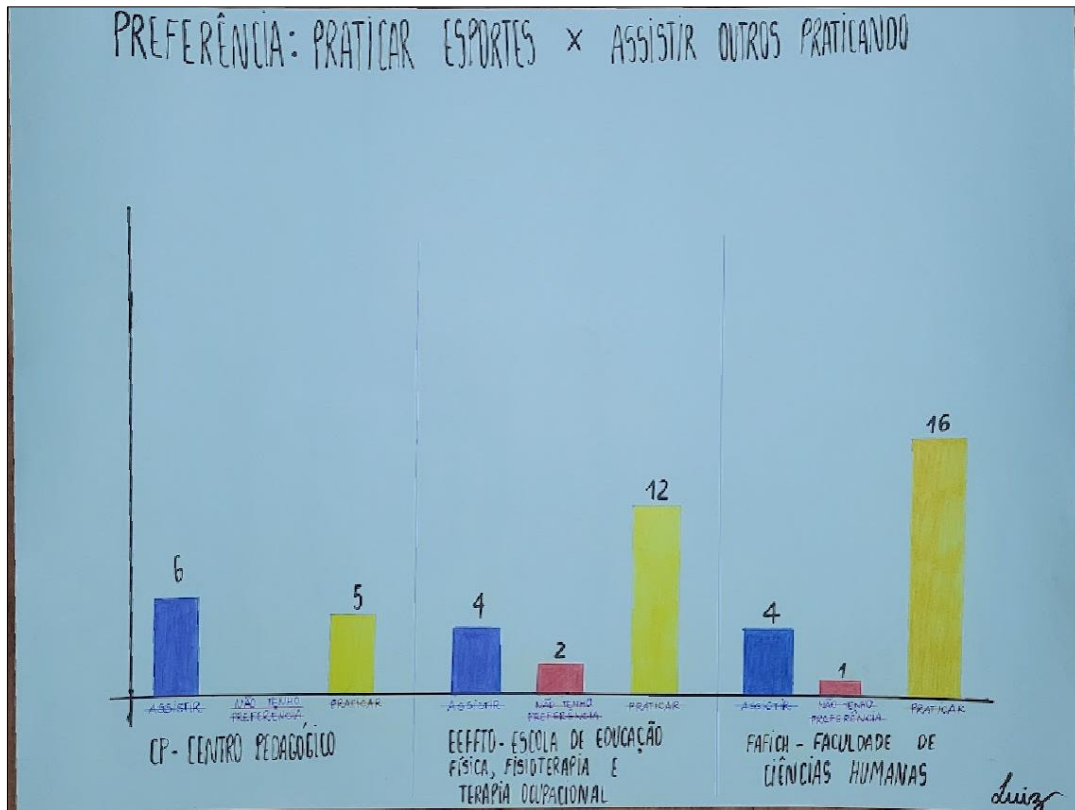
GRAPH 04: How much do criticisms impact the lives of athletes?



Source: Prepared by the students themselves, 2022.

When comparing the location of the research and the participants' opinions on their preference between watching and practicing sports, we obtained the following graph. It can be observed that the majority of undergraduate students prefer to engage in sports rather than watch. However, for the students from the Pedagogical Center, who are in basic education, this difference is not significant.

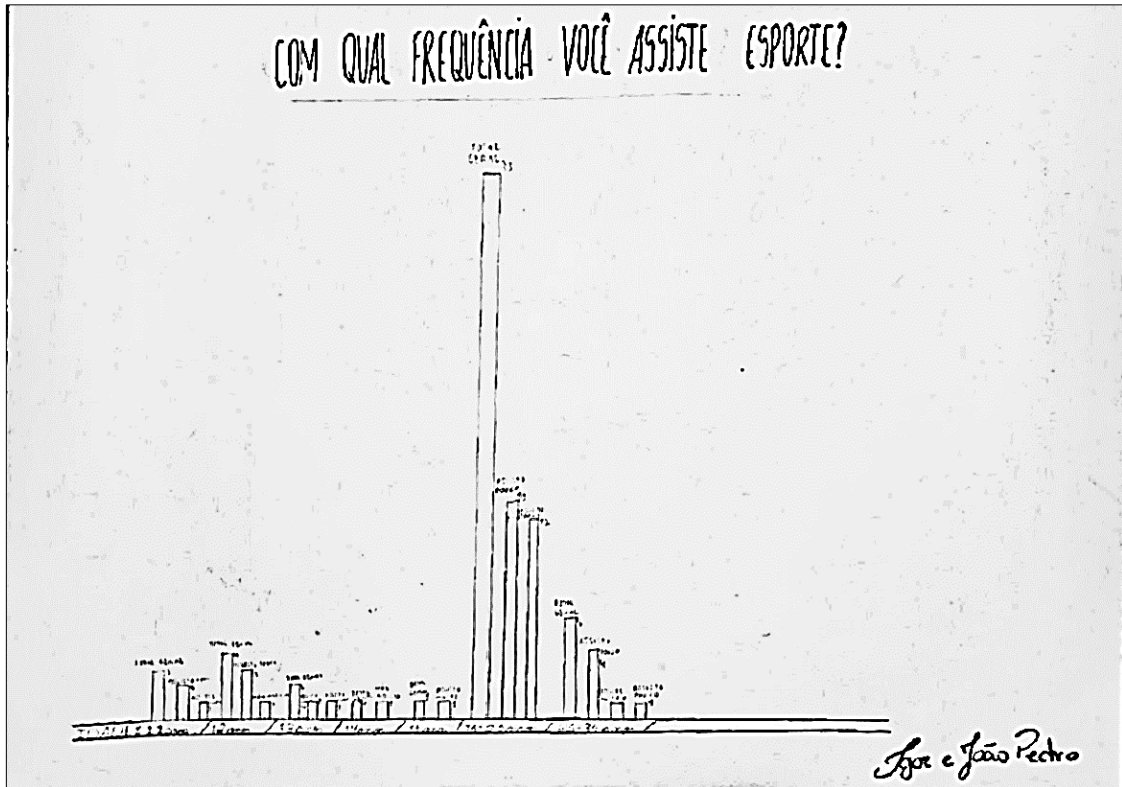
GRAPH 05: Preference: playing sports x watching others play.



Source: Prepared by the students themselves, 2022.

The frequency with which each age group watches sports was represented in this graph:

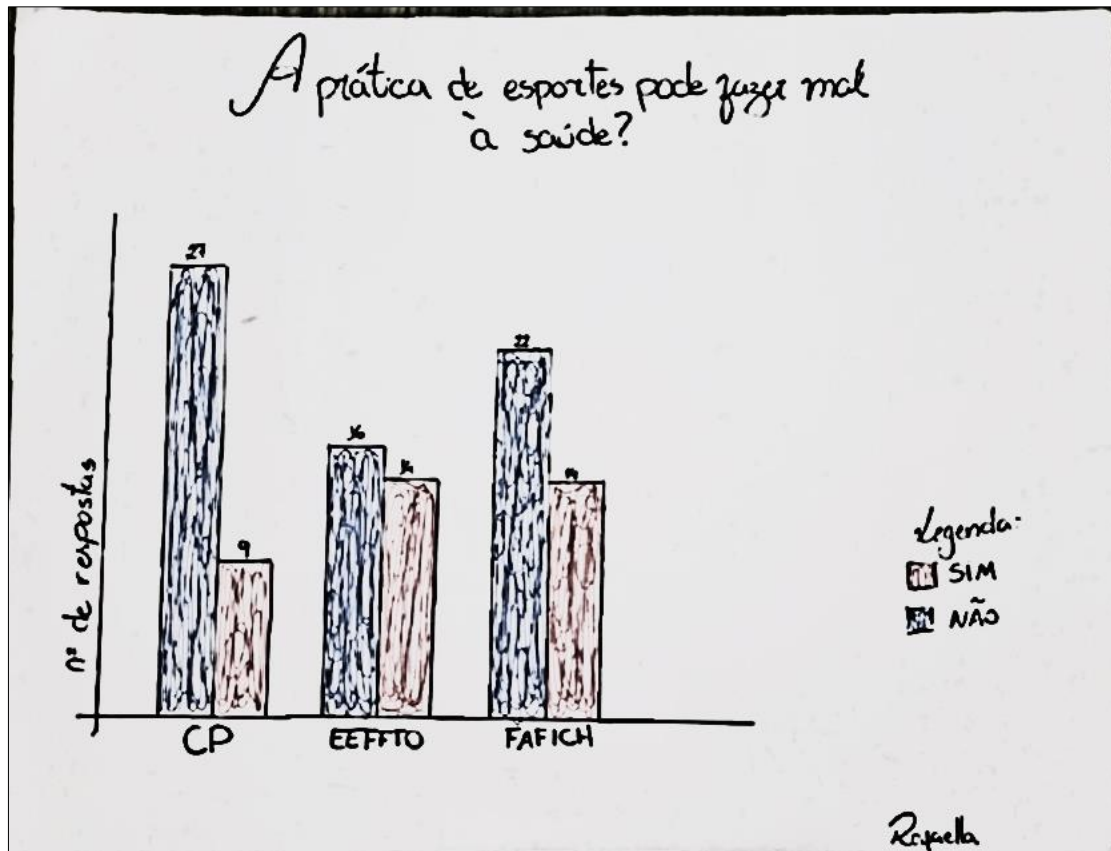
GRAPH 06: How often do you watch sports?



Source: Prepared by the students themselves, 2022.

The following graph relates people's opinions on the possibility of sports practice causing harm to the practitioner's health, according to the location of each participant:

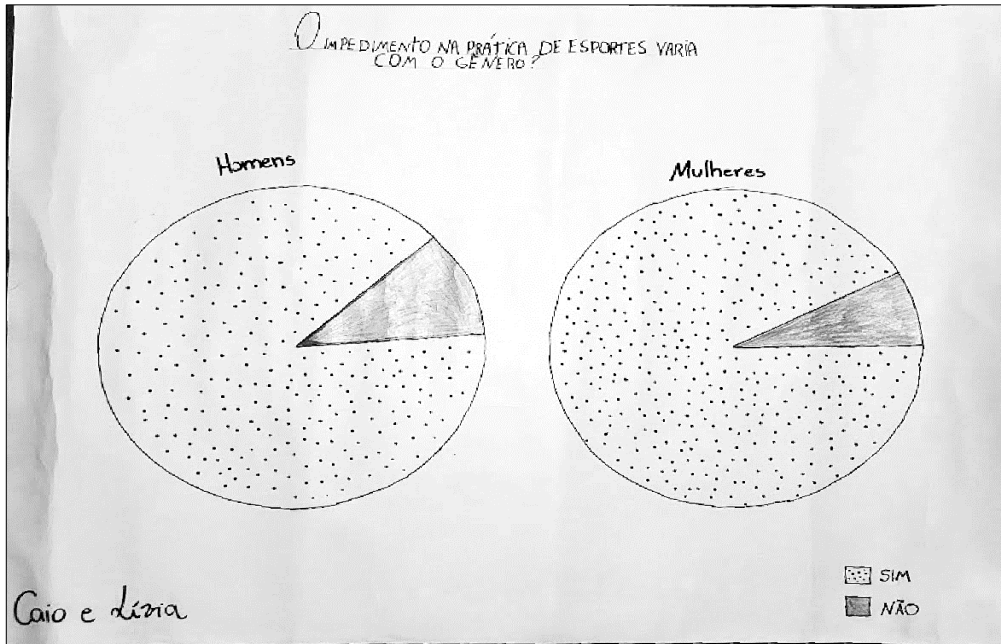
GRAPH 07: Can practicing sports be harmful to health?



Source: Prepared by the students themselves, 2022.

The following graph compares the opinions of men and women regarding their views on whether the athlete's financial condition can hinder sports practice:

GRAPH 08: Does gender affect the hindrance to sports practice?



Source: Prepared by the students themselves, 2022.

The last graph divided the participants by their age group and their opinion on the distribution of investments in sports.

GRAPH 09: Do you believe that sports investments are evenly distributed?



Source: Prepared by the students themselves, 2022.

Discussion

Among the results obtained in the research conducted with the students, we noticed that the majority of people are encouraged to participate in sports because they know that physical activities are beneficial for health, and they engage in them multiple times a week. Only 36% of the respondents believe that, in some circumstances, sports practice may have negative effects on health, such as wear and injuries. Regarding criticism, our result was as expected, with the majority of people believing that critiques can affect athletes in their performance.

In the entertainment question, the participants were evenly divided on the number of sports they watch, and the majority prefers participating in sports over watching them. However, in the financial aspect, most of the respondents believe that investments are not evenly distributed among sports, and the financial condition of athletes can hinder their participation in sports. To reach these conclusions, we asked the students to perform various analyses related to statistics. Requesting that the students undertake the task of counting the results and creating the graphs allowed them to take on the role of protagonists in the research. This, in turn, enabled them to develop data analysis strategies and provoke reflections, bringing a different perspective to the information collected, in contrast to the hypotheses that the students initially formulated about the possible results. For example, one of the initial hypotheses raised by the students was that the students from the Faculty of Humanities would be less interested in sports compared to the students from the School of Physical Education, Physiotherapy, and Occupational Therapy.

Conclusions

The experience of working with the NEPSO methodology with the students at the Pedagogical Center was highly beneficial for the didactic experience of the teachers in training and the learning of the students. Teaching scientific concepts in the classroom while addressing a subject of interest to the students brought a sense of ease to the lessons and increased participation. It is an excellent project to be developed in basic education classrooms.

From the perspective of a teacher in training, working with a class using the NEPSO format facilitated an understanding of the role of the teacher during the implementation of research with basic education students. With a pre-established schedule, well-detailed activities to be completed, and the guidance of mentors, the interaction between the teachers in training and the students enabled more participatory and dialogical lessons. The nearly biweekly meetings served to clarify many questions about the activities that the students should perform and also provided guidance, during which possibilities for working with the methodology and various student demands were discussed.

The fact that the methodology already had a well-defined and structured schedule, coupled with the guidance of two teachers who were familiar with the method and were always available to help address any issues encountered, made the teaching experience more open to new learning. Just as it is important for students to participate in learning to make it more meaningful, teachers in training also participated in this experience, experiencing different methodological strategies that can enhance the teaching and learning processes.

Another positive aspect of the methodology's application is the increased flexibility it brings to the classes. This work, for example, provided us with the opportunity to step out of the classroom with the students, conducting fieldwork beyond the school environment, which

served as a learning moment but also a source of relaxation for the students. The preparation for and the final presentation itself in the auditorium of the Faculty of Education at UFMG was also a unique moment for both teachers and students. During this event, everyone had the opportunity to participate in a scientific gathering with a showcase of their work, once again giving students a central role as they assumed and presented what they had developed.

A highly noticeable advantage of applying NEPSO in a Differentiated Work Group (GTD) class was the opportunity to work with students from different grade levels, including 7th, 8th, and 9th grades of the final years of Elementary School. This brought together different perspectives and approaches. It was important for us to learn how to reflect on and accept that we can have different opinions on the same subject while maintaining respect for all views.

According to Castro (2019), thinking about new pedagogical practices is a fundamental process for teaching and learning, and what this methodology brings to a teacher in training is a new perspective on how to bring science to the classroom. It goes beyond simply teaching theory, focusing on putting into practice what is commonly done in universities and research centers.

During the training sessions with teachers and other teachers in training from different fields, we were able to discuss different perceptions and possibilities for expanding the work. These moments were essential for the teaching practice of teachers in training. In the meetings, we shared information and discussed the progress of the research we were conducting. In these meetings, we brought different aspects regarding the importance and significance of our actions in the classroom, debating what was most meaningful in the methodology.

Working with teachers from various fields of knowledge brought a broader perspective to the development of research. Being one of the authors from the field of Natural Sciences and the others from the field

of Mathematics, it was possible to have a more open dialogue about the different possibilities for the development of this work. Beyond the concern with the statistical knowledge involved in the project, as well as the more quantitative part of the research, the teacher in training made many contributions to think about a more qualitative analysis of the responses, reflecting with the students on the insights that those responses brought regarding the sports theme. The final results of the research were presented in the Neidson Rodrigues Auditorium at the Faculty of Education (FaE) of UFMG on December 6, 2022. In addition to the Centro Pedagógico, students from other schools in the metropolitan region of Belo Horizonte, the Federal Institute of Minas Gerais, and Colégio Santa Maria, who had also conducted opinion surveys using the NEPSO methodology as a basis, were present. This was the XVII Regional Seminar "Our School Researches Your Opinion," which had been suspended for two consecutive years due to the COVID-19 pandemic. In addition to the presentations in the auditorium, posters were also created and displayed at FaE for one week, showcasing the work done by the classes and their results.

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