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Increased reality: A new style of teaching in the chair of biology

[1]Ana Thalía Lucas Zambrano, [2]Esthela María San Andrés Laz

Abstract*---**Information and communication technologies have complemented, enriched and transformed *educatio**n, the potentialization of the educational process thanks to the great diversity of available resources becomes especially visible in the improvement of learning, among these resources is augmented reality, a technology designed to simplify learning processes, through the visualization and incorporation of virtual data into physical elements of reality, this form of connection between the world Real and digital content benefits learning by allowing its reinforcement through its association with reality. The objective of this research is to analyze the didactic advantages of augmented reality, as a new teaching style in the Biology chair. Its development corresponds to a qualitative research of a bibliographic type prepared, from the review of primary information from specialized magazines that served to address the different categories of Augmented Reality, the inductive method was used to infer from logical reasoning, the conclusions Of the advantages offered by Biology teaching, the analytical method served to establish the benefits in relation to learning, motivation and academic performance. Among the conclusions, it was determined that the use of this technology applied to the subject area represents the opportunity to overcome traditional teaching methodologies and develop a new learning style.

***Keywords*---**Virtual data, academic performance, motivation, digital content, augmented reality.

I. INTRODUCTION

The new Information and Communication Technologies (ICT) constitute the most far-reaching and expanding cultural and technological event in recent years (Salazar, Armas, Romero, and Maldonado, 2016), the widespread use of the internet with special impact on the Communication has altered the way in which people connect with each other, access and share information (De la Horra, 2017), in the educational context, technologies have become an element of support for the teaching-learning process, facilitating the creation of spaces hybrids of learning, rethinking traditional teaching models (Ramírez, Monroy and Vargas, 2017) and becoming a current educational setting, characterized by the virtual representation of the teaching process and the restructuring of the empirical form traditionally applied in classrooms (San Andrés, Pazmiño, Mero and Pinargote, 2019).

The Quingdao declaration in recognition of the importance of technology in education indicates that it in various ways can facilitate universal access to education, reduce learning differences, support teacher development, improve quality and relevance learning, reinforce integration, and improve the management and administration of

[1] *Pontificia Universidad Católica del Ecuador, Portoviejo, EcuadorEmail: alucas5351@pucesm.edu.ec ORCID: https://orcid.org/0000-0002-1214-3477*
[2] *Pontificia Universidad Católica del Ecuador, Portoviejo, EcuadorEmail: esanandres@pucesm.edu.ec ORCID: https://orcid.org/0000-0003-3462-8528*

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education (UNESCO, 2015). Globally, educational systems face the challenge of incorporating technology into learning processes, to provide students with the necessary tools and knowledge that modern society demands (Hernández, 2017). Countries such as Finland, Singapore and South Korea are leaders in education for the use of educational technologies, contribution to development and innovation (Palomino, 2015).

Although technology is a source of opportunities for economic growth and social development, it is also an exclusion factor for those who cannot access and access it (Márquez, Acevedo and Castro, 2016), in order to eliminate technological asymmetries in In Latin America and the Caribbean, during the last decade, action plans and policy frameworks have been developed focused on the provision of technologies to their educational systems, as a means to promote development and counteract social inequalities (Quiroga and Torrent, 2017)

In Ecuador, educational policies have been oriented towards the creation of the 2.0 school, for which processes of teacher training, provision of infrastructure and technological resources have been developed that, together with the creation of the comprehensive technology system, seek to improve digital learning and democratize the use of technologies (Ministry of Education of Ecuador, 2017). Through the digital educational agenda 2017–2021, the teaching-learning process has been promoted through innovative practices that are integrated into the digital age (Navarrete and Mendieta, 2018) and "where teachers are immersed in the application of these novel concepts to the process of teaching learning of different subjects "(San Andrés & Rodríguez, 2013, p.68).

A tool offered by ICTs and pedagogical innovation is Augmented Reality (AR), it is a subset of virtual reality that allows information to be obtained from observing an environment, captured through the camera of a device that has with specific software (Blazquez, 2017), which integrates signals captured in the real world with signals generated by a device, making them correspond in the construction of new coherent realities (Vidal, et al., 2017), which enriches cognitive experiences in the visual order and improves the quality of communication in the school context. Its introduction in education is applicable to any area of knowledge and educational stages thanks to its adaptability and versatility (Barba, Yasaca, & Manosalbas, 2015), forming part of a new learning culture that offers potential communicative, interactive, collaborative information and innovative (Rivadulla and Rodriguez, 2020), its use in the classroom contributes to the improvement of active learning processes (Cortez, 2017) and educational quality (Castel, 2018).

Its background dates back to 1992, in the process of production of Boeing 747 aircraft when Thomas Caudell (Gutierrez, Duke and Chaparro, 2018), devised a screen in RA to guide his operators. But in 2016 it was when the RA acquired global dimensions popularized through the video game "Poquemon Go," (Otegui, 2017), which exposed the advantages of the tool to capture the attention of children and adolescents, causing a large number of RA resources with versatility to adapt to different areas of learning (Cabero and Barroso, 2016). Although its methodological application poses a challenge for teachers (Fombona and Vázques, 2017),the advantages associated with its use are vast, including the digitization of the large amount of content that is available to the student with a simple click.

The benefits of the methodology have been reported at different levels of education, in primary education (Roig, Lorenzo, and Mengual, 2019), (Toledo and Sánchez, 2017), (Moreno and Leiva, 2017), as a methodological proposal for bring children closer to learning natural sciences (Marín, Muñoz and Vega, 2016), in secondary

education (Cerro and Morales, 2017), in university education (Barba, Yasaca, and Manosalbas; Vidal, Lio, and Aquilino , 2017), in teacher education and training (Cabero, Gallegos, Puentes, and Jiménez, 2018), (Barroso and Gallegos, 2016) in environmental education (Huang and Li, 2015). In relation to the study of Biology and related areas, it has been identified as an innovative methodology to learn science in a different and unconventional way (López and Perilla, 2019), focused on curriculum development in the field of Biology (Restrepo, Cuello , and Contrera, 2015) or as a methodology to achieve greater perception, interaction and learning (Rivadulla and Rodriguez, 2020).

The Biology area is one of the most complex and interesting sciences due to the scope of its contents, including RA as teaching methodologies is a valid alternative to promote student learning and motivation taking into account that it will never have the same impact on the cognitive structure of the individual, the simple description of a structure or process that is important to the observation of detailed images accompanied by an explanation. In the exposed context, the integration between technology and learning is analyzed through the application of AR in the area of Biology, the improvement of the educational experience from the complementation between physical and virtual learning to establish its benefits in the development of more dynamic, attractive and personalized teaching. Consequently, the objective of the research is to finalize the didactic advantages of augmented reality as a new teaching style in the Chair of biology.

II. MATERIALS AND METHODS

This is a qualitative bibliographical research based on evaluation and weighting (Fidias, 2016), from specialized studies on RA obtained from digital databases such as Scopus, EBSCO, Scielo, Dialnet, Redalyc, Research, CrossRef, Unesdoc, among others, which contributed to the enrichment of scientific discussion, through bibliographic methodology; The information obtained from the primary sources was collected, analyzed and interpreted (Campos, 2019), to arrive at innovative reflections on RA.

In addition, the inductive and analytical method was selected. The induction allowed to start from a logical reasoning on the different categories of the RA, to infer the benefits that the use of the tool brings to education, establish the advantages of its application in the learning of the Biology area and draw up the respective conclusions. The analytical method served to analyze the different elements that are part of the RA and establish the main causal relationships of application in the learning of the Biology area.

III. ANALYSIS AND DISCUSSION

The widespread use of technologies, especially mobile devices and computing, define new methodologies, times and training spaces in the field of education (Cabero, Gallegos, Puentes and Jiménez, 2018), their incorporation becomes a priority in pedagogical practices (Fombona and Vázques, 2017), to overcome traditional learning methodologies (Lorenzo and Scagliarini, 2018), these changes summon teachers to enable teaching-learning spaces in which knowledge is combined in a pertinent, practical and social way (Ministry of Education of Ecuador, 2016). The growing interest in ICTs, applied in the field of education (Barroso, Cabero, Leiva and López,

2016), approves the incorporation of a great diversity of tools and technological resources to improve the quality of educational processes, one of these resources. It is the RA (Lorenzo and Scagliarini, 2018), being an interactive technology that brings students closer to a collaborative knowledge culture (Martínez and Fernández, 2018), in which taking and giving information becomes an increasingly simple process (Cerro and Morales, 2017).

RA is part of emerging technologies (Martínez and Fernández, 2018), based on Bruner's pedagogical postulates, who in his Theory of Instruction describe learning as a product of categorization or processes that simplify interaction with reality (Galárraga and León, 2017) for Bruner, cognitive schemas together with interactivity are conditioning factors for learning (Martínez and Fernández, 2018) being the student's predisposition (activation, maintenance and management) essential to achieve active participation and build their knowledge through discovery learning (Galárraga and León, 2017). Discovery learning has many benefits for the student, it is innate in the human being (Bernardini, 2016), it contributes to the student learning to learn, self-motivated, encourages problem solving, develops creative, critical thinking and the generation of own concepts without detaching the significance of learning (Romero, 2017).

Progressively incorporated as part of active pedagogies, RA favors learning by discovery in the different areas, it is one of the educational technologies with more future projection (Roig, Lorenzo and Mengual, 2019), with a horizon of implementation in educational centers from three to five years (Moreno and Leiva, 2017). RA, mixes a real environment with a virtual one, allowing to interact with physical reality in real time (Vidal, et al., 2017), combines digital and physical information (López and Maquilón, 2020), integrates video and audio signals from the world real with three-dimensional objects, (Angarita, 2018) by adding through various technological supports (tablet, cell phones, computers, screens, projectors), a layer of digital information to reality (Álvarez, et al., 2017), generated by sensors that feedback the characteristics of the real world to the type of information displayed before the user, it is easy to apply in teaching, since it is possible to use the student's own devices without requiring the availability of other technologies (Saez, Sevillano, and Pascual, 2019). Figure 1 shows its application in the biology course.

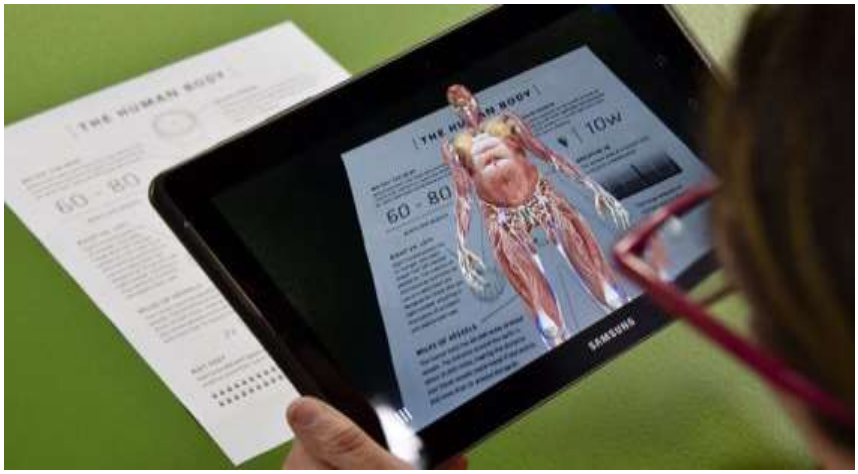

Figure 1. Example of application of RA in Biology
Source: Taken from (GlobalNet Solutions, 2019)

RA systems have three basic properties: The combination of real and virtual objects in a real environment, the alignment of real and virtual objects with each other and their execution interactively and in real time (Moreno and Leiva, 2017). The combination of virtual with real, digital information with physical information creates a new reality, allowing the construction of an amplified and enriched mixed communication environment (Moreno and Leiva, 2017), awakening great interest in students both from the technical and aesthetic point of view as well as its ease of use (Cabero and Barroso, 2018).

It presents characteristics such as interactivity in real time, ease of use, (Cabero and García, 2016) and the possibility of enriching the information presented through 3D presentations (Barroso and Gallegos, 2016), the attractiveness represented by the use of RA, is considered as its most outstanding characteristic, generator of a motivational factor that encourages the student to explore the reality of the environment in an autonomous non-linear way (Toledo and Sánchez, 2017). The objective of RA is to provide real-world objects with attributes that expand their information, to interact with them and with the added information (Álvarez, et al., 2017). The attributes increased for the user create a new enriched virtual reality (Cabero, 2016), the coexistence of virtual objects and real environments enables experimentation with phenomena that are not possible in the real world (Saez, Sevillano, & Pascual, 2019) offering opportunity to move to different training contexts outside of traditional settings (Cabero and Barroso, 2018).

For the production and observation of objects in RA, the following is required: A device to capture the image of reality observed by the user, process it by interpreting the information, and project the mixture of the real images with the synthesized ones. A software for program production. An activator of augmented reality or markers (QR Codes, physical objects, GPS), content server where the virtual information that you want to incorporate into reality is located (Cabero and Barroso, 2016). Figure 2 shows the components of the RA.

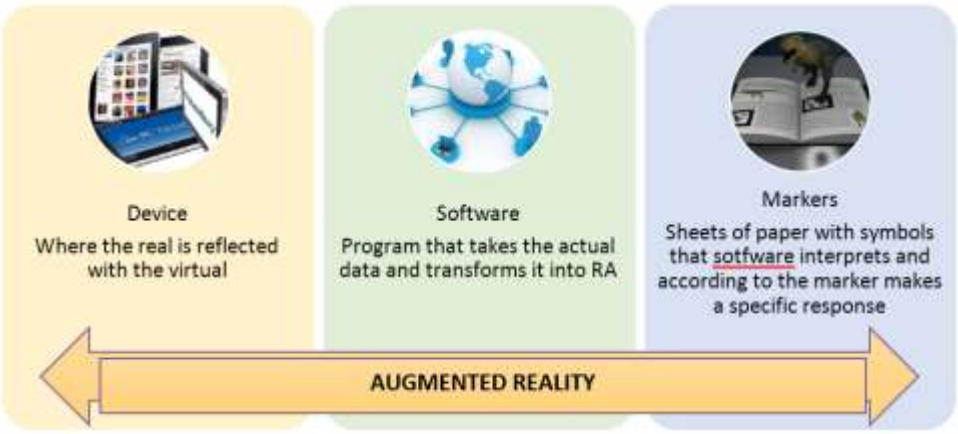

Figure 2. Components of Augmented Reality

Source: Own elaboration based on information from: (Cabero & Barroso, 2018)

As for the types of RA, these can be of three classes: Based on markers, usually QR code, which consists of an image with characteristics in which the virtual content displayed through a device that overlaps is superimposed.

follow the physical image; Based on geolocation through a GPS, it allows locating the user and superimposing information on the coordinates established in the software; increased vision in which the monitor or displays of the device are switched to light and transparent displays such as glasses (Restrepo, Cuello, & Contrera, 2015).

The incidence of AR, is increasingly notable in education, along with mobile technology is one of the most effective pairs to support ubiquitous and significant learning processes (Cabero and Barroso, 2018), is the origin of a verbose e intense line of work, in which the student training process becomes highly effective and unlimited (Lorenzo and Scagliarini, 2018). The RA, serves for students to activate their participation in the exploratory process to achieve knowledge and strengthen learning (Galárraga and León, 2017), simplifies the process of acquiring knowledge (Toledo and Sánchez, 2017), by approaching it in a simple way , playful and formative to the curricular contents, helps to understand complex concepts through the decomposition and analysis of each of its parts, achieving the capture from various angles of learning (Barroso and Gallegos, 2016).

It favors attention and motivation (Toledo and Sánchez, 2017), the development of competences linked to autonomy, group work, self-confidence and motivation (Ausín, Abella, Delgado, and Hortiguela, 2016), creating more attractive learning spaces, interactive, active, constructivist and informal. (Fernandez,2017), but its main advantage is associated with the significant improvement of the content acquisition process and therefore acadmic performance and learning (Toledo and Sánchez, 2017).

RA, applied in biology teaching, allows teachers to strengthen students' meaningful and collaborative learning by prioritizing relevant information and eliminating information that affects the learning process, enriching information from reality, making it more attractive and understandable. so that the appropriation of content is facilitated, create conditions for an object to be observed from different points of view and criteria, enhance ubiquitous learning, create safe artificial scenarios in which the student can explore a topic in depth, enrich materials with information additional in different supports, generally providing a large amount of information in digital format (Barroso and Gallegos, 2016), which supports the significant learning of students. RA with internet links allows objects to be recognized by the device and instantly compared to patterns or references on the Internet, allowing access to an unlimited amount of information (Fombona and Vázques, 2017). Finally, it must be specified that AR is a technology that still has many areas to develop and improve, its inclusion and use in education being a priority given the continuous development that it presents as cutting-edge technology (Angarita, 2018).

IV. CONCLUSIONS

Trends suggest the need to incorporate new technologies and innovative educational practices in the educational process, making it a priority to take advantage of the widespread use and high penetration of digital devices for the application of AR, a tool that positively impacts the teaching process learning especially learning by discovery, creativity, motivation, academic performance, development of interactive perception abilities and geographic-spatial conception and the technological competences of both teachers and students. The use of AR, is viable in all stages of teaching and learning areas that promote discovery knowledge, provides basic conditions for the student to independently explore content and delve into those that seem most attractive and interesting. In the

area of biology, RA represents the opportunity to simplify learning processes, overcome the application of traditional teaching methodologies, and take advantage of the diversity of existing applications to develop a new learning style.

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