Learning Objects and Geometric Representation for Teaching “Definition and Applications of Geometric Vector”

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ABSTRACT

Often during the teaching of mathematics, students have difficulties to understand some abstract concepts. That’s why it is necessary to show the student the concepts as clearly and definitely as possible. The proposal of this project is a teaching strategy. It is the use of Geometric Representation integrated Learning Objects for the internalization of concepts. The research process involves the design, development, and evaluation of Learning Objects and how it promotes understanding of the contents of the topic “Real Geometric Vectors and their application”. At the beginning of this article are the context and the latest research concerning to this project. Then an overview of the theoretical framework that supports this work is shown. Finally, the paper describes the methodology used in the project, results of data, expected contributions and conclusions.

Keywords: Encourage Learning, Geometric Representation, Learning Objects

1. INTRODUCTION

Through empirical experience, it has been observed that students have complications when they try to understand some abstract concepts with only proposition representations. It has been found that when the theoretical concept adds a graphical representation, concepts are better absorbed. Furthermore, today, the technology used in the classroom represents a greater motivation to students. Joining these two ideas, it was decided to create Learning Objects (LO) and Geometric Representations (GR) for teaching the subject of “Geometric

DOI: 10.4018/JCIT.2015010102
Real Vectors”. Making abstract concepts of linear algebra more concrete, promotes student understanding, because geometric figures and drawings help to visualize the contents. The method of concretization of concepts is more effective than the traditional approach, where they are just relations between symbols that lack mathematical sense, and they are resolved by memorization and repetition, which do not represent a significant learning for students (Soylu, 2007).

Soylu (2007) said that the reason why students have difficulty in understanding abstract concepts is because they are difficult to articulate and require a high level of mental activity. He proposed that this problem can be reduced through the concretization of abstract concepts through the development of drawings for easier interpretation; this method is called “method of concretization,” which is nothing more than introducing abstract concepts with the help of GR. However, some mathematical representations are not so simple to construct with pen and paper, or they require too much time for processing, thus, it is almost impossible to show them on the board during an exhibition class. One solution to this problem could be the use of mathematical software in the classroom, it must be affordable and accessible to everybody. That is why GeoGebra has been selected to build the GR, as it is a free and easy access software.

This paper proposes a teaching strategy to improve the understanding of concepts of theme vector through GR placed in LO, which integrates different activities to achieve objectives. It is based on a model that helps the understanding of concepts, definitions, operations and applications through geometric figures. Joins the cognitive theory of Duval (1993, 1995, 1998, 1999a) which defends that learning involves three kinds of geometric cognitive processes: visualization, reasoning and construction. The visualization and reasoning processes, leading to a deductive reasoning, is essential for solving geometric problems (R. Duval, 1998); and a theory of Mental Models of Johnson-Laird, which according to Moreira, Grecia and Palmero (2002), states that students may understand the definition or mathematical concept, when they have a mental model of this item. The LO are oriented to classroom training systems and they will be placed on the internet to assess its efficiency as support in teaching process. The valuation of pedagogical and technical quality of these LO will be made by students of “Mestrado em Educação e Ensino de Ciências Matemáticas” at Universidade Estadual da Paraíba (UEPB), Campina Grande, Brazil.

This project is an assessment of the pedagogical and technical qualities of these LO in order to value their usefulness for teaching abstract concepts. This review is the result of the analysis of data obtained through an assessment tool to test the hypothesis, “Learning Objects and Geometric Representations promote understanding of the contents of the theme Real Geometric Vectors and their applications.”

This paper consists of context and motivation that drives the dissertation research, research goals, state-of-the-art, hypothesis, theoretical framework, and the methodology used throughout the project, results to date and their validity, dissertation status and current and expected contributions.

2. CONTEXT AND MOTIVATION THAT DRIVES THE DISSERTATION RESEARCH

Often in the process of teaching and learning of some LA (Linear Algebra) concepts, instead of being learned significantly, are acquired through memorization as forms without content of symbols relations without meaning and tangible application necessary for meaningful learning (Pulido, 2002). Most students are not aware what the concepts that they study mean mathematically. Even fewer when the learning of mathematics with arithmetic operations, logical or algebraic symbols is done by memorization (Soylu, 2007).

This project assumes that the GR enhance understanding of abstract concepts; but what are the GR? And why do they help to improve learning? First, we must know the concept of
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