v. 3, n. 40, 2023

Journal of
Engineering
Research

APPLICATION OF A SOFTWARE IN TEACHING CALCULUS TO STUDENTS OF THE BASIC SCIENCES CENTER OF THE STATE POLYTECHNIC UNIVERSITY OF CARCHI

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Abstract: This work called "Application of software in teaching calculus to students of the Basic Sciences Center of the State Polytechnic University of Carchi", is carried out motivated by the fact that it is evident that students show lower levels in the use of tools of a educational software that improves performance in the subject of mathematics, where teaching methods are inappropriate creating gaps in knowledge, from there the idea arises of proposing as a main objective to analyze the effectiveness of the use of educational software for the subject of Mathematics as reinforcement in the learning process of the students of the Basic Sciences center in the subject of Comprehensive Calculus in order to identify and describe the effectiveness of the use of educational software for the subject of Mathematics as a reinforcement in the students' learning process
Keywords: Software, teaching, Integral calculus

The 21st century has generated various transformations when it comes to education, since it is constantly challenged by the new information knowledge society that allows it to respond to the needs of the context, where Information and Communication Technologies (ICT) They have a fundamental role in the panorama of educational training. Hence, it is vital for this study to publicize the models within teaching that allow the integration of ICT that are characterized by providing new ways of learning (Jiménez & Segovia, 2020).

Now, if continuous improvement is required in the educational system, models must be applied that guarantee quality and effectiveness in the process and that there is a link to transformations in the activities and functioning of the instances that are oriented as an alternative to new thoughts and actions. The incorporation of computer equipment in educational environments offers great possibilities to strengthen student learning and resolve school difficulties, leading to new possibilities and alternatives that activate their intelligence. Therefore, it provides the possibility for learning mathematics in traditional operations that are available to students and they can interact with them and obtain support from the device.

According to Brito et al. (2015) indicate that the use of educational software in teaching-learning of the four mathematical operations", presents the use of educational software and GCompris Tuxmath in improving student learning, the methodology used is quantitative, in addition the objective is to achieve the objectives that will be measured at the end of the project, and can be reformulated and applied to other classes, the results show good performance of the students and it was also established that after the use of educational software there was a greater interest in mathematics.

GeoGebra is a Dynamic Program for the Teaching and Learning of Mathematics for education at all levels, it dynamically combines geometry, algebra, analysis and statistics in a single set that is as simple at an operational level as it is powerful. It offers diverse representations of objects from each of their possible perspectives, graphical, algebraic, statistical and organizational views in tables and spreadsheets, and dynamically linked data sheets.

Currently, teaching and learning is linked to technology, which is a systematic means for the design, implementation and evaluation of all teaching and learning processes in accordance with the objectives set to achieve greater efficiency, taking into account the techniques used.

They use and the way they are incorporated, through technology the integration between scientific knowledge and technique is

required, hence its significance because it allows social development because education needs to be on par with the advances that are established in humanity, where the use of ICT is essential for the teaching and learning of exact sciences.

Educational software is a valuable didactic tool for teaching-learning within the training of students; According to their typology, functions and characteristics, they allow them to be included in the process of direct support for education, which constitutes an effective instrument for the development of the individual. To ensure that the use of software in education plays an appropriate role, its quality must be taken into consideration and its effectiveness must be measured by the knowledge it can represent and impart. Therefore, an effective evaluation is necessary, taking into account the general, pedagogical, technical, aesthetic and operational objectives (Dorta, 2017).

The creation of computer-assisted teaching and learning environments requires the development of specific software, the characteristics of which may depend on the learning needs to be addressed, the goals to be achieved, the content to be investigated, individual learning styles and strategies, assumptions. and pedagogical norms of the local culture, among other factors. Hence the need to develop computer systems for educational purposes, which are commonly called teaching material software.

The process of learning mathematics includes many different aspects, in its diversity only one very special aspect can be considered, given that the new developments that technology in computer science and computer science topics and is nothing more than use of computer programs to teach mathematics at the university level.

There are many softwares that can be used to develop mathematical skills, some of which are better suited to the curriculum content of curriculum units, such as calculus, geometry, and linear algebra. One of the main problems currently faced by teachers in the area of mathematics in education is the lack of updating in the methods or forms of teaching for certain topics where didactic tools that are found in everyday life can be used, such as example technology.

As mentioned (Martínez, 2022), at the State Polytechnic University of Carchi (UPEC), through the application of a survey to teachers of mathematics and similar subjects, both tenured and occasional, they agree with the use of mathematical software for teaching certain topics, but each one is based on their own experience or mastery of a certain program, there is no standardization of the methodology to be used in the teaching and learning process of precalculus and calculus within engineering meshes.

A survey was also carried out on students from the UPEC Basic Sciences Center, where the acceptance of educational software in the teaching and learning process of mathematics is visible, since the majority of them come from virtual education due to the pandemic and the technological era that we live in today where computer tools are used for most daily procedures. (Martínez, 2022).

In its publication (Vilca, 2022) it highlights that the subjects of Differential and Integral Calculus present a higher degree of difficulty and understanding in university students. Computer resources can provide their capacity for dynamic interaction, through animations, simulations and 3D views helping visual exploration, this way ICT would allow working on different areas of mathematical calculation.

The research population is a characteristic that defines scientific knowledge, as indicated by Arias (2012), that the population is "…a finite or infinite set of elements with

common characteristics to which the research conclusions will be extensive. This is delimited by the problem and the objectives of the study" (p.21). The population as part of this work is constituted by a finite population since it is made up of students from the Center for Basic Sciences who take the subject of Comprehensive Calculus at the State Polytechnic University of Carchi, in the semester of study, who will participate in a hundred percent.

In this research, the study unit will be a total of 180 students, no sampling was presented. For the processing and analysis of the results, data tabulations were carried out in MATLAB, where the program license acquired in the research project Analysis of learning results under international standards of the students of the Center for Basic Sciences of the careers is available. of engineering from UPEC.

With the previous precedents, it was decided to apply educational software in the planning and evaluation of a topic within Comprehensive Calculus such as revolution volumes. Since there is a need for flexibility and rapid changes in research, it is necessary to use the action research methodology or better known in English as Action Research (O' Brien, 1998).

This methodology was devised by Kurt Lewin, which is considered as a process in which one or several people meet to identify a problem and do something to solve it until the results are to their satisfaction (Gabel, 1995), which has four stages.

Current students prefer learning that involves technological tools since they can interact with technology and experiment and explore new procedures in solving exercises.

Mathematics teachers agree that the use of computer packages in the mathematics teaching process is useful, but they do not have in-depth knowledge of methodologies in the application of these programs for teaching exact sciences.

In a case of specific application such as the topic of volumes of revolution, which is an abstract domain according to its graph since it handles three dimensions, the students who applied the software obtained a higher average grade than the course of students who handled it traditional way, with graphics done manually.

Carry out continuous training for academic staff on methodological strategies for using software in teaching basic sciences, since teachers know how to use the different programs, but there are gaps in how to use them to obtain better learning results.

Planning	Follow-up of the syllabus of the integral calculus subject of the State Polytechnic University of Carchi, taking as reference the theme of volumes of revolution where the GeoGebra software was used as it is a free downloadable program from the cloud, and the easy interaction of the students with this program, since they had previous knowledge in the subject of Differential Calculus in graphs of functions and limits
Performance	Preparation of teaching material for the two Comprehensive Calculus courses, which were divided into two groups, students who received classes in the morning where a traditional methodology was used without the use of computer programs and students who received the subject in the afternoon where The use of GeoGebra has already been implemented
Note	The results of the application of the plan are gathered, belonging to the experimentation the following results are obtained: the students of the morning session obtained an average of 7.03 and with the students of the afternoon session an average of 8.09 was reached.
To think about it	It refers to the conclusions drawn in the process

Table 1 Stages of the Action Research methodology

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