THE USE OF GEOGEBRA TO SOLVING A PROBLEM HISTORY: A CASE OF WORK MASCHERONI (1750 – 1800)

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46

ABSTRACT

The work deals with the disclosure of a proposal of activities for teaching Euclidean Plane to light the historical problem of Lorenzo Mascheroni (1750-1800) through software GeoGebra. The problem became known in the work La del Geometry Compass, published in 1797, which gives the possibility to perform all geometric constructions Euclidean plane - where the information sought would be points - using only the compass. For the proposed inclusion of this issue in higher education, particularly in the aforementioned discipline, we support you, because in mathematical research Bridge, Brocade and Oliveira (2005) and considerations about the use of computers in mathematics education by Borba and Hairstyle (2007) in order to produce a sequence of historical activities potentiated via TIC, especially by software GeoGebra for teaching Euclidean geometry. Thus, through bibliographic research, we present initial considerations about the problem mentioned on Mascheroni and historical solution and then development, we consider the possibilities of alliance with TIC. Further, we show the proposed activities based on the work and saw GeoGebra.

Keywords: Mascheroni. GeoGebra. Geometry compass.

INTRODUCTION

In order to present an approach to Euclidean Plane, from a research project linked to a master's professional interest is developing an educational product to the area above, we conducted a study of the means by which research should go. With this build our methodological framework, in which we present some of the possibilities and/or ways in which we tread throughout this study.

We started our study from the survey data that provide information on the work recently published in events in the field of mathematics education, related to two trends
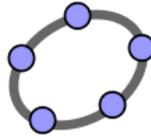
in mathematics education, these being the History of Mathematics as a teaching resource, and the use of technology in mathematics education, as well as academic papers, namely, theses and dissertations. In order to analyze the state of the art, these works have been divided into sub-themes, which are presented throughout the text.

After this survey we carried out a historical-literature in order to find a problem, the history of mathematics, we could overcome their historical solution to a computational environment and as a result, we got the work La del Geometry Compass mathematician Lorenzo Mascheroni (1750-1800). From the analysis of this work we have studied some of the problems presented by the author, statements and put possibilities constructions presented in the traditional mold. Then reproduce such constructions with the software Geogebra and selected to compose some of the development activities to be applied to students of Euclidean Plane.

BACKGROUND

Upon completion of the survey work in the same direction with proposals of ours, we obtained results as a small amount of those who have in their proposed educational interest to work with the History of Mathematics and Tic's. However, there is a lot of research when it comes to these trends separately, emphasizing in both cases their enormous potential for teaching of school mathematics and academic. Then bring the suggestion to adapt a problem contained in the history of mathematics in a technological environment, giving through the GeoGebra software in order to propose an alliance, we credit be further potentiated teaching, two trends in mathematics education who have been shown to be effective in isolation. With this study we are crediting the interaction between the two trends mentioned will enrich the learning of mathematics.

To proceed with this study we are using the work La Geometry del Comapsso Lorenzo Mascheroni, where the geometric constructions are carried out only with the aid of the compass, because according to the author in this instrument ensures a precise geometry that does not rule gives us.

Given the proposed Mascheroni, we wish to achieve as a result of our study, a sequence of activities for teaching the subject of Euclidean Geometry and Geometrical
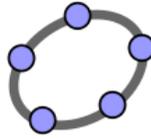
Drawing, in which we will be studying the geometry compass by GeoGebra. Our interest in working with this software is the ability to minimize errors that may arise with the handling of the instrument traditional compass or even the lack of ability of the student in their manipulation, which can lead to more errors.

OBJECTIVE

As the introduction and justification submitted, we aim to disseminate this work a proposal of activities for teaching concepts of Euclidean geometry in the light of the historical problem of Lorenzo Mascheroni (1750 - 1800) - with respect to geometric constructions, which says all Euclidean construction, in that the elements are data points, can be accomplished with the Euclidean measure only - through the educational software GeoGebra.

METHODS

During the development of the proposal, we will work with-research, due to its nature to take the action research field researcher, because according to Laville and Dionne (1999) the pesquisação is a research methodology where the researcher is directly involved with respondents and thus will be part of both the research and the intervention action as class teacher. While we consider that there are times where the developing characteristics of the studies present research teaching, because the activities to be performed during the research are framed in these terms, in which the teacher is an active participant both as a teacher of students as a researcher.

To collect empirical data we will take as theoretical support guidelines provided by Laville and Dionne (1999), by presenting a discussion explaining how we should proceed and what tools to use to accomplish empirical investigations. Therefore, there is a need for data collection followed by an analysis of such data in order to identify the influences afforded by the research activities of mathematical problems that may present historical discussions of contents in higher education, particularly in the discipline of Euclidean geometry via GeoGebra.
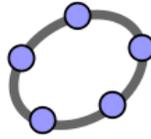
In this direction, we will start our investigation with a questionnaire that within the presented by Laville and Dionne (1999) is classified as semi -structured, because it will be composed of closed questions, where students will have to choose an answer that fits the his thinking, however there will be open questions so that students can show their real idea what you are asked. We will have specific questionnaires for the students in the class or classes, with an initial questionnaire to survey on the knowledge of students about the use of software and the history of mathematics, as well as their opinion about the teaching of mathematics through these resources. In the final questionnaire, we will seek to assess student learning from the use of these resources, as well as what they think about such resources in math classes.

A third questionnaire will be applied to teachers of the institution in order to understand the situation regarding the use of the teaching laboratories (from different areas), since part of the research activities take place in the computer lab, as well as investigate about the frequency or do not use these resources for teacher and feasibility of the proposal.

During the implementation of the activity will be also making use of other resources for documentation and storage of data that will contribute to an improvement and implementation of the set of proposed activities. Some of these resources are filming and photography, as these have great potential for data collection. Since these instruments allow register precious moments during the handling process of software by the students in the execution of activities previously prepared, once the pictures allow the researcher to examine how the students are reacting and / or interacting with the activity itself. At the end of the collection of data we can return to students with a possible interview to collect data that will clarify answers provided in the questionnaires, as well as for us to have a students' opinion about the activity applied.

To facilitate and guide the achievement of objectives, we began our research by doing a survey of data from a literature that seeks to obtain information on the state of the art alliance in history of mathematics and the use of information and communication technologies (TIC), more specifically, educational productions working to solve historical problems with the support of educational software.

As the first stage of the research was then conducted a survey of the work recently published in area events, as well as research in academic papers in the categories of
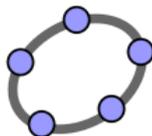
dissertations and theses. This survey consists of the search of the following sources: CAPES thesis database in BDTD and some sites postgraduate programs. It is noteworthy that the studies reviewed in the categories of presentations at events, dissertations and theses, both were published in the period 2009-2012.

The events referred to mathematics education are: IX National Seminar on the History of Mathematics (IX SNHM), promoted by the Brazilian Society of History of Mathematics, held at the Federal University of Sergipe , in 2011, Colloquium on the History of Mathematics and Technology in Teaching mathematics (HTEM 5), sponsored by the Graduate program in Teaching mathematics and Technology (EDUMATEC), the Education Center of the Federal University of Pernambuco in Recife (UFPE) and the Study Group on New Educational Technologies (PEOPLE) in 2010 and the XIII Inter-American Conference on Mathematics Education (CIAEM XIII), held at the federal University of Pernambuco, in 2011.

As said, the research work presented in the events mentioned earlier consists of a search for articles (presented as a poster , experience report , oral presentation or short course) mathematics education which present a discussion on the use of software in mathematics teaching , taking focused on solving historical problems through such technologies . To carry out this survey regarding the subject mentioned above, some subthemes were designated for classification of articles exposed, which consist of:

1. The use of software and the history of mathematics in mathematics education;
2. The use of software in teaching mathematics without historical approach to the contents explained;
3. The use of other technological resources in teaching mathematics.

Now explain what is being considered in each of these sub-themes. First, the use of software and the history of mathematics in mathematics education, comprises works that have a historical approach mathematical problems by making use of software for its resolution. In the second theme, the use of software in teaching mathematics without historical approach, are the work of researchers in mathematics education that have the use of software as a resource for improving the teaching of this subject. In the third sub math the use of other
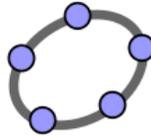
technological resources in teaching mathematics, it is the general use of technological resources for the teaching of mathematics, not just the papers presented at these events were classified into subthemes, more academic work also undergone A similar analysis within these same ratings.

As a second stage of the study, after the completion of this survey and analysis of the state of the art, we developed a focused literature search to identify problems and/or episodes in the history of mathematics for construction of the final material of this research. As a result of this research, we come to the content of the work La geometry compass by Lorenzo Mascheroni literature on sources consist of books of history of mathematics as Boyer (1996), Eves (2004), Wussing (1998) among others, as well as articles published in journals and / or periodicals, as well as academic papers such as theses and dissertations.

Figure 1 – Lorenzo Mascheroni

Source: La Geometria del Compasso (1901)

As a third step of the research, after the literature to define the problem, we then study its historical solutions proposed by Mascheroni, in order to comply with the drafting of the sequence of activities to be implemented with software GeoGebra in order to develop a courseware support for teaching Euclidean geometry. In this sense, we present in this article the proposed guided these two activities and preliminary research that will later be applied in the aforementioned discipline. It follows this stage, the complement of detailed study of the work associated with the development of more activities. It should also clarify that a preliminary survey was carried out a selection of the content and issues presented in the work of Mascheroni, in view of the wide range of possibilities presented for the preparation of this
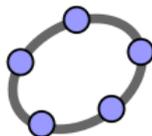
proposal which aims to culminate in a educational product associated with one of a dissertation Professional Master area.

Thus, of the 12 books that make up the work of Mascheroni, 3 was selected , and the first few are proven lemmas , theorems and corollaries, taken as basic for the Euclidean plane, which are discussed for those who come to study Geometry of the compass , pay for themselves by Mascheroni knowledge taken as needed. Thus, it would be a prerequisite, in other words, comes to basic concepts of Euclidean plane geometry which will be used in the statements of the problems addressed in other books. The other two books selected address problems of the following nature: Book II problems on the division of circles and circle into equal parts. Paper III presents problems of multiplication and division of straight-line distances. As here presents two problems Book II, namely the problem of dividing the circumference into four equal parts and the problem of division into eight equal parts.

− now present some images to illustrate how Mascheroni made divisions of the circumference in four, eight , twelve , and twenty- four equal parts − present in the first edition of La del Geometry Compass. Then we expose two images taken with software GeoGebra constructions, the problems that are in the activities presented in this paper.

Figure 2 – Divisions of the circle made by Mascheroni
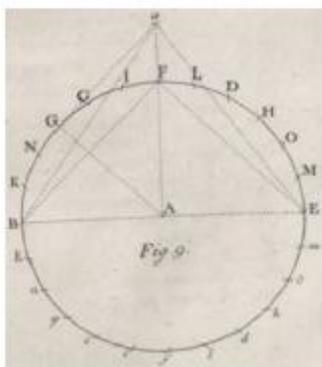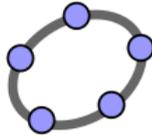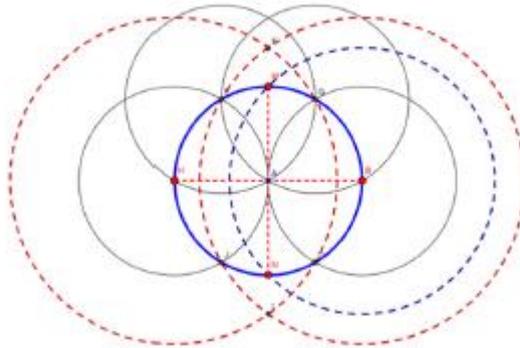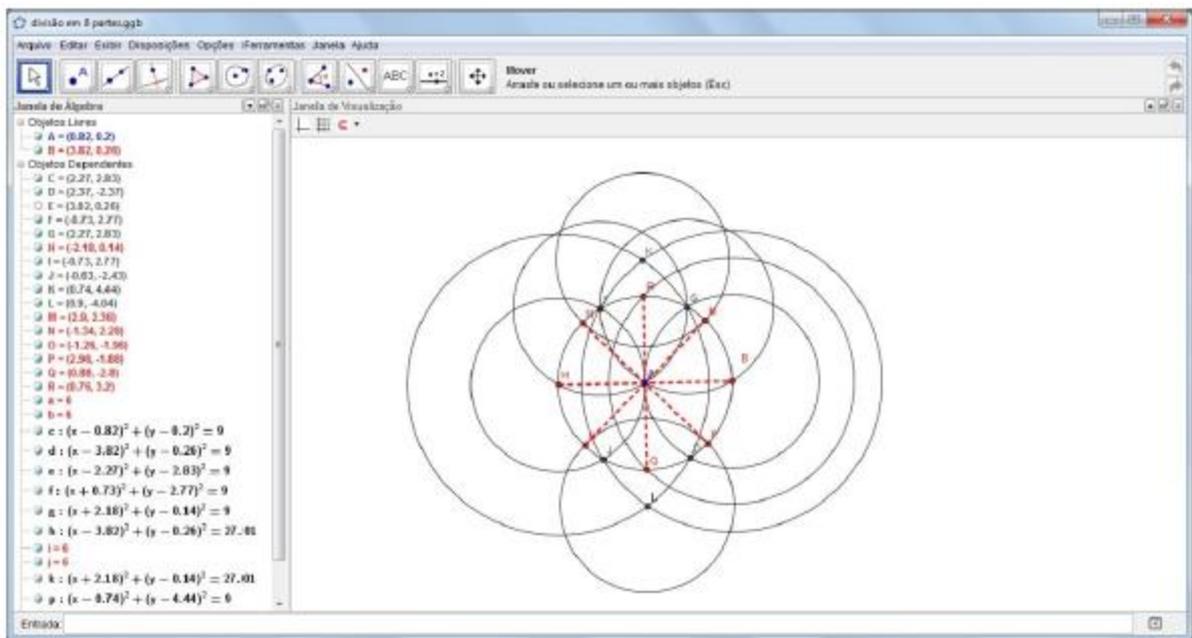

Source: La Geometria del Compasso (1797)

Figure 3 – Dividing the circumference into four equal parts

Source: Arquivo pessoal

Figure 4 – Dividing the circumference into eight equal parts

Source: Arquivo pessoal

RESULTS

The considerations put forward, has as preliminary results of ongoing research, the presentation of two proposed activities (see Appendices A and B) to support the discipline of Euclidean Geometry GeoGebra saw the light of the work of Mascheroni. Moreover, the
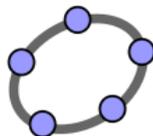
appointment of the possibilities of alliance between history and Tic so that the latter can enhance the first in favor of the teaching of mathematics, particularly in Euclidean geometry.

CONCLUSIONS

In proposing the development of a sequence of activities based on historical solution and via TIC (software) problem Lorenzo Mascheroni (1750-1800) about the geometric constructions, transitions between two trends in mathematics education, the use of history of mathematics and the use of technological resources for teaching mathematics, aiming an alliance between these two trends from the appreciation of the problem solved via Mascheroni history and dynamic geometry.

Thus, credits that will bring the story shrouded by a new approach to computing resources that will be trying to make troubleshooting a bit more dynamic, allowing, in front of a computer environment, students can develop activities more effective and fast, so we can explore both the mathematical concepts through the use of history as well as by GeoGebra. In fact, we believe that the software reduces, for example, errors in handling the traditional instrument (Euclidean signature) that may have already inaccuracy of the instrument itself and the students while trying to perform the Euclidean constructions.

In the case for the solution of the problems posed in the work of Mascheroni, we use mainly the GeoGebra compass tool that allows you to transpose measures. Thus, the resolution of the problem through software minimizes errors that students can make for not having skill and/or knowledge regarding the handling of the compass, little mathematical tool used lately in Mathematics classes. This can be evidenced in the discipline of Euclidean geometry, when crafted in the traditional way. However, it should be noted that the standard Euclidean no restriction of instruments for the buildings, but consider the fact that reducing the instrument via the proposal put by Mascheroni in his work , as well as a challenge to the student motivational also the possibility to analyze the mathematical this in another method.

That said, as a result put the pointing of the possibilities of alliance between history and Tic so that the latter can enhance the first to support the teaching of mathematics, particularly in Euclidean geometry. In addition, points are still with out of this research the product of two early activities based on the proposal stated.
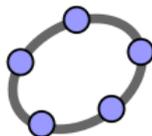
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