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GeoGebra and Computational Geometry: The use of computer graphics in the teaching of analytical geometry.

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1 Introduction

In this work, we will address the advantages of using GeoGebra educational software in the teaching of analytical geometry in high school using applications in computational geometry as a resource for the development of content.

The choice of the problem is based on the students' lack of interest in the content of analytical geometry and because they have difficulties in visualizing the concepts worked with the restricted use of the blackboard [1]. Therefore, we believe that methodologies that use computational resources can motivate the development of the content and make explicit its use in a practical context.

We opted for the study of computer graphics because it is increasingly present in various artistic expressions, in the development of entertainment media and in engineering, constituting an important mathematical application [4]. Therefore, we believe that the subject can both arouse the student's interest in understanding how the contents seen in the classroom can be used in this practical context, as well as prepare it to deal with its diverse daily and even professional uses.

We decided to use the GeoGebra software in the study of analytical geometry, since this tool has pedagogical potential for teaching mathematics and can contribute to the learning of analytical geometry through its dynamic interface that allows the manipulation of geometric elements and the investigation of mathematical applications [1].

In the next section, we will discuss the importance of information technologies in the teaching and learning process, in particular the GeoGebra software, and how they can be used in the study of analytical geometry contextualized with the use of computational geometry. In the last section, based on current studies, we grounded possible future work and made our considerations about the research.

2 Technology in Education and Computational Geometry

According to Burke [2], the evolution of technology transforms society, changing its various segments until it is absorbed by educational activity. Therefore, as well as several didactic instruments were studied to be perfected, it is necessary to problematize the use of technologies as

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a teaching tool. However, it is necessary to highlight that computers alone are not enough, it is necessary that they are articulated in pedagogical proposals that allow the effective construction of knowledge through this new tool [3].

The use of technologies with graphic resources allows the student to visualize abstract and dynamic concepts that could not be represented on a blackboard, reducing learning difficulties [1]. Thus, we highlight the importance of carrying out pedagogical practices that use interactive software that allows the manipulation of the investigated elements.

Educational software allows the student to carry out experiments while learning, giving new meanings to the knowledge built. In this sense, we observed that Borba, Silva and Gadanidis [1], points out that the interactivity of the GeoGebra software allows simulations that can be analyzed and modified, making learning more effective, since methodologies that go far beyond are explored the use of paper and pencil.

We use the book by Liseikin [4] to study the uses of analytical geometry in computational geometry. To create a graphic computational model of an object, we build a three-dimensional grid to map the points of the object and translate this information into a series of equations that can be interpreted by the computer. In the discipline of Computational Geometry of the Bachelor's Degree in Applied Mathematics, it was observed that the concepts of analytical geometry seen in high school had practical applications that could be carried out with simple computational resources, and that served as motivation for the development of the content.

3 Future Studies and Considerations

Subsequently, based on current studies, we wish to develop a didactic practice for a better understanding of analytical geometry, using the GeoGebra software as a tool linked to the didactic-pedagogical methodology that will be developed, as well as the main uses of this content in the applications of computational geometry. And then apply this pedagogical practice in a computer lab with a high school class and analyze its realization and its effects on the learning process through questionnaires with students and teachers. We intend to analyze the results of the questionnaires through the theory of negotiation of meanings and qualitative and quantitative research.

Although the research is still being carried out, we can already see that new pedagogical practices, combined with the use of technology, make the teaching-learning process more significant and it is beneficial to use them together with the mediation of the teacher. With these practices we intend to improve student performance in the content of analytical geometry.

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