

## Augmented And Virtual Reality For The Strengthening Of Education In The Marina Museum Park

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### Abstract

*Within the effects of the post-pandemic, museums face difficult challenges, which include the increase in tourists and, with it, the diversification of the types of audiences. Therefore, new strategies must be generated for the dissemination and promotion of their national and cultural heritage. Thus, the objective of this document is to present the benefits of a proposed technological solution for conducting tours in the Marine Corps Museum Park, using View 360 technology and Augmented Reality based on recognition. The methodology is basic, with descriptive scope. As results, technologies that integrate multiple realities are proposed. It is concluded that this proposal lays the foundations of behaviorist and constructivist pedagogical currents, which improve apprehension in the museum context, according to the authors consulted.*

**Keywords:** *Cultural Heritage, Augmented Reality, Reality, Tourism, Behaviorism, Constructivism.*

### 1. Introduction

In the 1950s, technology was considered a privilege that only a few could enjoy. This is because, firstly, it was not easily accessible and affordable to all people; and second, the use

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given to it was limited, since to use it people had to be experts in the areas of computer science and mathematical sciences, given its complexity. However, in the last two decades, humans have increased its use, which has allowed technological development and advancement to take giant steps towards all the sectors in which the world operates (De la Vega, 2018). The technological tools that existed in the past fulfilled very specific functions outlined only in the sectors of industry, academia and the military, but little by little they were introduced into the daily lives and everyday lives of people, and currently it is essential to make use of them. these 24 hours a day, that is, it went from being a privilege to a facilitator in the development of the processes that human beings carry out constantly, to such an extent that the individual who does not have skills and abilities in the use of these is considered technologically illiterate in the 21st century (Del Cerro and Morales, 2017). Currently, technology is applied to various sectors of knowledge such as medicine, education, the military, museums, entertainment, leisure among other sectors and are fundamental pillars in the development of research because they optimize the activities carried out in terms of time and costs. There is a great diversity of technologies that are integrated today and have been provided to the public, called emerging and convergent technologies belonging to industry 4.0, which aim at digital transformation (De la Vega, 2018).

Among the technologies framed in industry 4.0 are Augmented Reality (AR), Virtual Reality (VR) and Mixed Reality (MR), also known as multiple realities, which have the property of representing information in an attractive and interactive way. standing out for their applicability in different social areas and that little by little they have become necessary tools to better understand the reality that surrounds us, facilitating the way in which it is perceived, understood and applied to any context that desired (Torres, Linares, and Martínez, 2019).

Multiple realities currently represent a powerful tool that has demonstrated versatility in a wide range of applications in various fields of knowledge. One of them is the field of education, where great possibilities have been found for the dissemination and presentation of knowledge content in an interactive and educational way at the same time (Otegui, 2017).

AR, VR and MR are increasingly popular as, in many domestic and industrial applications, much of the available information relates to real-world objects. RA integrate digital content with objects from the real world, enriching the context in which the user operates without losing the notion of what surrounds him, among the multiple realities due to the rise in the use of mobile devices, it is considered the most economical reality of implement among the three, because it only requires the use of a digital camera and a display. VR introduces the user into a non-existent world, making the user lose track of the context that surrounds them, different input and output peripherals are needed for use, it is the most expensive reality. RM is the reality that integrates the best of the two previously mentioned, allowing the user not to lose the notion of what surrounds them but at the same time interacts with digital information.

In education, emerging technologies are disrupting the hegemony of students and teachers, turning everyone into educators and learners. Given this, educational institutions have proposed teaching using new technologies. Converting learning scenarios from serious scenarios to playful, interactive and didactic scenarios, in addition to guaranteeing students the right to quality education to be competent individuals in a multi-connected society (Chávez, 2019).

One of the challenges that education currently has is to promote interest in knowledge of cultural heritage in the museum field. Today it is found that national museums face constant indifference, forgetfulness, lack of awareness and sense of belonging of people before the value of historical heritage. Heritage must be preserved for new generations so that they know the cultural legacy from which they come. This is where technological advances play a

fundamental role, this is because they have allowed themselves to benefit from multiple realities to the extent that they offer access through devices commonly used by the majority of users, who are the standard bearers of the education binomial, and in that sense they position AR and VR as technologies that have the potential to contribute to teaching and improve the learning experience of students, who seek and are motivated to learn and experiment through media. alternatives (Lobo, Santoyo and Briceño, 2018).

Regarding the Marine Corps Museum Park, it is a young museum that has been open for around 8 years. This was created with the purpose of teaching the history of the Colombian Marine Infantry. Until 2019, before the pandemic, it was considered one of the tourist sites in Coveñas visited by excursions from basic and secondary educational institutions in Colombia, thanks to the historical legacy that this place has. Offering its visitors education on the topics of the Colombian marine infantry from the time of independence to the current date, making use of cultural, educational, technological, recreational and ecological spaces, to clearly publicize the different stages of this military force.

The directors of the museum express the importance of being able to reach all basic and secondary education institutions, both official and private, so that they know and take ownership of military history, specifically of the country's navy and the Caribbean Region. In addition, the importance of being able to innovate while guaranteeing the autonomy of tourists when taking tours within the museum facilities. Among the technologies proposed to generate possible technological solutions, View 360 technology and Augmented Reality based on recognition are selected, which allows applying a teaching program based on a constructivist and behavioral approach in learning the cultural heritage of a part of the Colombian militia, these pedagogical currents are those framed within the marine infantry training school.

### **1.1 Augmented Reality (AR)**

Augmented Reality (AR) is an emerging technology that has been widely accepted by users of digital content in the 21st century, due to its attractiveness of integrating virtual content with the real world in different proportions. Among the most widely accepted content are 3D models, videos, images and text. Due to its characteristics, the Augmented Reality system enriches spaces such as classrooms, museums, open spaces, points of interest in tourist aspects, among others. This leads to more and more developers and companies aiming to develop new and better ways to exchange and manipulate multimedia content (Lobo et al., 2018).

For (Martínez and Hernández 2015), augmented reality is based on a technology that integrates components of technological devices to create a vision enriched with virtual elements of real scenarios. The devices add these elements in real time, thus creating a rich view through the device. Therefore, AR consists of superimposing a layer of virtual content on the image of the real world, in a way that complements it with additional information. In order to know where to overlay virtual content, marker recognition can be used.

### **1.2 Virtual Reality (VR)**

There are two types of virtual reality, depending on the hardware used: desktop virtual reality and full virtual reality. In the first, the virtual environment is displayed on a computer screen and participants can interact with it using special devices, such as a mouse for 3D navigation, data gloves, positioning sensors, among other event detection elements. This means that the immersion (the psychological effect of feeling 'inside' the virtual environment) that the material creates is limited. In the second, fully immersive virtual reality, the user uses a helmet or a virtual reality device that covers the viewing angle where the virtual environment is displayed, using motion sensors and data gloves. This device allows the user to produce a high degree of

immersion, as long as the instrument is applied and calibrated correctly, otherwise the user may experience side effects, such as dizziness or disorientation (Duque, 2018).

### **1.3 Augmented Reality and Virtual Reality in Education**

Educational technology (teaching techniques, learning methods, instructional design...) is the tool that teachers have at their disposal to design effective learning environments using ICT. Any effort to develop educational materials must consider the technology and educational media that will be used.

This ability to combine the real and virtual worlds offers great possibilities in the field of education, as demonstrated by the experiences carried out in different research.

One of the most frequent experiments is based on the metaphor of the reinforcement book, which is widely used in applications related to the educational environment. As a result, the encoding of the words is printed on one of the pages, allowing access to additional information through 3D graphics, and displaying the virtual characters that appear on the pages of the book through the viewer (Escartín, 1999).

### **1.4 Behavioral Approach in Teaching using VR and AR**

When we talk about behaviorism in teaching, it is understood that the objective of the activity is to study and analyze the relationships and principles that govern environmental events, and the behavior of living organisms so that, once identified, the behaviors can be described, predictions and control that can be achieved objectively. In principle, the environment determines the behavior of the organism, it learns from it and depends on the disposition of the environment, that is, on the random conditions and the relationship between the previous or subsequent stimuli and the behavior of the subject and, therefore, At a given moment, the external conditions of the subject or learner can be arranged to change their behavior. Therefore, establishing a virtual environment with AR and VR or any device modifies the behavior of anyone who encounters them in a much more efficient way than what a teacher can do in class (Izurieta, 2017).

Behaviorism finds in emerging technologies, specifically AR and VR, a very useful tool to reinvent itself since it has a bidirectional relationship with the activities carried out in daily life and that are influenced by the environment. In fact, the behavioral propensity is easily reproduced with the use of certain programs and the prudent use of technology. The development of computer programs with virtual reality simulate events or phenomena that are exposed within the different scenarios shown in museums, thus facilitating remote two-way communication by end users and, therefore, greatly improving the apprehension of knowledge, due to the motivation it generates in the user, providing a more dynamic exercise and thus modifies their behavior, making them more open towards the acquisition of learning.

### **1.5 The Foundation of Constructivism to strengthen Behaviorism applied with AR and VR**

Constructivism is an educational philosophy that states that the student eventually constructs his or her own knowledge, and that knowledge eventually becomes part of him, so that everyone's knowledge is as unique as he or she is (Ballén, 2020). Furthermore, the essence of constructivism is that the individual as his own construction is created through the interaction of his internal situations with his environment and the idea that cognitive consciousness is not a copy of reality but a work that no one creates (Sánchez, 2015).

Virtual and Augmented Reality allow the realistic simulation of an interactive environment and in ways that go beyond the real environment, as they recognize abstract entities that would

otherwise have no representation. Virtual Reality technology is suitable for communicating abstract and difficult concepts thanks to its visualization capabilities. In this way, VR/AR allows you to control what is imagined, which is not possible in a real environment (Lobo et al., 2018).

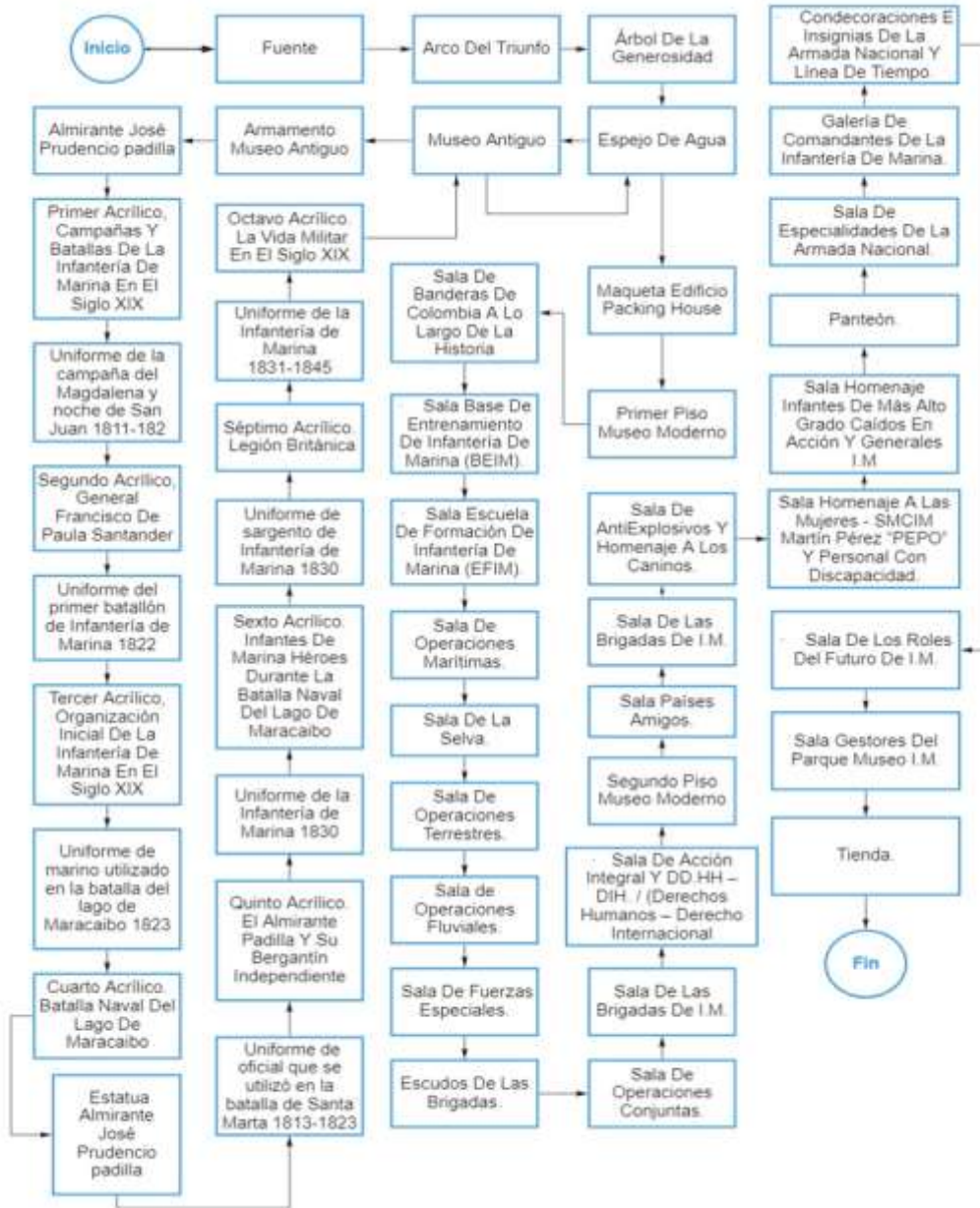
Likewise, the psychological processes that are stimulated in immersive Virtual Reality are very similar to the psychological processes that operate when a person acquires knowledge through objects and events in the real world, since the virtual environment is not supported by symbols, it is a immersive virtual reality state that allows students to learn concepts and solve problems in a non-symbolic way, a virtual world that allows knowledge to be built on direct experience, not on the basis of a description of the experience (Romero, 2020).

## **2. Results and Discussion**

The results of this study can be defined as the results of various investigations in charge of improving education for the benefit of educational institutions, and it must be understood the importance of implementing technological innovations in the current teaching process in the museum context of the Marine Corps Park.

Virtual Reality and Augmented Reality can be integrated into the learning system, if teachers are trained in the various uses and management of virtual headsets and the benefits they will bring to education, and it should be noted that training must be both theoretical as a practice in the effective use of technological equipment (Almenara Olivencia, Martínez, Osuna, and Meneses 2016). Teaching and learning systems must make systemic changes so that their learning programs allow them to complement the various AR and VR experiences currently in use (Hincapié, 2020). Furthermore, involving government organizations responsible for education, since precise funding is required, digital devices can be purchased to implement projects for students (Lobo et al., 2018).

Likewise, developing guide plans to implement Augmented and Virtual Reality in education will accelerate student learning, demonstrating that technology is a powerful tool as long as it is used correctly and with a positive purpose (García, Lengua and Flórez, 2017). Within the present research, Figure 1 shows the proposal of a software prototype with 360 vision to integrate the use of virtual reality and allow remote tourists to take virtual tours within the facilities of the Marine Infantry Museum Park (Herranz, Caerols and Sidorenko, 2019).

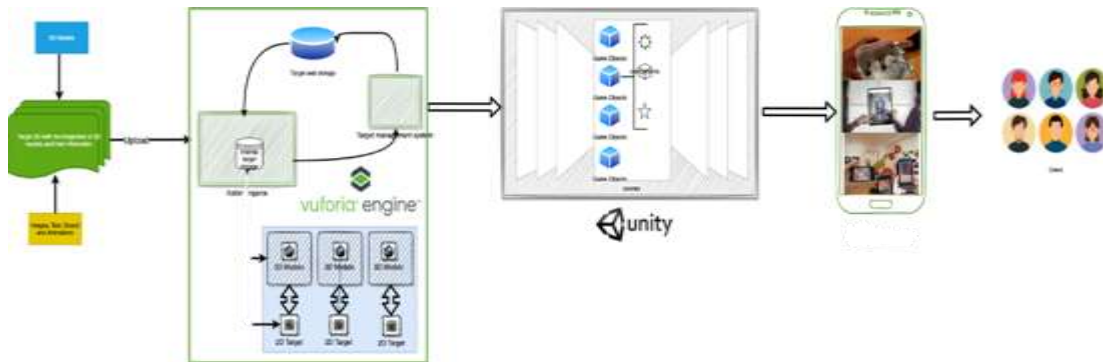


Source: Authors of the research

Figure I. Mapping of the Virtual Tour with 360 Vision

This tool integrates each of the heritages of the marine infantry museum park, both ancient and modern, and is presented in a sequential way so that the remote tourist can recognize the important aspects of the museum. However, it also has hyperlink points that allow you to jump from one heritage to another, providing flexibility in the museum's route. It should be noted that this web platform will grant basic and secondary education institutions in Colombia the possibility of being used as a tool or educational resource for the subjects associated with the areas of social sciences, specifically the subjects of history, contributing not only as a tool used in the hours of student support, but also as an important tool in the independent hours.

Regarding the application of augmented reality through recognition, for the autonomy of in-person tourists on tours within the museum facilities, Figure 2 shows the design..



**Source:** Authors of the research

### Figure II. Augmented Reality Diagram with Recognition

En la figura anterior, se detalla un diagrama de bloque el cual ilustra las tecnologías que actuarían para la realización de un prototipo software con uso de realidad aumentada como apoyo en los recorridos del museo, entre las herramientas se tiene Unity, gestor de desarrollo de software multiplataforma el cual permite integrar tecnologías como SDK de Android y SDK de Vuforia, además de la integración de contenidos digitales multimedia, facilitando el desarrollo de esta herramienta. Por otra parte, el aplicativo tendrá una base de datos elaborada en Vuforia, para el reconocimiento de imágenes o target 2D necesarios para poder disparar el evento de mostrar los contenidos digitales por medio del uso de una cámara digital para la captura de la imagen a reconocer y un display para mostrar los datos o información superpuesta en el escenario real. Este aplicativo propuesto permitirá a los turistas realizar un recorrido autónomo por las instalaciones del museo revisando los contenidos de interés para cada uno de ellos y apoyando en esfuerzos al personal del museo en desgaste físico y de habla.

### 3. Conclusions

Although Augmented Reality and Virtual Reality are mostly unknown to the public, recent years have been crucial to enter the current social panorama in which the educational environment occupies a prominent place. Here they are used as communication and content dissemination tools, where a playful and rational approach prevails, which is very attractive.

Although this technology exists and the means to adapt it can be obtained, no significant effort has been made to undertake small innovative projects related to the use of Augmented and Virtual Reality in education facilities to contribute to learning. Virtual Reality and Augmented Reality is a technological tool with great potential to simulate situations in different areas of the real world, especially in the educational field, whose characteristics are first-person learning and non-symbolic interaction, which greatly helps the teaching/learning process.

It is essential to deliver projects aimed at involving teachers, at the primary, secondary and higher levels, who can immerse their students in immersive virtual reality processes, thus improving the final experience and instilling a standard that is “more real” than what manipulated in the physical world. Virtual reality has the advantage of being a tool that stimulates the user's senses, being accepted for the teaching/learning process. However, software applications must also consider teaching techniques and instruments, instructional

objectives and learning styles to develop applications that are student-centered and not just content-centered.

Regarding the comparison between AR and VR, it could be concluded that the two interfaces would go hand in hand in a purely technical career, but AR would probably be the least expensive, especially due to its universality. This is due to their use for mobile devices, which is very important given how ingrained they are in our lifestyle and their integration into the educational field would be easier.

Likewise, approaching knowledge with a new perspective, in which the diversity of explanatory discourses prevails, has its advantages. The most important task from the teacher's point of view in relation to Augmented and Virtual Reality will be to communicate the needs that these educational environments represent, so that the tools provided by new technologies allow access to a greater variety. and diversity of knowledge.

Finally, the proposed applications have great acceptance by those in charge of the marine infantry museum, in addition to being viable to build in a short term in order to enhance and strengthen the main mission of the museums, which is to disseminate and safeguard heritage, the latter technology allows the power to transform existing information in physical media into digital media, making it portable and more durable over time.

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