

Virtual Environments in Learning the Biology of High School Students

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ABSTRACT

This work analyzed the potential impact of virtual environments on learning biology at a high school. This case study was done at a secondary institution in Ecuador. A quantitative and descriptive study was carried out and two measuring instruments were applied to different populations. This work concluded that the educational community has favorable views about the use of technology as a learning strategy. Virtual environments were identified to positively affect meeting the class objectives and improve learning conditions such as interest, attention, and student motivation.

Keywords: Virtual Learning Environment, Virtual Classroom, Biology Learning, Instructional Design, Middle Education

INTRODUCTION

This article presents the relationship between the implementation of a virtual environment has in biology learning. The study was conducted on high school students and analyzed the perception of the educational community to identify the best instructional design aimed at a morning face-to-face institution. This digital space aimed at improving the didactic interaction between teachers and students needs continuous advances and approaches between the technological and the educational. However, this progress has not been seen on time in the biology subject in Ecuadorian institutions (Noroña, 2012). Consequently, an approach to its curriculum and an instructional design can cover this deficiency.

This background helps to identify an important factor. Although Ecuadorian teachers have implemented different methodological or didactic strategies, the use of technology has been recently included as a tool (Romero, 2016). Thus, analyzing this phenomenon in this context allows increasing the study resources so that more teachers can improve their technical capabilities.

Virtual Environments

A virtual learning environment is a site hosted on a server that combines learning resources, activities, qualifications and in general the components that are detached from the teaching process and learning a subject. This allows horizontal communication between the teacher and students in such a way that it overcomes spatial and temporal limitations while promoting interactions different from those of face-to-face education (Betanco, 2019).

Due to these features, the design of study resources facilitates and increases the motivation of students. Thus, the use of virtual environments in education facilitates sections of learning that would previously be impossible. For instance, the case of automated evaluations or non-chronic sessions outside the physical structure of the school. This does not only reduce working time for the teacher but can be advantageous to provide feedback in the most difficult subjects, a key theme to improve the quality of learning (Sánchez & Manrique, 2018). From this perspective, it can be identified that virtual environments are important tools that could become indispensable due to their influence on the teaching-learning process without the need to attend a place in person. Also, with-in the framework of educational innovation, it allows the transition from traditional to virtual scenarios where difficult situations can be emulated in a laboratory or practices of relative danger. Therefore, the design of these environments needs a solid structure based on technology integration models according to each school context.

Examples of integration models are SAMR, TPACK, or TAM3; which are characterized by changing the policies of the educational institution; generate technological, pedagogical and curriculum training; and form a perception of ease of

use respectively (Samperio & Barragán, 2018). Within any integration model, different virtual objects can be pinned in a virtual environment, including three large groups: 1) learning resources, 2) development activities, and 3) teacher administrative management components. The first case is tools dedicated to querying and sharing multimedia (Cacheiro, 2011) content such as YouTube or Wikisource. The second case is tools that allow interaction with the object, such as forums, online evaluations, or contextualized games (Acedo, 2020). The third case is tools that facilitate the work that the teacher must do outside the classroom such as reporting or grade management.

Biology Learning of High School Students

The curriculum content for biology teaching in high school depends on the interests of a private institution or the interests of such a country. For example, in the case of Ecuador, the curriculum content of Biology for the first year of high school focuses on researching natural phenomena through laboratory practices and critical text analysis.

The skills that a student acquires when taking this subject to allow him to describe, compare and analyze the basic characteristics of biomolecules, the hypotheses of the origin of life, theories of the evolution of species and the processes related to cellular metabolism. For this reason, the modules or units of the Ecuadorian national curriculum focus on these three themes in the first half of the school year (Ministerio de Educación del Ecuador, 2016).

However, the objectives set for the fulfillment of curriculum skills depend on the teacher's methodology, the number of hours intended for the subject and in general the development of students based on the factors that influence learning, such as attention, interest, and motivation. These are essential in the teaching and learning process since through visual or auditory stimuli the desire to learn is magnified and the student attitude towards the contents improves (Lázaro & Mateos, 2018).

METHOD

Participants

This research was applied in 75 individuals corresponding to the population of first year high school and 6 individuals corresponding to the population of teachers in the area of the natural sciences of an institution belonging to the public education system of Quito in Ecuador.

Research Design

This research is quantitative and descriptive.

Instruments and procedure

The collection of information was carried out through two instruments. One directed to students and one to teachers. These instruments were designed in Google Forms and validated in the technical and conceptual section by two academic experts in education. Both questionnaires measured the community's perception of the use of virtual environments in Biology learning in the first year of high school. Table 1 shows the reliability rates of the instruments.

Table 1. Cronbach's Alpha analysis

Questionnaire	Cronbach's Alpha	Elements' No.
Aimed at students	.833	11
Aimed at teachers	.915	18

Data Analyses

Descriptive statistical techniques to analyze instruments' reliability were applied.

RESULTS

Interaction of the educational community with virtual environments

The educational community believes that there are simpler means of communication between students, for instance, social networks stand out. In addition, the educational community argues that a virtual learning environment facilitates and therefore improves feedback when the number of students in a classroom is manageable (less than 50 students per classroom).

Learning capacity

Students and teachers report that resources and activities quality should be more important than quantity in a virtual environment. These virtual objects should be piloted to identify potential improvements and replace them if the results are not as expected in terms of significant learning.

Technology evaluation

Although students think online assessments are simpler than paper assessments, they have not been exposed to such stimuli beforehand. On the teachers' side, switching from paper strategy to online assessment is considered feasible as it decreases their management time in individual qualification.

Developing virtual objects

Students consider the difficulty to rise when exposed to video-mediated learning. At the same time, teachers consider that it is more difficult to develop virtual resources than a face-to-face class. However, these resources can decrease working time in the future since they are reusable in the following school year.

Developing creativity with virtual learning objects

Both students and teachers believe that resources and activities in virtual object format develop creative capabilities that are not applied in paper problem-solving. At the same time, the educational community considered that the aesthetics of resources are important since it generates interest in students, although it is not essential if the drafting of the order by the teacher is clear.

Document management

Teachers believe that applications for administrative or document management can drastically reduce their working time. Moreover, the time saved can be used for feedback to their students. Similarly, teachers prefer virtual over paper and believe that this change should happen in the medium term.

DISCUSSION AND CONCLUSIONS

Virtual environments contextualized to the reality of an institution and a specific subject improve student learning achievements, facilitate the fulfillment of the objectives set by teachers and achieve more skills and learning standards proposed in Ecuador's national curriculum.

Although the educational community studied is generally open towards the virtual, it is essential to identify the characteristics of the institution's technological structure because this change can be difficult in schools without enough resources or in schools with students who lack connectivity at home.

Student's interest, attention and motivation are key to learning. Thus, the didactic and methodological strategies that a teacher must choose at the beginning of the school year must be in sync with the educational reality. It has been seen that the technological medium can be advantageous in the improvement of learning. However, it brings with it different problems that are not observed in traditional teaching.

To implement a virtual learning environment, it is important to identify which platform is feasible within a school. For instance, some studies mention a better student reaction to Google Classroom instead of Moodle (Bel-Oms & Bel-Pérez,

2019). However, the financial or technical resources needed to create a server for the school or pay for certifications or licenses can hinder the capacity to acquire the most feasible platform.

Therefore, it can be concluded that institutions with sufficient resources and with teachers with sufficient technical capacity could implement virtual tools to complement face-to-face education to improve students' learning. However, training of the platform that can work in the institution will be necessary.

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