# Study of augmented reality for the development of learning at the primary education level

Maryori Dayana Flores Ventes[1] [0000-0002-9737-7597], Alex Leonardo Quispe Matta[2] [0000-0002-3892-6330], Edwin Abel Cabana Palomino[3] [0000-0002-6820-4101], José Antonio Ogosi Auqui[4] [0000-0002-4708-610X] and Jorge Cano Chuqui[5] [0000-0003-4809-6008]

[1] Universidad Privada San Juan Bautista, Ica, Peru, maryori.flores@upsjb.edu.pe
[2] Universidad Privada San Juan Bautista, Ica, Peru, alexl.quispe@upsjb.edu.pe
[3] Universidad Privada San Juan Bautista, Ica, Peru, edwin.cabana@upsjb.edu.pe
[4] Universidad Privada San Juan Bautista, Lima, Perú, jose.ogosi@upsjb.edu.pe
[5] Universidad Privada César Vallejo, Lima, Perú, ccanochu@ucvvirtual.edu.pe

**Abstract.** Augmented Reality is a technology that has appeared in recent years, having a significant impact on the lives of many people.

**Keywords:** Augmented Reality, implementation, efficiency, education, technology.

## 1 Introduction

Over time we can imagine a magnitude of important changes in the area of education, in this case we will take into consideration primary education and the impact that the use of augmented reality will have. On the other hand, we are aware that augmented reality is well known because it provides many practical aspects that allow us to see and use images that help improve or enhance training and motivating the student to awaken their interest, curiosity and notions of the aspects of technology that is augmented reality.

This new concept requires that the development of mobile devices and other technologies be adapted to support the technology and adapt to the implementation of educational applications with augmented reality, providing transparency on acceptable terms for useful use by students. In the opinion of [1], the development that Information and Communication Technologies (hereinafter ICT) have experienced on the one hand and their intertwining with educational action on the other, have precipitated that their presence in the classrooms and in the academic life of students and teachers are necessarily imbued with them.

Therefore, this research article has the mission of studying the use of AR in primary education, taking as references scientific articles that help guide and enrich the information for the correct development of research.

All the information taken to carry out the article, will have the purpose of showing if the support of ar in the educational area, specifically at the primary level, has a positive influence.

## 2 Materials and Methods

The methodology implemented in this research is qualitative, because it is based on a theoretical analysis in relation to the topic of AR and also because its sample is minimal. In such a way that scientific articles from indexed journals from 2012 to the present were analyzed.

The analytical method will be carried out since it is important to understand the teaching methods of teachers, analyzing the actions they perform in their field of work.

Following the research pattern, we will take as a reference a place of primary study called "The student" - Ingenio, for which we will have a student body of 30 (boys and girls), and we will measure the performance of each student with respect to AR.

### 2.1 Selection criteria of the sample or subjects of the study

Research subjects were selected under the following criteria:

**Selection of students**

1. Active primary school students.
2. Age range from 6 to 10 years.
3. Gender: indistinct.
4. Ethnic roots: indistinct.
5. Language: Spanish, whether as a mother tongue or second language (intermediate domain of Spanish).
6. Special educational needs: indistinct.

**Selection of teachers.**

1. Active teacher in front of a group of students.
2. Teaching experience: three years of seniority or more and knowledge of ICT.
3. Gender: indistinct
4. Ethnic roots: indistinct.
5. Language: Spanish, whether as a mother tongue or second language (intermediate domain of Spanish).
6. Education: Master in Primary Education.

### 2.2 Description of the data collection tools used

The instruments used to visualize the interaction between students and augmented reality were applications such as:

- Chromeville Science: This app is about science-related drawings that you have to color. The focused course is Science and Technology.
- Explore the World: This tool allows you to visualize animals of various species, it comes to focus on the area of Social Sciences.
- Quiver: This tool encourages creativity; is focused on the area or course of Art and Culture.

### 2.3 Validation of the instruments used

The instruments mentioned above have been evaluated with respect to the academic degree of primary level and its scope in the development in the realization of RA.

### 2.4 Data information

In this aspect, we mention the databases that were used for information queries, in reference to the theme of Augmented Reality.

**Table 1.** The following table shows the following indexed information sources.

| Database | Augmented reality | Augmented Reality in Education | Augmented reality |
|---|---|---|---|
| Scopus | 3031 | 12301 | 437 |
| EbscoHost | 6956 | 109 | 157 |
| Alicia Concytec | 27 | 4 | 31 |
| Google Scholar | 55800 | 18600 | 1070 |

Source: Authors' own elaboration of reference database of scientific articles.

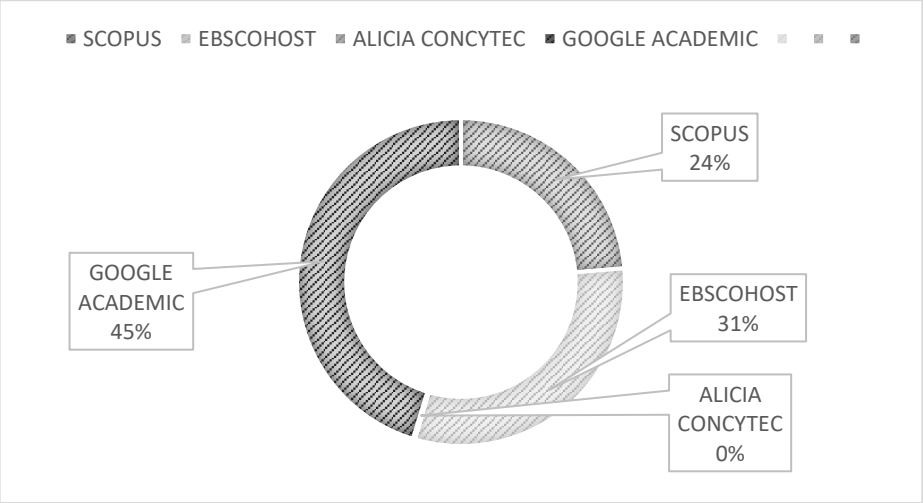


**Fig. 1.** The following graph shows the following indexed information sources, expressed in a pie chart of data corresponding to the Augmented Reality column.

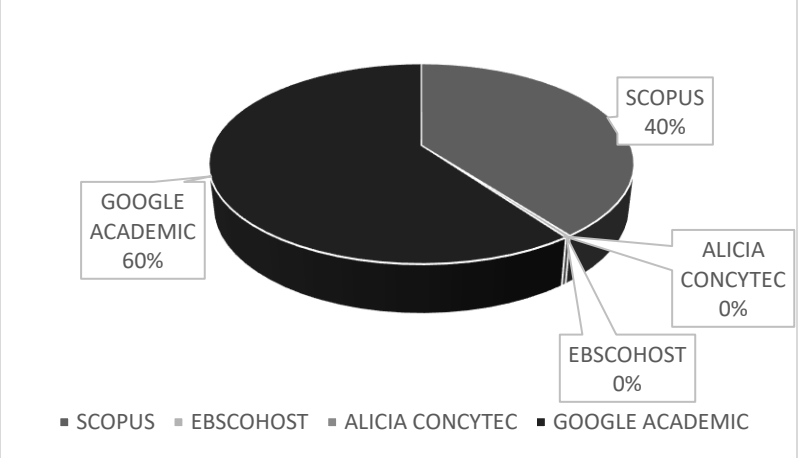


**Fig. 2.** The following graph shows the following indexed information sources, expressed in a pie chart of data corresponding to the Augmented Reality in Education column.

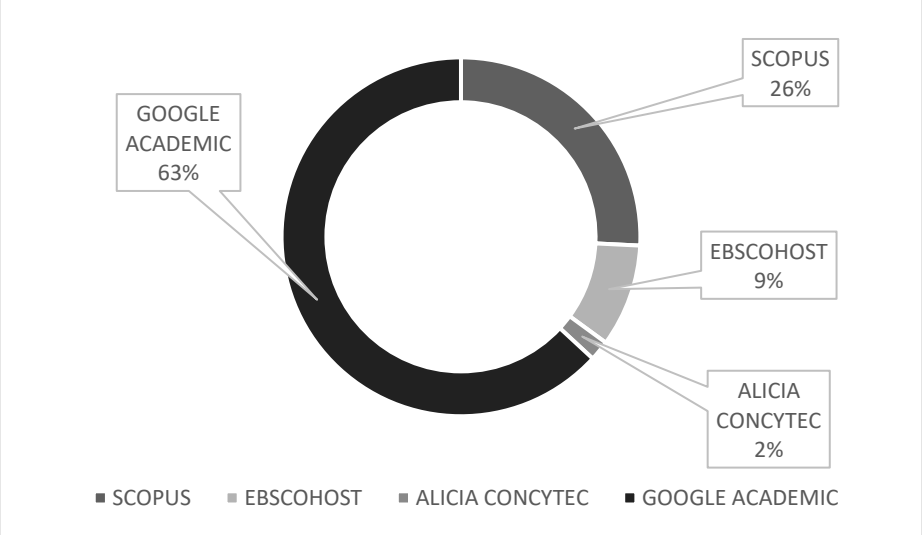


**Fig. 3.** The following table mentions some programs that are used for educational media, as well as experimental in areas of Marketing.

**Table 2.** The following table mentions some programs that are used for educational media, as well as experimental in areas of Marketing.

| Software | Description | Usefulness | User Design |
|---|---|---|---|
| LearnAR: | Allows you to manage through a WebCam and assemble 3D images through visual code | visual teaching for chemical materials, bones of the human body, etc. | Paid version and Free Software |
| iSkull AR | It allows to observe a very realistic skull, where its different parts are indicated through colors | used in marketing, education, books, press, etc. | Paid version and Free Software |
| AR Experience | Software to improve your product or brand through augmented reality | It is used for Marketing with a navigation interface, a video, an interactive 3D element or any multimedia element from the mobile device. | Paid version and Free Software |
| Aumentaty Author | It has fixed markers that can be associated with models available | 3D models can be rotated through the movement of the marker or through | Paid version and Free Software |

| | | | |
|---|---|---|---|
| | in Ampliaty or imported. | a menu that allows rotation, translation or scaling operations, among others. | |

Source: Authors ' own elaboration with reference to indexed databases.

# 3 Results

## 3.1 Phase 1: Survey and interview of elementary school students

It begins with the visit to the Educational Center of Ingenio in order to survey the students of the degree mentioned above, for this reason the AR system in the different areas of primary education is taken into account.

Mainly the category of the teacher was taken into account and how he took advantage of the teaching of his subjects to the students, in this way to observe who comes to have a greater interest in AR.

They asked a series of questions to the respondents and according to this information was obtained from their level of understanding and familiarity towards this new technological trend.

## 3.2 Phase 02: Analysis of the results

In this phase it was studied how the technology of the AR aroused the interest in the students to assimilate in a better way the teachings made in classes.

The results point to a greater use of teaching strategies, for this we will show a graph that allows us to interpret the improvements with the use of AR

To carry out the survey, we will support ourselves with the following finite population formula of probabilistic sampling that will make it easier for us to calculate our population

$$n_0 = \frac{Z^2.N.P.Q}{Z^2.P.Q + (N-1).E^2}$$

The following values shall be taken into consideration for each variable:
Z = 1.96
N = 30
P = 0.5
Q = 0.5
E = 0.05
The sample obtained is as follows:
n = 28

Where 28 is the number of students who will choose which course to apply more Augmented Reality.

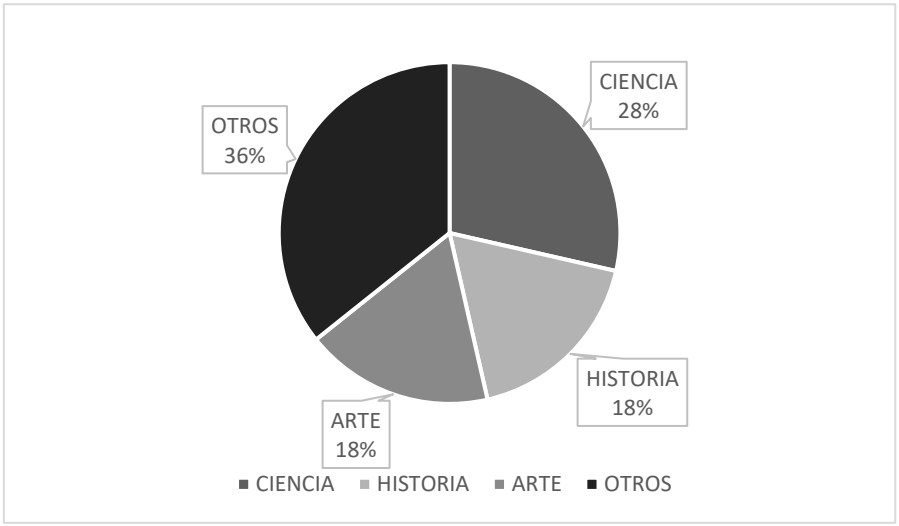


**Fig. 4.** Manifestation of the development of RA in these areas taken into account.

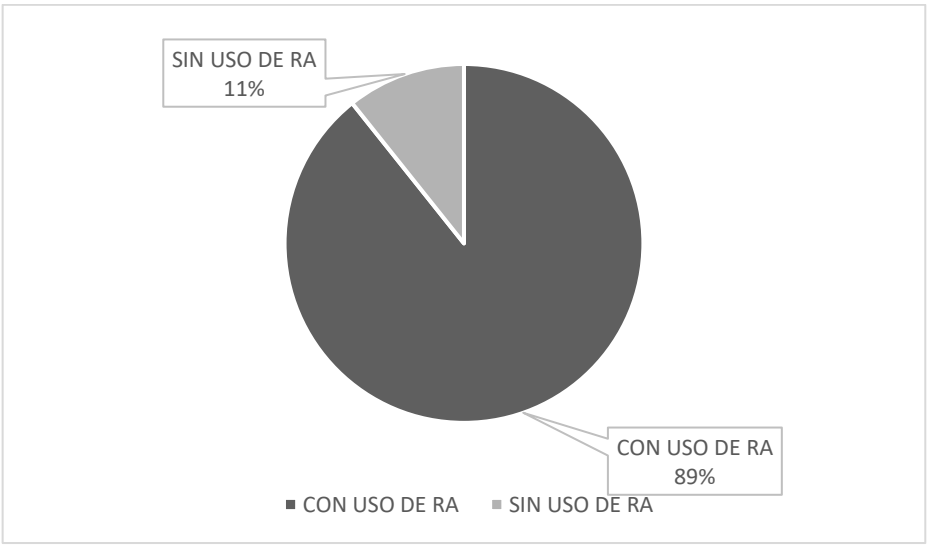


**Fig. 5.** Consideration of the usefulness of implementing a tool such as AR in education

## 4 Conclusion

Taking reference to the review carried out it can be concluded that the use of this technology shows many advances and impulses in areas such as education, medicine, physics, etc. It is important for the users of this technology, to advance towards an improvement of results, thus generating projections that awaken notions of learning or desire to want to discover more every day. At the pace with which technology advances, other methods will be discovered to include in teaching and this will only be the beginning for an educational improvement.

## References


1. E. Berumen López, S. Acevedo Sandoval and S. Reveles Gamboa, Augmented reality as a didactic technique in the teaching of calculus topics in higher education., Jerez : Ride, 2021.
2. B. Díaz Campos, Augmented Reality in Education, Salvador: CAMJOL, 2016.
3. B. Rivas Rebaque, F. Gértrudix Barrio and M. Gértrudix-Barrio, Systematic analysis on the use of Augmented Reality in Early Childhood Education., Spain: Edutec, 2021.
4. D. Velasquez Tunjano and M. Rodriguez Santana, Implementation of virtual reality and augmented reality in medical education: narrative review of literature, Bogotá: El Bosque, 2020.
5. Sosa Jiménez, López Martínez and Aguilar Vera, Intervention of Augmented Reality Technology in Education: A Systematic Review of the Literature, Mexico: CONAIC, 2020.
6. B. Rodríguez Caldera, Augmented Reality in Primary Education: Systematic Review, Spain: Edutec, 2021.
7. C. Prendes Espinosa, Augmented reality and education: analysis of practical experiences, Seville: Pixel Bit, 2015.
8. S. Gómez Jaramillo, W. Rendón Franco and J. Monsalve Sánchez, Systematic review of augmented reality literature applied in education, Antioquia: TDEA, 2020.
9. J.M. Romero Rodríguez, Mobile Virtual Reality Technology in Education: A Review of the State of Scientific Literature in Spain, Granada: UcoPress, 2018.
10. M. González Zamar and E. Abad Segura, Augmented Reality as a creative resource in education, Spain: DialNet, 2020.
11. M. Vidal Ledo, B. Lío Alonso, A. Santiago Garrido, A. Muñoz Hernández, . I. d. R. Morales Suárez and . A.M. Toledo Fernández, Augmented Reality, Havana: EMS, 2017.
12. C. Mesquida Jerez and A. Pérez, Estudio de las Apps de realidad aumentada para su uso en campos de aprendizaje en un entorno natural, Islas Baleares: Electrónica de Tecnología Educativa, 2017.
13. J. Otegui Castillo, Virtual reality and augmented reality, Basque: Business Management and Administration, 2017.
14. G. A. Céspedes de los Ríos, B. Valencia Suárez and S. Santacruz Pareja, Augmented reality as a tool in the teaching-learning of Basic geometry, Bogotá: Panorama, 2012.
15. J. De la Torre Cantero, N. Martin Dorta, J. L. Saorín Pérez, C. Carbonell Carrera and M. Contero González, Ubiquitous learning environment with augmented reality and tablets to stimulate the understanding of three-dimensional space, San Cristobal: RED, 2012.
16. V. Marín Díaz and B. E. Sampedro Requena, Augmented Reality in Primary Education from the vision of students, Quito: Alteridad, 2020.

17. M. Abasolo, W. Gavilanes and B. Cuji, Summary of reviews on Augmented Reality in Education, Valencia: Spaces, 2017.
18. F. Montecé Mosquera, A. Verdesoto Arguello, C. Montecé Mosquera and C. Caicedo Camposano, Impacto de la Realidad Aumentada en la Educación del Siglo XXI, Babahoyo: European Scientific Journal, 2017.
19. M. A. Vincenzi, Augmented Reality in Education., La Plata: UNLP, 2019.
20. . J. G. López Hernández, G. A. López Morteo and A.C. Justo López , Augmented reality as a didactic alternative in public schools in rural and semi-urban areas of San Quintín and Mexicali, Mexico, Mexicali: ITM, 2021.