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Augmented Reality as a Teaching and Learning Strategy in Higher Education in Colombia

Sandra Bayona Gómez[a]

[a]GIDSE research group, Universidad Francisco de Paula Santander, Colombia, e-mail address: sbayonag@ufpso.edu.co

A B S T R A C T

This article shows a literature review of national research on the use of Augmented Reality (AR) as an innovative technology for the creation of learning strategies, which makes great contributions to higher education in the training processes of students in different academic programs and in different disciplines. In the review of different research articles, it is evident how a large number of universities in Colombia, research on how to create and implement didactic resources of Augmented Reality to reinforce learning in different subjects and how this can be used as a support tool for the creation of innovative teaching strategies, which have the ability to awaken in higher education students the interest and motivation to appropriate knowledge.

Keywords: Augmented Reality, Teaching and learning strategies, Augmented Reality in higher education.

1. Introduction

Currently, Augmented Reality (AR) technology is presented as an innovative emerging tool, whose use has aroused interest in many areas such as medicine, business logistics, marketing, geolocation, entertainment, experiential communication, operator training, technological assistance, Industry 4.0, interactive advertising and not escaping education, in which, there are several investigations and digital educational resources based on this technological tool, not only has favored the learning of students in educational institutions in the basic and secondary modalities, but also in higher education.

Augmented Reality, properly used to meet the particularities and educational needs of students, provides significant contributions to education, enabling the creation of digital resources that, as stated by (Muñoz - Hernandez, Canabal - Guzman, & Galarcio - Guevara, 2020), are characterized by being innovative tools that support and facilitate learning processes, increase students' level of attention, stimulate the desire to learn and awaken their interest, promote the spirit of research and other factors that facilitate the understanding and assimilation of knowledge (pp. 38-39). Similarly, Augmented Reality, through various investigations, has proven to be a tool that enables students' autonomous learning, self-evaluation through the feedback provided by the applications used, and increases their competitive spirit by motivating their desire to achieve the objectives of the proposed tasks.

Taking into account these particular characteristics that enhance the usefulness of Augmented Reality in educational environments and that are relevant in the training of students, many higher education institutions worldwide and nationally, are currently conducting research in which digital resources are created to take advantage of their properties and serve as support tools for teachers in the creation of learning strategies that are really meaningful for students and allow them to appropriate knowledge in a fun and different way to strengthen their skills in different areas of knowledge.

In view of the above premise, the study conducted by (Moreno - Mendoza & Coronel - Arenas, 2020), In view of the above premise, the study carried out by the University Francisco de Paula Santander Ocaña shows that 32% of the students of the administration program at the University Francisco de Paula Santander Ocaña do not forge reading skills despite being immersed in technological content, where it can be concluded that there are no strategies that lead to immersion in augmented interactive books and thus encourage reading habits from a more pleasant didactic to the students.

* Corresponding author.
  E-mail address: sbayonag@ufpso.edu.co

Nor should we ignore the fact that a significant number of urban and rural schools in Colombia do not have access to technological resources that would allow the appropriation of augmented reality as a new learning methodology, as expressed in the following statement (Cruz - Carbonell, Hernández - Arias, & Silva - Arias, 2020), It is significant to recognize the need to incorporate technology in educational pedagogy.

Given the above, it is important to highlight that our country has been strengthening the incorporation of innovative ICT tools in educational processes, since, as they say (Cruz - Carbonell, Hernández - Arias, & Silva - Arias, 2020), it is relevant to be aware of the need to incorporate ICT goods and services in educational pedagogical practices, since they generate a positive impact on education indicators and student performance.

Likewise, not only the educational sector should turn to the incorporation of technological tools, but also the business sector, as it expresses it (Álvarez-Silva, Guarín-Rivera, & Bermeo-Giraldo, 2020).The redesign of the way of working in companies should be implemented with the use of technologies and thus improve processes and work performance.

The purpose of this article is to review the research literature on the use of Augmented Reality technology in different areas of knowledge in higher education in Colombia, as a way to innovate in the training processes of students.

2. Theoretical framework

Augmented Reality is defined by (Azuma, 1997), as an environment that "allows the user to see the real world, with virtual objects superimposed or composited with the real world. Thus, Augmented Reality complements reality, rather than replacing it completely". This conception perceives augmented reality as a medium that makes it possible to visualize any real environment, simultaneously incorporating virtual qualities, where a totally new scenario is constructed that allows interaction between the physical and the three-dimensional environment, which is digitally created.

These properties of Augmented Reality enable the creation of teaching and learning strategies in higher education environments, with which the teacher has the opportunity to allow students to make use of their previous knowledge to construct new learning.

Given the above, (Díaz & Hernández Rojas, 1999), state that learning strategies refer to the instructions or resources used by teachers to promote meaningful learning in their students; this learning is developed through the processes included in cognitive strategies based on the teacher's need to transmit knowledge and teach students how to learn.

Augmented Reality technology in academic environments, becomes a novel tool to strengthen teaching and learning processes, and its application in these, are more favorable than the simple transmission of content as they are done with traditional pedagogical models and, favors innovative didactics that promote a more efficient and meaningful learning (Cabero-Almenara, Vázquez-Cano, Villota-Oyarvide, & López-Meneses, 2021).

3. Methodology

The methodology used in this article is a qualitative approach under the documentary review model in order to investigate works related to the research topic.A documentary review was carried out to identify previously elaborated research related to the topic of study, consolidate them and thus build the theoretical framework.

4. Results

Currently, the Colombian government, through the Ministry of National Education and the Ministry of ICTs, implements public policies and strategies that guarantee the accessibility and use of Information and Communication Technologies in education, and although the digital gap is still large, little by little it has been incorporated into the teaching and learning processes.

Bearing in mind the great contributions that ICTs make to education, it is relevant to inquire about an innovative technology that is making inroads and is being incorporated into educational processes. This technology is Augmented Reality (AR), which, given its particularity of allowing to simulate virtual environments in which a person can immerse, interact with real-looking simulated elements and make use of mobile devices for visualization, makes it suitable for the creation of digital resources that adapt to the learning needs of students.

Similarly, AR makes it possible to recreate real-world objects and bring them to life for later study, thus allowing the use of this technology as a teaching and learning tool.

These features have sparked the interest of research professors, who have sought ways to integrate this technology into different disciplines to improve the learning outcomes of their students.

(Muñoz - Hernandez, Canabal - Guzman, & Galarcio - Guevara, 2020), in their research work, made use of an Augmented Reality mobile application in order to improve the apprenticeships "of the students of the Faculty of Economics, Administrative and Accounting Sciences", in the subject Financial Mathematics. The authors hope that through the use of this augmented reality learning object, the study of this subject will be more practical since its customization in the use of formulas, graphs, tables and all its context, awakens the student's interest and improves their academic performance.

Another area in which augmented reality is used in university environments is in Physics, which is evidenced in a research conducted by (Cairasco, Santacruz, & Eraso, 2020), for the Environmental Engineering program, where they seek through the development of a didactic tool based on augmented reality to reinforce the understanding of the abstract concept of energy; the resource improves the student's experience by allowing a stimulation of their sensations, without affecting their integrity and without investment in infrastructure.

Similarly, (Marino Dodge & De León, 2012), in their research, propose "a specification of requirements that serves as a basis for the design and development of a software program" of Augmented Reality that allows to increase the acquisition of knowledge in the subject Physics Mechanics in universities. They argue that the use of Augmented Reality strengthens students' learning in this subject, creates innovative environments and that its properties are in line with current learning theories.

Augmented Reality has become an allied technological tool for numerous higher education institutions in Colombia, to strengthen their teaching and learning processes and also as a topic of interest to investigate the benefits that this brings through the design of didactic strategies that support these processes in different academic education programs. In this regard (Millán Rojas, Carvajal Beltrán, & García Quintero, 2016), propose the implementation of a didactic strategy to strengthen "the learning of students in the area of logic and algorithm of the Systems Engineering program at the Universidad de la Amazonía". With this research, the authors hope to promote autonomous learning in students, make use of their previous knowledge to create a new one, interact in virtual spaces where the game is encouraged with dynamic and motivating activities where collaborative work is promoted.

Finishing this documentary review, it is of relevance to mention a study conducted by (Cupitra García & Duque Bedoya, 2018), in which they make a reflection on the didactic resources of Augmented Reality that teachers implement in their pedagogical practices, analyzing experiences at the national level, to investigate with a pedagogical approach, the transversality of Augmented Reality in the educational context, and how it allows to propitiate innovative pedagogical experiences, which enrich the learning process of students.

5. Conclusions

Currently, there are many universities in Colombia that are investigating the use of Augmented Reality as an innovative tool suitable for strengthening the teaching and learning processes in the various disciplines that are part of their academic programs.

Augmented Reality is a technological tool whose characteristics allow the design of didactic strategies that, when applied in learning environments, awaken the interest and motivation of students to appropriate knowledge, promoting self-learning, interaction with virtual environments, activity and creativity.

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