Use of Augmented Reality to Articulate Grapheme and Phoneme in the Literacy Process

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Abstract

In the first years of schooling there are difficulties in reading and writing, these problems lead to poor academic performance and school dropout. The objective of this research is that children strengthen their learning in a more attractive, playful and innovative way, developing in the different evaluations applied by the Ministry of Education. Our work proposal is to make use of the LEAR application with Augmented Reality (AR) through interactive activities using 3D objects being this tool used to a greater extent in these years. The research is of pre-experimental cut, for data collection a preliminary evaluation was applied to 120 students, the results obtained were analyzed with the t student statistic that shows that there is a difference between the evaluations taken in the pre-test and post-test, where the 60% that were in low reading level was reduced to 8.3% and the 54.2% in writing that were in difficulty was reduced to 6.7%, revealing that the post-test is more evolutionary by the difference in averages. Demonstrating that the use of reality increases improves the levels of literacy in a positive and significant way in first grade students.

Keywords

Augmented Reality, Reading, writing, M-Learning

1. Introduction

In the first years of schooling, the most frequent learning problems that Peru is causing in education is the difficulty in the processes of acquisition of reading and writing in the first years of schooling of students between 6 and 7 years of age, therefore, it is essential to intervene in time as this will affect their academic performance and lead to school failure. In the educational field, the development and learning of reading and writing represents an essential tool to achieve an adequate social integration and access to the world of technology [1]. Therefore, reading and writing is a complex activity for the progress of infants being necessary to reach new knowledge, since through these they will build meanings [2], that is why in schools they play an essential role for the continuous development of reading skills such as the progress of writing, which has its origin in the first years of life of an individual and the good reader is improving his skills [3], to develop these skills we need to transform our educational reality, knowing that the teacher is one of the key actors in the process of training and development of communicative skills, performing an accompaniment and monitoring of their learning [4]. According to the report of the Ministry of Education of 2019 through the Censal Evaluation of Students (ECE) in both public and private institutions of Peru, show that in the process level there are 58.6 %, however in the satisfactory level we see that they have reached only 37.6 %, therefore it is necessary to give priority to those who are in the process level since they present difficulties that must be solved in the first years of schooling.
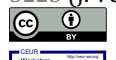
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Our proposal wishes to strengthen and develop reading and writing in first grade students with the use of Augmented Reality as an educational resource with the LEAR application, with the objective of educating the child to be competent in life by integrating new pedagogical strategies with the use of technologies that integrate new functionalities generating skills through a constructive practice by applying interactive and sound activities to strengthen Phonological Awareness since research has identified this as one of the main causes of reading difficulties, since students with good Phonological awareness are in an excellent position to become good readers [5]. Empowering learning for the benefit of the child and improving their school performance.

2. State of the Art

The AHA (ADHD-Augmented) project focused on helping underachieving children throughout their school life with digital technology intervention in children's literacy skills by enhancing an existing literacy program with AR functionality. This pilot study involved 117 Irish children and this research has demonstrated that augmented reality (AR) can improve academic outcomes and improve reading and spelling skills by stimulating students' attention. The AHA project aimed to implement an evidence based intervention to improve the reading and spelling skills of children with ADHD. This literacy program in its preliminary reports of the pilot study and its effectiveness of the AHA system in promoting literacy skill acquisition with ADHD children compared to the usual literacy program. The design and intervention methodology of the AHA project is also described where preliminary results have shown that the AHA project has succeeded in providing an AR solution within an existing online literacy program, which integrates a set of specific technologies and supports interactive educational content, services, assessment and feedback. Means and standard deviations, medians and ranges calculated by group (WWL vs. WWL-AR) were calculated for the total scores on the questionnaires completed by the children. In relation to the aim of the study, a series of Mann-Whitney U tests were used to assess differences between the WWL and WWL-AR conditions, in students' performances on the selected questionnaires as outcome measures. More specifically, 10 Mann-Whitney U tests were performed to compare the mean performance of the children in the group. RStudio version 1.1.463 was used for statistical analyses. With a significant $p < 0.05$.With these preliminary results have shown that the AHA project succeeded in providing a solution with AR within an existing online literacy program.[6].

This study investigated how Augmented Reality (AR) impacted EFL students' reading comprehension and attitudes toward using AR. Paired independent samples t-test was used to investigate the experimental group's reading comprehension and possible differences between the groups' reading comprehension after using AR. Quantitative findings indicated that the experimental group showed a significantly higher level of reading comprehension than the control group. Thematic analysis of the semi-structured interviews revealed that the students enjoyed using augmented reality and no longer preferred it to traditional methods of reading comprehension thus, a statistically significant difference was found between the two groups in the reading comprehension post-tests ($p = 0.001$); regarding the first and second research question on the impact of using AR on EFL reading comprehension, the findings showed that the use of AR and the implementation of the Reader Buddy project in the reading course of the EG participants improve their reading skills compared to the traditional teaching method. In addition, post-tests of reading comprehension revealed a statistically significant difference between the two groups.[7].

Over the years AR (Augmented Reality) technology has been incorporated in different areas being this three dimensional technology besides working with reading activities as in the presentation of characters, images and videos at an appropriate level to attract students' attention, helped to develop reading motivation. It was seen that reading activities based on augmented reality were effective in increasing students' motivation to read. The aim of this study was to examine the effect of augmented reality-based reading activities on reading comprehension, reading motivation, attitude toward reading, and class participation of fourth grade elementary school students. The research was conducted with 54 fourth grade students

attending two different classes in a public school, the study conducted was quantitative, in which a sequential explanatory mixed design was used, with a quasi-experimental design having a control group with pretest and posttest. The students stated that they could use augmented reality with ease, and that it presented real, three-dimensional, entertaining and participatory features. Furthermore, students reported that, in addition to reading comprehension and reading attitude, it had an effect on their thinking skills, academic development, and communication skills. The results of the dependent samples t-test related to the reading comprehension levels of students subjected to augmented reality-based reading activities are shown the mean obtained by students in the reading comprehension test was (f= 12.57), and the standard deviation was ($sigma$ = 4.45). After implementation, the mean score obtained by students on the reading comprehension test was (f= 18.61), and the standard deviation was ($sigma$ = 2.29).According to the results of the dependent samples t-test that was conducted, the augmented reality-based reading activities applied to students significantly increased their mean scores on the reading comprehension test (= 6.03).[8].

3. Theoretical framework

3.1. M-learning

M-learning is the process of learning supported by a technological medium, it can refer to a distance education, this is interpreted as learning through mobile devices, such as tablets or smartphones using digital tools or applications as a support for teaching and learning[9]. According to another definition, m-learning means a teaching and learning process in which students use mobile devices for the development of activities, allowing computerized data management and wireless connectivity for interaction [10]. According to the learning pillars, three important factors were considered to be taken into account when dealing with learning methods and taking into account, these three pillars can provide the desired level of learning. These three pillars are: learner style, mobile, mobile device or applications [11]. One of the enormous advantages of m-Learning is that it makes it possible for learning to take place outside the classroom, making it possible to be in different places. This benefits and helps to maintain constant processes, which greatly enriches the learning experience.

3.2. Augmented reality

Augmented Reality can be defined as a technology that allows combining virtual objects in real spaces in real time through technological devices. Therefore, as augmented reality states, it complements reality without replacing it [12]. For programming augmented reality is processing and combining data, it also indicates that augmented reality employs 3D models from the data generated, using scanning sensors and augmented by sensory inputs such as sound, positional video and location data [13]. They also indicate that augmented reality consists of combining real and virtual space by means of a computer process, which is enriched by the visual experience with 3D objects [14]. Augmented reality devices that overlay information on your view of your surroundings allow you to visualize images superimposed on real spaces, the device provides information about your location or surroundings, or even your destination that are used to generate AR [15].

3.3. Intervention of Augmented Reality in the learning process

In recent years many countries are making use of this technology as an innovative tool and as a means of scaffolding learning such as Japan called Fujitsu [16] , One author also mentions that the augmented reality mobile application has great potential for use in teaching and learning [17]; we can notice that the students of this century are digital natives being a generation of students living in a technological world, the use of AR has a great enriching potential in the learning

process having as an impact on the student the following benefits motivation, commitment and collaboration [18]. This tool has great versatility such as the incorporation of sound, 3D images, audio in this way can be placed in books with markers that will be recognized with the camera of the cell phone for example can be used in flashcards and other materials.

3.3.1. Types of Augmented Reality

• **Augmented reality based on pattern or mark recognition:** It uses markers, which can be symbols or images that are superimposed when a specific software recognizes them, allowing the adjustment of the position of the 3D model. It is about the use of markers, symbols printed on paper or images, we can see which markers detect information which is previously placed in the image and in the three-dimensional world to achieve the calibration parameters. With all this process, the system is able to add virtual objects to the scene [19].
• **Augmented reality based on the recognition of Markeless images:** It uses images of the environment as an activating element of the image itself; this reality recognizes the images of the environment, to be able to superimpose the assigned virtual elements [20], it is in this way that it recognizes the spaces of an environment such as "a room", to superimpose a virtual object that could be a three-dimensional design of a table. It positions it in space, recognizing areas such as the floor, wall, or angles, to correctly overlap reality [19].
• **Augmented reality based on geolocation:** In this type of AR, a point of interest is located with the device's GPS, and the applications for mobile devices called augmented reality navigators are displayed on the screen using the hardware of mobile devices (GPS, compass, and accelerometer) to locate and superimpose a layer of information on points of interest in our environment. At the moment in which the user moves the device after capturing the image of his environment, the browser shows the nearby points of interest [19].

4. Literacy

4.1. Reading

Human beings should be readers and critics of texts they read, so that they can find meaning in the written word;[21] however, children who expect written language to be exactly the same as speech are likely to have difficulties in predicting and understanding text [22]. In this sense, it is relevant to recognize the importance of the process of reading acquisition in interrelation with the stages of the writing process and comprehension [22], so that the initiation of reading and writing falls on the learner [23], because the subject is building his learning, where he will relate the concepts to learn and gives a meaning from its conceptual structure of the knowledge he has acquired previously [24].

4.1.1. Writing

Writing is an individual and complex learning process that is determined by your context, where you will build your own learning in the social writing system [21].
Writing levels:
1. syllabic level: At this level they begin to understand the written representation to the alphabetic system of writing.
2. syllabic-alphabetic level: This is the transition from the previous level and the alphabetic level.
3. Alphabetic level: This level includes the internal character of alphabetic writing, such as punctuation marks, capitalization and others.

4.2. The transition from pencil and paper to the digitization of reading and writing

Reading and writing are not individual tasks, it is the act of interpreting the meaning that a word acquires in each context, searching for ideas and organizing them coherently [25]. That is why we see that to improve literacy are making use of ICT and is more pervasive in the lives of children ranging from home to classrooms in digital environments [26]. In recent years, the transition from print to digital reading has accentuated reading as a material practice by assigning it as a mental activity. Interaction with text on digital mobile devices can create a different environment for children's early literacy experiences [27].

4.3. Phonological awareness for literacy learning

It is important to know how to work on phonological awareness in the first years of schooling since it is often considered a metalinguistic skill where the student must develop the ability to reflect and manipulate the structural aspects of spoken language [28], the importance of phonological awareness in the study of writing is due to the fact that the graphic representations transfer the sounds of oral language, since when writing the letters they function as a sign of the sounds of speech [29]. By developing phonological awareness, the student finds that words are composed of syllables and that these are formed by phonemes (sounds), and in turn this understanding supports the child to later develop reading and writing with greater interest, since this ability is useful to access phonemes and intentionally manipulate them within the intentionally manipulate them within words[30].

4.3.1. Phonological Awareness

Phonological awareness is the ability to meditate on one's own language, including the ability to identify and recognize, use the words that make up sentences, syllables and phonemes [31]. Therefore, phonological awareness is understood as the awareness of oral language, such as separating words, pronouncing them, suppressing phonemes or adding others, articulating them from phonematic sequences, and articulating them from phonematic sequences [32].

4.3.2. Levels of Phonological Awareness

The Peruvian Ministry of Education considers working these levels in the following way [33].
1. Lexical Awareness: Ability to identify the words that make up sentences and deliberately manipulate them to structure the ideas they need to express within the context of the sentence.
2. Syllabic Awareness.: Ability to segment and manipulate the syllables that make up words that are made up of syllables.
3. Phonemic Awareness: Related to the child's awareness that words are made up of phonemes, this fundamental ability is when learning to decode words by blending sounds and hearing vowel sounds.

4.4. Communication Area Competence

Reads various types of written texts in the native language: the dynamic interrelationship between the reader, the text, and the sociocultural contexts that frame the reading [34]. his competency involves the combination of the following capabilities:
• Obtains information from written text.
• Inferences and interprets information from the text:
• Reflects and evaluates the form, content, and context of the text.

Write various types of text in the mother tongue: This reflective process involves textual adequacy and consideration of contexts and communicative purpose. [34]. This competency involves the combination of the following abilities:

- Adapts the text to the communicative situation.
- Organizes and develops the ideas in a coherent and cohesive way.
- Uses conventions of written language in a pertinent way.
- Reflects and evaluates the form, content and context of the written text.

4.5. Methods and Materials

The method used for the research is explanatory, the study design is pre-experimental and the results were collected through a questionnaire applying a pre-test and post-test, in a period of 2020 in March virtually and in 2021 taking it in face-to-face workshops working five days a week in a time of forty-five minutes fulfilling the pedagogical hour with 15 students per block, which is divided by levels such as: syllabic, syllabic-alphabetic and alphabetic. We conducted learning workshops to be able to apply the teaching sessions with AR, at the beginning it was given virtually and then changing the regulations of the state of emergency of COVID-19 we could do it in person. At the beginning with a minimum group of children, reaching a sample population of 120 children, we had more welcome by children who were already finishing kindergarten to move to first grade. The concern of parents for their children to read and write was a reason to grow our group of students since they did not know how to teach them in a didactic way.

For the implementation of the application, we used the following platforms and services:

- **ARcore:** It is a platform used to create augmented reality experiences can be used to detect flat surfaces and receives an anchor that is used to mark the position of the object against the environment is a 3d library for android [35].

- **Firefase:** It is an API to save and synchronize data in the cloud in real time to save data, records and allows us to perform an analysis[36].

4.6. Proposal

In the school context, it was perceived that first-grade students present difficulties in developing reading and writing skills, as evidenced in the standardized evaluations of the Ministry of Education, in order to know what and how much students are learning. The test is designed to identify the learning that each of its students has been able to develop in the competencies assessed. In this work we proposed to respond to two competencies in the area of communication that were aligned to respond to the expected learning indicated in the grade. An application was designed with the use of special augmented reality for the development of reading and writing. This application is focused on the development of the student's competencies and performance: Read various types of written texts in their mother tongue and write various types of texts in their mother tongue, so that students develop these communicative competencies, through the use of a cell phone, fun 3D images that allow detecting flat surfaces to anchor and mark the position of objects in their environment. The operation of the application is that students have a number of words that will be used during the sessions, passing a series of levels. Through the application created the student will be able to place the 3d image in their environment and will also hear the correct pronunciation for each image. In this way, they will be able to visually and aurally review their lessons and vocabulary. This pedagogical learning material for reading and writing was generated according to the student's context and needs.

Then a preliminary assessment was conducted to determine the level at which the students were, then learning workshops were planned with the LEAR app which was divided into 3 levels, the first level used labels of commercial products, in the second level words were built through consonants and vowels, in the third level sentences were formed with the vocabulary learned in

the previous levels, in each of these levels phonological awareness was taken into account by implementing the sound in the proposed exercises being a key function for the acquisition of reading in its early stages. The last evaluation was applied to know how much the student has managed to develop in the evaluated competences with respect to the previous preliminary evaluation that was carried out; the groups were divided by 15 students each one by blocks to avoid contagions, of a total sample of 120 students 80 girls and 40 boys. Another point is that for the selection of the 3D objects it was not possible to make a preference survey to the children to select the images with which we were going to work, for reasons of the contingency plan that was taking place in our Peruvian state, that is why we had to choose the objects according to their context and their local environment, despite this we managed to motivate them and capture their attention with the selected objects.
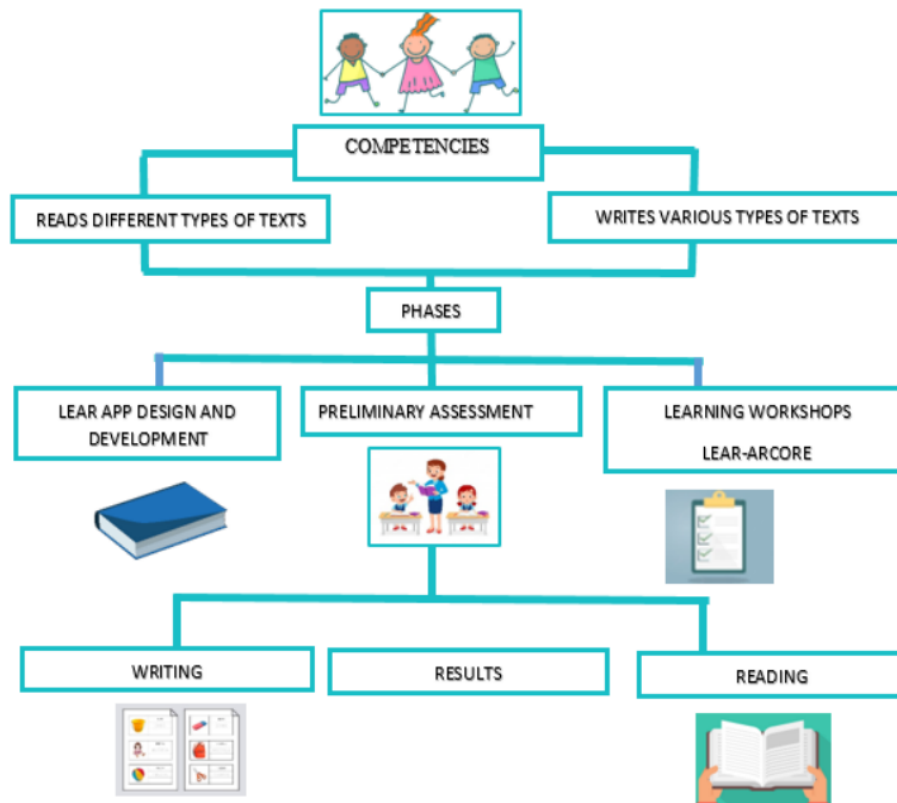
Figure 1: Proposal

In figures 3, 4, 5 and 6 we can see that the students interact with the LEAR application in this phase they identified images and sounds of the consonants that were developed in the sessions; the pedagogical process of the session began; motivation, previous knowledge and cognitive conflict, these activities helped to reinforce their learning.

Figure 2: Consonant S   **Figure 3**: Consonant P   **Figure 4**: Consonant D

4.7. Resource selection

4.7.1. Evaluation

The proposed evaluation allows us to know their learning; this phase evaluates the process of appropriation of the writing and reading system of the students. the different aspects of the level in which they are (pre-syllabic, syllabic, syllabic-alphabetic or alphabetic), syllabic-alphabetic or alphabetic. Thanks to this information, we established learning strategies using the LEAR application that allowed us to focus on their needs and strengthen their learning according to their level.

4.7.2. Tags

For the use of labels, the pedagogical proposal was a set of learning strategies in which the student is an active agent who, by means of the different resources, constructs his or her own learning learning [37] in this phase we worked on the vowels to build the vocal scheme that is necessary in the pedagogical process, in this way the vocal training allowed us to organize the sensory experience.[38] for this purpose, a list of categories of advertising labels such as cleaning products, food and school supplies was made, as shown in the following table 1

4.7.3. Consonants

In this stage we worked with consonants, selected letters of the alphabet to perform phonological awareness that allows to reinforce oral language and the ability to identify syllables, intrasyllabic units and phonemes [39]. Also to build different words that have a certain meaning. In addition, activities were carried out with the labels and vocabulary worked in the first level, in this stage the following basic consonants were selected: M-P-S-SD-L-T-R-J-N-F, each of them provided three images per consonnate worked.

Table 1
Labels

LABELS
SELLO DE ORO
MARGARITA
SUBLIME
GLORIA
MOROCHAS
JUSTUS
FABER CASTELL
VINIFAN
PEGAFAN
UHU
AYUDIN
PATITO
MARCELA
BOLIVAR
ARIEL

Table 2
CONSONANTS

	CONSONANTS		
M	MEMO	J	JINETE
	MARIPOSA		PÁJARO
	MONO		OJO
P	PESA	T	TOMATE
	PUMA		PATO
	PIPA		PELOTA
S	SILLA	R	PIRATA
	SAPO		RATÓN
	SOFA		ROSA
D	DEDO	F	FALDA
	DADOS		FANTASMA
	DONAS		FOCA
L	LIBRO	N	NIDO
	LOBO		ENANO
	PALOMA		RANA

4.7.4. Sentences

In this phase we worked with the vocabulary acquired during the first two phases, structuring sentences according to the number of words of 3, 4, 5 and 6 words per sentence, each of which was formed by the consonants worked on.

4.7.5. Learning workshops

In the workshops, a pedagogical follow-up and accompaniment was carried out during the learning sessions, respecting the cognitive and didactic structure and the moments of each process, considering the individual rhythm, interaction, perception, content structure, feedback and above all, motivating the student as an important factor, since without him nothing can be

initiated. The strategy used with augmented reality was used at the time of development of the session and at the closing as feedback.

4.7.6. Application Design

In the development of the app we used the Android operating system for mobile devices, being a free and attractive platform, aiming to meet the needs of mobile operators and device manufacturers also encourages the development of applications.[40]. For Augmented Reality we worked with the Google ARcore platform to create quality AR experiences, it integrates virtual content with the real world by monitoring the position of the device and its movements, it also makes use of the phone's camera to identify different points of flat surfaces and thus record how they move allowing the mobile to understand and track its position in relation to the world[41]. Likewise, we selected commercial labels that are known by the infants, for which we searched for 3D models, using free 3d platforms, Poly google and sketchfab. The selected models were used both for reading and writing where vowels will be recognized through the labels, identifying the consonant by joining it with a vowel to form a syllable, complementary games to order a sentence of three, four and five words. We looked for images that do not weigh much to use the application without using the internet and all the information storage is in the Firebase database.
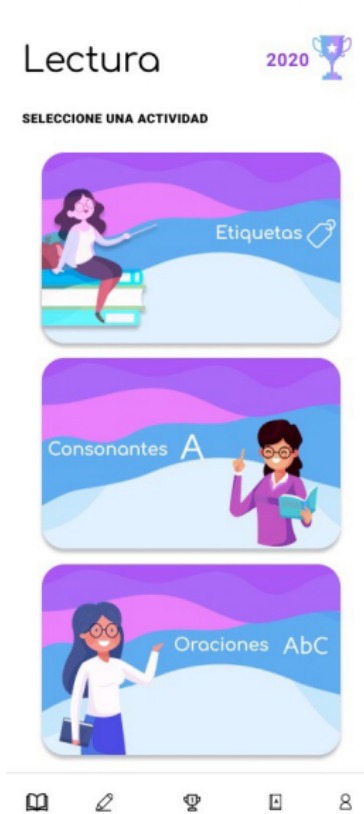
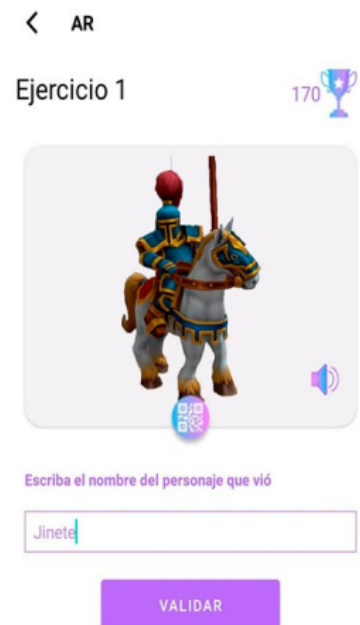**Figure 5**: Write   **Figure 6**: Read   **Figure 7**: App AR

5. Results

The research began with 120 children of the first grade of regular basic education, a pretest and a post test were applied. They were submitted to the deductive statistical test of the T-student, as shown in the tables, therefore, according to this criterion, the data were submitted to the mentioned test.

Table 3
Syllabic Level

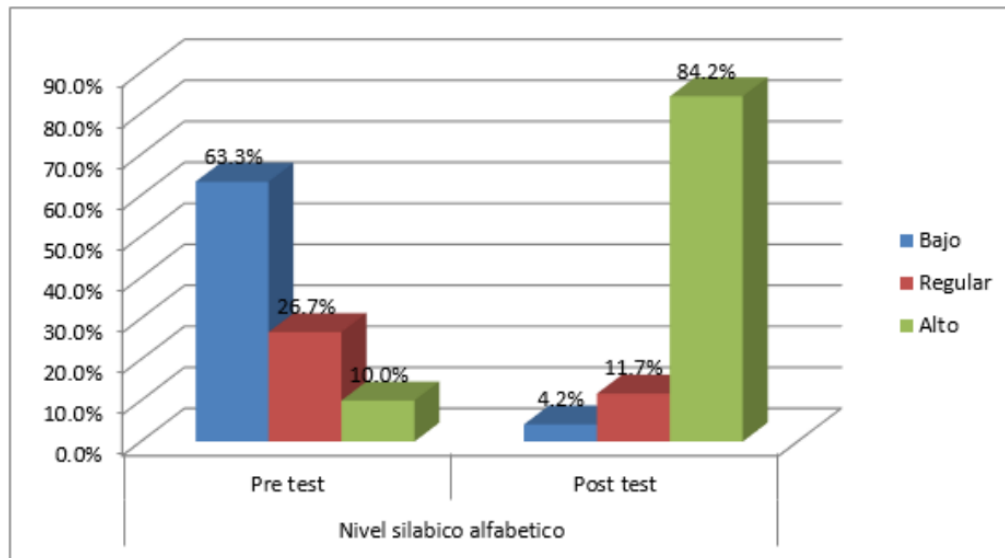|	Pre test		Post test	
	f	%	f	%
Under	74	61.7	3	2.5
Regular	35	29.2	19	15.8
Hight	11	9.2	98	81.7
Total	**120**	**100**	**120**	**100**
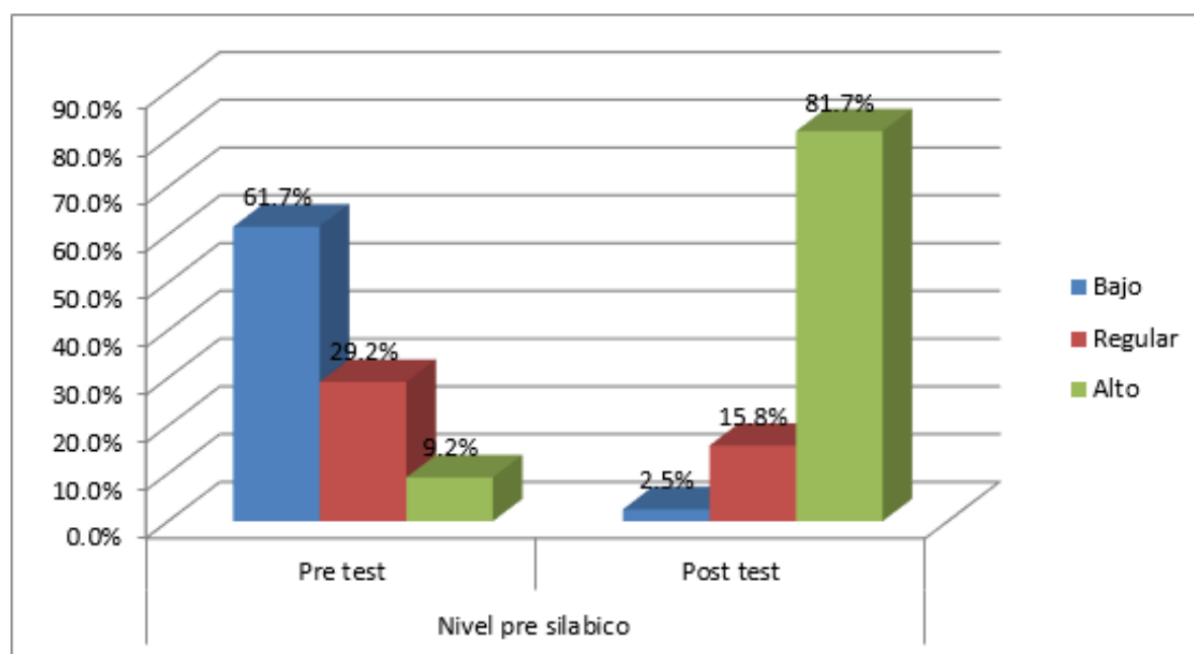
Figure 8: Syllabic Level

The syllabic level is observed that when applying the pre-test data reflected that 61.7 % of the students were at a low level, followed by 29.2 % who showed a regular level of syllabic and only 9.2 % showed a high level of this dimension, however, when applying the program, the changes were remarkable because 81.7% were at a high level, while only 15.8% remained at a regular level and 2.5% at a low level.

Table 4
Alphabetic Syllabic Level

|	Pre test		Post test	
	f	%	f	%
Under	76	63.3	5	4.2
Regular	32	26.7	14	11.7
Hight	12	10.0	101	84.2
Total	**120**	**100**	**120**	**100**

In the dimension of syllabic-alphabetic level, the data reflect that 63.3% of the children were at a low level, while 26.7% were at a regular level and minimally 10% were at a high level of writing; however, when applying the LEAR, it was found that 84.2% of the children achieved a high level, that is, they had the ability to write whole words according to their sound, while 11.7% presented difficulties, placing them at a regular level, and 4.2% did not have the ability to write as many words according to their sound, placing them at a low level in this dimension, demonstrating the effectiveness of the program.

Figure 9: Syllabic-alphabetic level

Table 5
Alphabetical Level

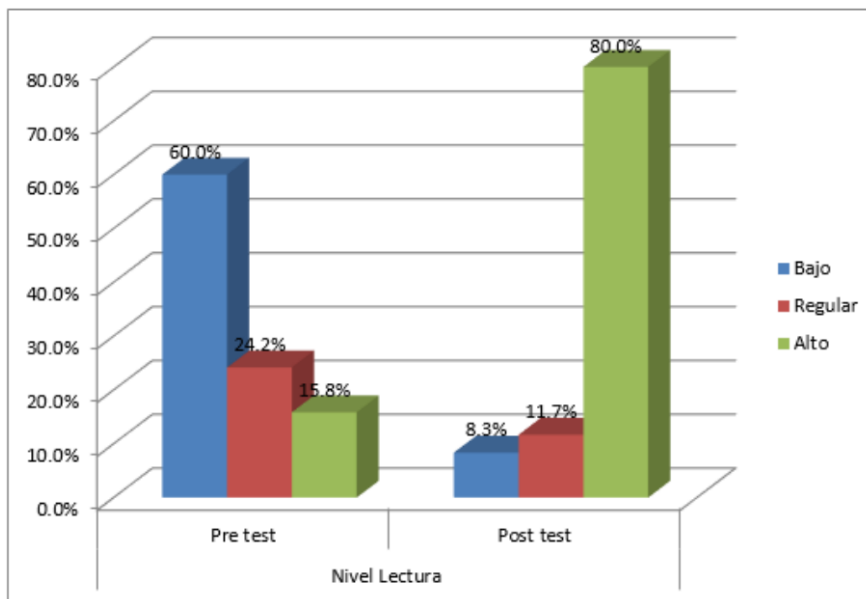|	Pre test		Post test	
	f	%	f	%
Under	68	56.7	8	6.7
Regular	38	31.7	15	12.5
Hight	14	11.7	97	80.8
Total	**120**	**100**	**120**	**100**
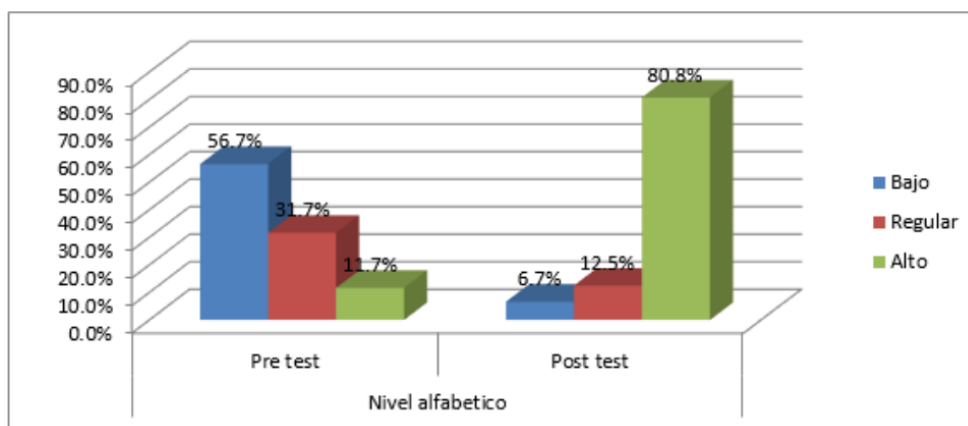
Figure 10: Alphabetical Level

In the alphabetic level, the data reflected when applying the pre-test is that 56.7% of the children were at a low level of achievement in this dimension, while 31.7% showed a regular level and only 11.7% reached high alphabetic levels. However, applying the LEAR program, a

considerable transformation was observed, where 80% of the children reached a high level, since they could establish a clear relationship between the sound and the graphic, being aware of which sounds correspond to the letter, reaching the alphabetic level, however, 12.5% of the children still show a regular level of this ability and 6.75% were at a low level. In reference to the reading levels observed when applying the pre-test, it was found that 60% of the students were at a low reading level, followed by 24.2% who demonstrated a regular reading level, because they identified some words or phrases, while 15.8% had a level of reading knowledge. However, when applying the program and evaluating it through the post-test, it was found that 80% of the students were at a high level, having better abilities to identify and reach the syllabic and alphabetic levels of reading, while 11.7% were at a regular reading level and 8.3% were at a low level because they could not identify most of the words.

Table 6
Reading Level

	Pre test		Post test	
	f	%	f	%
Under	72	60.0	10	8.3
Regular	29	24.2	14	11.7
Hight	19	15.8	96	80.0
Total	**120**	**100**	**120**	**100**

Figure 11: Reading

Table 7
Reading Level

	Pre test		Post test	
	f	%	f	%
Under	65	54.2	8	86.7
Regular	21	20.2	21	17.5
Hight	31	25.8	91	75.8
Total	**120**	**100**	**120**	**100**

In the writing levels, the data show that when applying the pre-test 54.2% of the children were at a low level of writing, followed by 25.8% who had previous knowledge to write and 20% were at a regular level, however, when applying the LEAR program it was corroborated that 75.8% of the children were at a high level, because they had better writing skills, followed by 17.5% who were still at a regular level and 6.7% who could not write adequately.

Table 8
T-Student

			Pre test - Post test
Related differences	Differences matched 95%, of confidence interval the difference	Half	3,950
		Deviation tip	1,950
		Error tip de la media	,1770
		Lower	4,30391
		Upper	3,59609
		t	12,216
		gl	119
		sig (bilateral)	,000

Table 9
Normality test

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistical	gl	Sig	Statistical	gl	Sig
Pre test	,372	120	,000	,693	120	,000
Post test	,479	120	,000	,508	120	,000
a. Lilliefors significance correction						
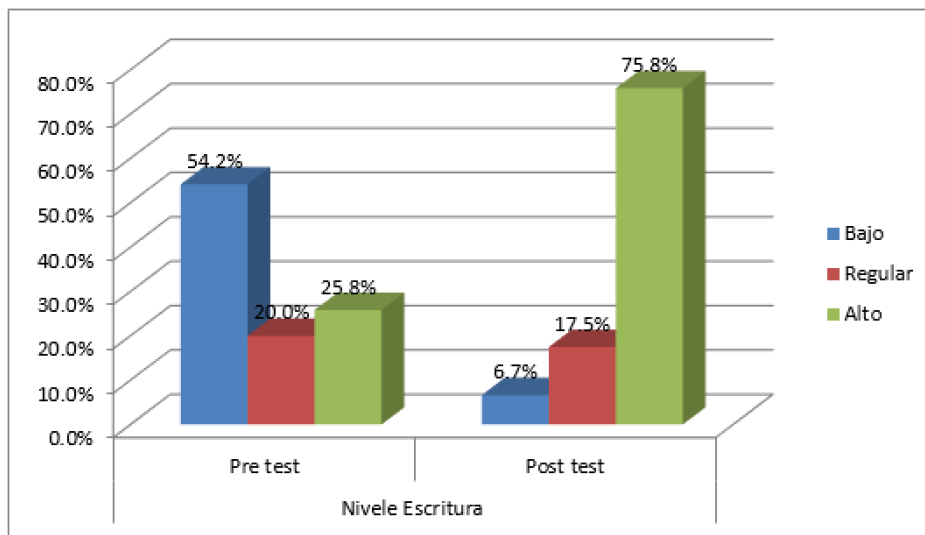
Figure 12: Writing

Ubicación del valor de la T student

1,717   12,216

Figure 23: Paired tests

The results found in the t student statistical analysis show that there is a difference between the pre-test and post-test, since the $t = 17.216$ is greater than the limit parameter ($t = 1.171$) and show that the post-test is more evolutive due to the difference in means. The results analyzed by means of parametric tests show that being greater than 50 individuals, the Kolmogorov-Smirnova normality test was used because it is greater than 50 individuals. The result shows that : P0.05 if it has normal distribution The results show a non-parametric normality distribution and the wilcoxson test was used. Table 9

5.1. Discussion and Conclusion

• At present, Peruvian education has not been able to solve the difficulties in the first years of regular basic education, therefore the results are not as expected; in order to improve this difficulty, we used a source of resources that facilitate the teachinglearning process in the area of communication, being this a support tool for the development of reading and writing processes. It was observed that the use of AR, gives the possibility of interaction with the use of sensors, 3D images and sounds of the LEAR app, which facilitate learning and development of abstract knowledge to reach concrete knowledge to students, this technology being a support tool in improving learning.

• As demonstrated in the following work, the use of the app for the development and learning of reading and writing represents an essential tool to achieve an adequate integration of learning and access to the world [1]; since reading and writing is a complex activity for the progress of students being necessary, to achieve new knowledge, which will help to build meanings [2] .Therefore, teaching carries a great responsibility of support in the case of parents and teachers to achieve the development of their learning. Due to the problems that arose during the pandemic, it was a challenge to teach this process, and an alternative was proposed with the use of AR and workshops using the LEAR app, where students learned to read and write, this tool being a great support, showing the results of the statistical analysis t student that gives the difference between the pretest and post-test, since the value found of the t= 17.216 is greater than the limit parameter (t=1.171) and shows that the post-test is more evolving because of the difference in averages. These results reinforce that the use of reality increases benefits students in a positive and significant way. In the same way, we worked with the competencies of the area and designed activities that were adapted to the pace of work and learning needs.

• In the research (In 2020) Exploring the effect of an augmented reality literacy programmed for reading and spelling difficulties for children diagnosed with ADHD for reading and spelling

difficulties for children diagnosed with ADHD, this research presents a concept, design and development of augmented reality (AR) application in which creates a literate environment to motivate and stimulate children and especially capture their attention to improve reading and spelling skills despite having learning disabilities, proposes to develop a mobile learning application to improve their literacy skills in children with ADHD, However, in our research we do not focus on spelling because they are infants who are just getting to know the world of reading and writing, but we focus on improving phonological awareness as a key requirement for the acquisition of reading in its early stages, since children must decode (decoding) and to achieve this they must have previously become aware that the written words are composed of letters that are transformed into sounds. [42]. This study as well as our research managed to strengthen the learning of students using AR, being this technology quite versatile that allows us to combine virtual objects in real spaces through technological devices, especially to stimulate and capture the attention of students at the primary level. Therefore, as augmented reality allows to complete reality without substituting it, giving good results in the students' learning [12], Therefore, when using this resource, we did not stop using pencil and paper since they are complementary for learning, the objective to work at this stage was fine psychomotor skills, this ability to use hands and fingers accurately according to the required activity and so it influences the skills needed to manipulate an object [43].

• In this sense and under the analysis of the results, it is confirmed that the use of technology improves students' learning. However, in our research, according to the results obtained, the strengthening of reading and writing was reflected. Now with respect to writing on paper students do not have good penmanship, there is incorrect handling of the pencil, inadequate posture when writing and when applying some strokes are not legible, being a reason for further research to create an application that supports the development of penmanship. Knowing that writing is a complex learning process in which knowledge and skills come into play. Once the student has contact with writing, he/she enters the literate world, since he/she will build his/her own learning in the writing system [21]. This leads us to investigate whether it is possible to change writing from paper to digital in the first years of schooling.

• In conclusion, it was determined that the improvement of reading and writing skills with the use of the LEAR application has contributed to their progress in the syllabic, syllabic-alphabetic and alphabetic levels in the students of the first grade of Regular Basic Education, syllabic-alphabetic and alphabetic levels in the students of the first grade of Regular Basic Education, reflected in the application of the instruments where it was obtained that the pre-test showed that 60 % were at a low level of reading, however when the program was applied, the results were reduced to 8.3 %, resulting in the post-test that 80 % were at a high level, giving as a result an improvement in reading. Likewise in the writing level it was obtained that the pretest reached 54.2% in low level of writing and when applying the program, it was reduced to 6.7% increasing in the post test to 75.8 % referring only to the writing of words.

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