MLS - EDUCATIONAL RESEARCH (MLSER)
http://mlsjournals.com/Educational-Research-Journal
ISSN: 2603-5820

(2025) MLS-Educational Research, 9(1), 22-43. doi.org/10.29314/mlser.v9i1.2914.

DEVELOPMENT OF A DIDACTIC STRATEGY INTEGRATING ICT TO IMPROVE THE LEARNING OF READING AND WRITING IN ELEMENTARY SCHOOL STUDENTS

DESARROLLO DE UNA ESTRATEGIA DIDÁCTICA INTEGRANDO LAS TIC PARA MEJORAR EL APRENDIZAJE DE LA LECTO-ESCRITURA EN LOS ESTUDIANTES DE BÁSICA PRIMARIA

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Manuscript information:

Recibido/Received: 13/06/2024
Revisado/Reviewed: 12/11/2024
Aceptado/Accepted: 14/11/2024

Keywords:
technology in education, reading and writing, reading levels, didactic proposal, ICT

ABSTRACT

Information and Communication Technologies (ICT) constitute an agent of change for the redesign of learning environments and didactic resources. They have become a relevant tool in the teaching-learning process of reading and writing. The objective of the study was to develop a didactic proposal to improve the teaching of reading and writing through the use of ICTs in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó. The research is framed within the projective type with a non-experimental, transversal - field design; the population was formed by 156 students, applying the convenience sampling, it was formed by 62 students of the three educational institutions. A quantitative processing was used, by means of descriptive statistics (measures of central tendency and variability). It was concluded that students improve their reading levels with the implementation of the didactic strategy mediated by ICT. It is recommended to show the results of the research to the directors of each of the institutions so that they take measures regarding the implementation of the didactic units for the strengthening of reading and writing in all fifth grade students of the institutions involved in this study and thus, provide students with collaborative learning environments where the necessary resources exist to achieve significant learning.

Palabras clave:
la tecnología en la educación, lecto-escritura, niveles de lectura, propuesta didáctica, TIC

RESUMEN

Las Tecnologías de la Información y la Comunicación (TIC) constituyen un agente de cambio para el rediseño de entornos de aprendizaje y recursos didácticos. Se han constituido en una herramienta relevante en el proceso de enseñanza-aprendizaje de la lectura y la escritura. El estudio tuvo como objetivo desarrollar una propuesta didáctica para mejorar la enseñanza de la lecto-escritura mediante la vinculación de las

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	TIC, en los estudiantes de básica primaria de las Instituciones Educativas Antonio María Claret, Antonio Ricaurte y Pedro Grau y Arola de la ciudad de Quibdó. La investigación se enmarca dentro del tipo proyectiva con un diseño no experimental, transversal - de campo; la población estuvo conformada por 156 estudiantes, aplicándose el muestreo por conveniencia, quedó conformado por 62 estudiantes de las tres instituciones educativas. Se empleó un procesamiento cuantitativo, mediante la estadística descriptiva (medidas de tendencia central y variabilidad). Se concluyó que los estudiantes mejoran los niveles de lectura a partir de la implementación de la estrategia didáctica mediada por las TIC. Se recomienda evidenciar los resultados de la investigación ante las directivas de cada una de las instituciones para que tomen medidas en cuanto a la implementación de las unidades didáctica para el fortalecimiento de la lecto-escritura en todos los estudiantes del grado quinto de las instituciones vinculadas a este estudio y así, brindar a los estudiantes ambientes de aprendizaje colaborativos donde existan los recursos necesarios para alcanzar un aprendizaje significativo.

Introduction

There is agreement on the importance of reading and writing as a fundamental tool for learning in all areas of the curriculum (MEN, 2006). In particular, the language area is oriented to the development of basic communication skills (speaking, listening, reading and writing). According to the Curricular Standards for Spanish Language published by the Colombian Ministry of National Education (MEN), the area of language complements it with the functionality of the communicative act, literature and semiotics. Nowadays, the development of comprehension and communication skills is required to allow the student to access any area of knowledge.

The teaching of writing can have in technology an important support, this statement is based on the study "The effect of computers on students' writing", where a meta-analysis of 26 researches carried out in the period between 1992 and 2002 is carried out. This study highlights that the use of computers for teaching writing has a positive impact on the quality and quantity of texts produced by students, and that the writing process is more interactive, social and collaborative compared to traditional teaching (Eduteka, 2003).

In 2011, the Ministry of National Education launched the National Reading and Writing Plan "Reading is my story" whose purpose was to promote the development of communication skills through the improvement of reading and writing levels (reading behavior, reading comprehension and textual production). It was aimed at preschool, elementary and middle school students through the strengthening of the school as an essential space for the formation of readers and writers, including the family in the process. The implementation of the plan introduced substantial improvements in the initial orientation, in accordance with the Colombian context and the practical variables related to language, such as reading comprehension, writing and orality as a sociocultural practice. However, orality was not developed significantly in the initial formulation of the Plan, but is now a central dimension of it. To this end, in recent years, joint work with local authorities has been intensified to identify the needs of communities in order to close the gaps between rural and urban schools in terms of access to written culture and orality (MEN, 2021).

Learning to read is a process that begins at an early age, between three and six years old, and continues throughout life. Given its relevance, many studies have established different ways of approaching this topic, mainly in its beginnings, since this is where the foundations for later learning are laid (Saldaña-Gómez and Fajardo-Pacheco, 2020; Chávez-Delgado et al., 2022; Quispilema-Fiallos, 2020). It should be emphasized that written language is not in the genetic code of individuals, but is a cultural manifestation that needs to be taught and learned, and is therefore absolutely arbitrary (Loría-Rocha, 2020). Hence the importance of establishing didactic strategies in line with local and regional educational needs.

For this reason, didactic strategies designed for the teaching and strengthening of reading and writing in primary education have been a topic that focuses the attention of teachers, researchers and theoreticians in the educational field (Feicán-Zumba et al., 2021; Navarro et al., 2020). A large amount of literature has focused on knowing the strategies used by teachers and the results they have obtained in their implementation, as well as proposing different methods that are in accordance with the complexity of the educational level, such as elementary school (Viñas-Marte and Guzmán-Taveras, 2020; Chacha-Supe and Rosero-Morales, 2020; Pisco-Román et al., 2023).

Given the challenges faced by some schools during the development of basic literacy skills at school age, this study has been developed with the objective of developing

a didactic proposal to improve the teaching of reading and writing through the use of ICT in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó. In order to achieve this objective, an exhaustive search of didactic strategies for teaching ICT-mediated reading was carried out, so that students could improve the reading levels they already possess.

This study is situated in the Didactics of Language research line, in the area of reading and writing in elementary school, allowing to organize and guide the research work in the area of language, serving as a basis for the production of knowledge that contributes to respond to the problems to be addressed. The type of research is projective, which consisted of developing a strategy that provides a practical solution in a specific area of knowledge, based on a diagnosis of current needs, explanatory processes and future trends. This type of research encompasses the creation, design and elaboration of plans and projects based on a methodical process of tracking and probing in description, analysis of results and predictability. Additionally, it is framed within the non-experimental, field, cross-sectional design.

Method

Research Design

This research is within the non-experimental, field, cross-sectional design, given that the phenomena and subjects were observed in their natural environment without being intentionally provoked by the researcher. According to Hernández-Sampieri et al. (2014) a non-experimental research is one that is conducted without deliberately manipulating variables. What is done in non-experimental research is to observe phenomena as they occur in their natural context and then to analyze them (Hernández Sampieri et al., 2014).

This approach is useful in situations where it is not ethical or practical to perform controlled experiments, such as in the study of human or social behavior. It can also be useful when you want to explore relationships or patterns in a phenomenon without intervening in it.

On the other hand, the study is cross-sectional, since the current situation of the reading and writing process of elementary school students was analyzed. The purpose of this is to use the results to design a didactic proposal, which contains four units, with different activities and interactive strategies that lead to the improvement of deficiencies and difficulties in reading and writing in elementary school students, since this has repercussions in the other areas of knowledge. Hernández-Sampieri et al. (2014) state that the transectional or cross-sectional study is conducted at a single point in time. This is carried out when the research is focused on analyzing the level or state of one or several variables at a given time or the relationship between a set of variables at a given point in time. Its essential purpose is to describe variables and analyze their incidence and interrelation at a given time.

Population and Sample

According to the Departmental Secretary of Education of Chocó, the municipality of Quibdó is certified; it has 184 educational establishments and 1,098 schools distributed as follows:

Table 1

Number of educational establishments

Educational Establishment	Quantity
Educational institution for Afro population	77
Educational institution for indigenous population	31
Educational Center for Afro population	33
Educational Center for Indigenous Population	43
Afro population	687
Indigenous population sites	411

Note. Source: Gobernación del Choco (2020).

According to the SIMAT Information System, the 2019 fiscal year registered an enrollment of 72,270 children and young people in the official sector and 32,356 in the contracted sector. The official enrollment corresponds to 69% and the contracted enrollment to 31%, an increase of 4,743 students compared to the previous fiscal year. 35.9% of students receive care in urban areas and 64.1% in rural areas. The highest percentage of students are concentrated at the elementary school level with 49% and junior high school with 24%, and the levels with the lowest percentage of students are preschool and middle school with 7% each.

As a sample, children from the educational institutions Pedro Grau y Arola, Antonio María Claret and Antonio Ricaurte in the city of Quibdó were chosen.

Table 2

Number of children per school

Institution	Number of children	Number of girls	Teacher number
Anthony Mary Claret	1545	1101	97
Antonio Ricaurte	1233	1280	68
Pedro Grau and Arola	1290	1640	128
Total	**4068**	**4021**	**293**

Convenience sampling was used for the sample. It is a non-probabilistic and non-random sampling technique used to create samples according to the ease of access, the availability of people to be part of the sample. This technique is selected to observe habits, opinions and points of view in a simple way (Hernández Sampieri et al., 2014). From each institution, the list was taken from the fifth grade A, one hundred and fifty-six (156) students, 90 boys and 66 girls, between the ages of 9 and 12 years old. Inclusion criteria: age, grade, enrolled in one of the selected institutions. Exclusion criteria: age, not being enrolled in any of the institutions, not belonging to the Quito A grade. The groups do not include the disabled, displaced or those with special learning needs.

Variables

Learning to read and write

Reading and writing means the union of two processes that are totally connected: reading and writing. Likewise, reading and writing are two activities that may have a certain degree of difficulty, but are nevertheless fundamental, because the fact that people continue learning throughout their lives depends on them. It is a linguistic process, where the student uses hands and oro-facial movements, so different skills are involved in order to do it successfully. These skills are thinking skills such as: observation, identification,

comparison and description. Linguistic, where the student can communicate verbally with others -seeing and hearing-. The informal ones, which help students develop the ability to search, classify and communicate information, thus developing the habit of reading and writing, obtaining, in addition, a significant advance, conforms to the school system (Londoño-Vásquez, 2014).

Use of ICT

ICT are pedagogical support tools, which, when used appropriately in the classroom, improve the competencies and skills required in different knowledge disciplines. ICTs develop literacy skills and motivate learning in students (Luna-Miranda et al., 2020). ICTs are technological tools; their presence in the spaces where students are immersed is overwhelming. Linking ICT in the learning process favors the planning of a written text, in addition, it allows the learner to interact with reading and writing from a real projection, awakening interest and motivation in the student (Suárez-Cárdenas et al., 2015)

Research Instruments

The techniques used in this data collection process were two questionnaires.

The questionnaire is a procedure that makes it possible to explore issues of subjectivity and at the same time to obtain this information from a considerable number of people, for example: it makes it possible to explore public opinion and the current values of a society, issues of scientific significance and importance in democratic societies (García-Alcaraz et al., 2006). The questionnaire is the systematic search for information in which the researcher asks respondents about the data he/she wishes to obtain, and then gathers this individual data in order to obtain aggregate data during the evaluation (García, 2003).

By means of the first questionnaire, several aspects of the students in the fifth grade A were measured, such as their socioeconomic level, geographic location, access to technological media both in and out of school, and tastes and interests in reading and writing.

Next, in order to determine the level of reading comprehension and knowledge prior and subsequent to the didactic-methodological intervention, related to the programmatic contents according to the class program of the subject of communication in the development of reading skills, a written questionnaire-type test was administered at the beginning of the intervention to groups of students in grades 5A.

Data Analysis

For the purposes of this research, statistical analyses were performed with the SPSS program. This software is used to perform data capture and analysis to create charts and graphs. It uses a wide range of statistical analyses, such as descriptive statistics, bivariate statistics, regression, factor analysis and graphical representation of data. This software was originally designed and named for the social sciences, but can be used on many types of experimental or observational data.

Descriptive statistics are used. For the analysis of the diagnostic and evaluation tests, first the normality test was performed to determine whether they are parametric or nonparametric tests, then the hypothesis test for related samples was performed, as follows:

$H_0: \mu_1 = \mu_2$ Means are equal, there is no significant difference between diagnosis and evaluation.

$H_0: \mu_1 \neq \mu_2$ Means are different if there is a significant difference between diagnosis and evaluation.

Where:

Ho: Null hypothesis.

Hi: Alternative hypothesis

μ_1: Pre-test mean

μ_2: Post-test mean

If the test is parametric, the Student's t-test for paired samples will be applied; if it is non-parametric, the Wilcoxon t-test will be applied. This is a non-parametric test used to compare two related or matched samples. In simple terms, the Wilcoxon t-test is used when data do not follow a normal distribution or when the difference between samples is not symmetrical. This test evaluates whether the differences between the two samples are statistically significant. It is based on the ranges of the differences between pairs of data from the two samples. The sum of the ranges of the differences is calculated and compared to a critical value to determine if the difference between the samples is statistically significant. In summary, the Wilcoxon t-test is a useful statistical tool when working with related samples and the assumptions of the Student's t-test are not met. It is important to note that this test may be less powerful than Student's t-test if the data meet the assumptions of normal distribution and homogeneity of variances.

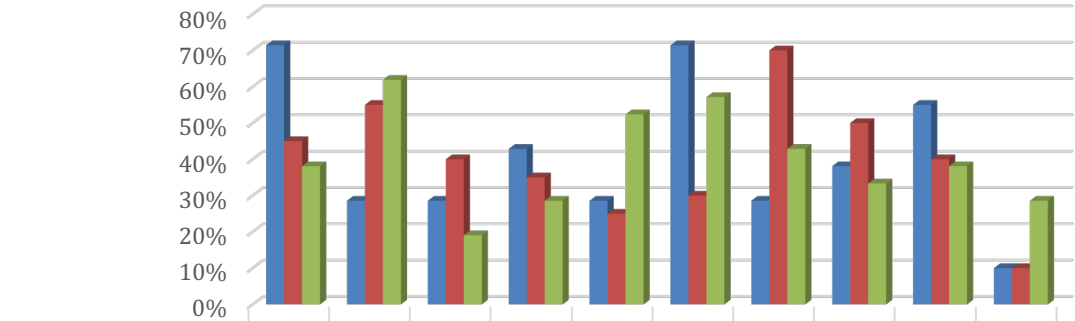
Results

The general objective of the research is to develop a didactic proposal to improve the teaching of reading and writing through the use of ICT in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó. In order to correctly interpret the data obtained and to design appropriate sampling strategies that guarantee the representativeness of the sample and the validity of the results, the sociodemographic data of the participating students were analyzed.

As indicated above, the sample consisted of 62 elementary school students from the Antonio María Claret (20), Antonio Ricaurte (21) and Pedro Grau y Arola (21) schools in the city of Quibdó. From the Pedro Grau y Arola Educational Institution 15 girls and 6 boys participated; from Antonio María Claret 9 girls and 11 boys; from Antonio Ricaurte 8 girls and 13 boys; all between the ages of 10 and 12 years old. Regarding social stratum, 25 participants belong to stratum 1; 27 belong to stratum 2 and 10 students belong to stratum 3. Of the participants, 33 are from urban areas and 29 are from rural areas.

The sociodemographic data of the sample, broken down by educational institution, are presented below.

Figure 1
Sociodemographic data



	Fem.	Mas.	10 años	11 años	12 años	Urb.	Rur.	Estr1	Estr2	Estr3
Pedro Grau y Arola	71%	29%	29%	43%	29%	71%	29%	38%	55%	10%
Antonio María Claret	45%	55%	40%	35%	25%	30%	70%	50%	40%	10%
Antonio Ricaurte	38%	62%	19%	29%	52%	57%	43%	33%	38%	29%

Note: The graph represents the results of the students of the three educational institutions that were part of the sample

The Antonio Ricaurte Educational Institution has 11 participants of 12 years of age, being the highest record of student age; Pedro Grau y Arola has the highest number of 11 year old children, 9 in total and, finally, Antonio María Claret has 8 children, in general, there are no significant differences between the age of the participants of the three educational institutions.

There is disagreement as to whether the age at which literacy learning begins, both in formal and natural contexts, has any impact on language proficiency. Some authors maintain that, regardless of age, the process and results are the same in both children and adults, or even adults tend to obtain better results, given their learning capacity. Other authors argue that adults are at a disadvantage with respect to young people in aspects such as phonological (MacLaughlin, 1987). On the other hand, there is a trend that states that only young people reach a certain degree of perfection, such as the free pronunciation of the accent (Scovel, 1981).

Age is one of the most studied variables in the learning of reading and writing, in discussions about individual differences in its learning, given that the optimal stage in which this process should begin is sought. In theory, it is an internal factor of variability that is easy to define and measure; however, there are problems with age that are complex. The age factor is fundamental when it comes to language learning in general (Bettoni, 2007).

The age factor can be treated from two different approaches: from the biological and sociological perspective. Children have a neurological structure better adapted to linguistic learning, they have greater plasticity, although their brain, cognitively, is less mature. From a theoretical standpoint, the age factor is interesting only if the explanation has an organic basis. If it is limited in terms of experience, it becomes a psychological and cultural variable, which can be easily manipulated and significantly increase the performance of older students and level off with that of younger ones. From a neurological point of view, the neurological capacity to produce and understand language is located in both lobes of the brain and, subsequently, is concentrated in the left lobe of the brain; thus, the critical period for learning is genetically determined and ends with puberty.

With respect to gender, a total of 32 female and 30 male and 30 male students from the three institutions participated. In particular, the Pedro Grau y Arola Educational Institution had the highest number of female participants (15), Antonio Ricaurte reported 13 male participants and 11 in Antonio María Claret. In general, the number of participants of different genders does not show a significant difference between male and female participants.

The vast gender disparity in the acquisition of reading skills is a significant piece of information yielded by learning assessments. The advantage of girls is notable over boys; however, this disparity changes in early adulthood. Reading and writing skills continue to develop after the compulsory education period and reach their peak around the age of 30. The mode of development of reading skills depends on multiple factors, as well as different educational and employment choices and training paths (Caballeros-Ruiz et al., 2014).

On the other hand, boys and girls present differences in their maturation rhythms, interests, concerns, hobbies, ways of socializing, reactions to identical stimuli, ways of playing, affectivity and behavior. These differences influence the way they learn, which is important to consider in the educational environment.

It should be noted that in this research it is relevant to know the conditions in which the participants live. Most of them belong to stratum one and two, 25 and 27 respectively, 10 participants from stratum 1. In this first part, the social stratum to which the students belong was identified, with which the difficulties in literacy learning can be deduced from different studies and theories, which express that social and economic inequalities have significant effects on the cognitive and socioemotional development of students, as well as on their educational outcomes (Grantham-McGregor et al., 2007). Multiple inequalities produce a negative impact on the learning ability of vulnerable children, therefore, the gap between advantaged and non-advantaged students deepens over time (Shonkoff and Garner, 2012).

In summary, sociodemographic data can affect literacy learning in a variety of ways, whether through the availability of educational resources, family environment, or cultural and linguistic influences. It is important to take these factors into account when designing educational interventions that promote the development of literacy skills in all children, regardless of their sociodemographic context.

Use of ICT

The second part of the survey addresses students' perceptions of ICT use and their access to technology, both at school and at home. The results are presented below.

Table 3

Use of technologies

Item	Scale	Frequency	Percentage
Does your educational institution have technological tools for education?	Yes, but with limitations	62	100
Do you have technological tools for education at home?	I do not have	28	45.2
	Yes, but with limitations	28	45.2
	Yes, comfortably	6	9.7
how much do you use technology in education?	Nothing	15	24.2
	Regular	42	67.7
	Enough	5	8.1
What is the use you give to ICT?	Homework assistance	24	38.7
	Learning new things	4	6.5
	To play	26	41.9
	To communicate with friends and family	8	12.9

Note. Source: Results obtained using SPSS

The

Table ***3*** the results show that all of the students consider that the educational institution they attend has technological tools for education, but with limitations. The lack of technological tools in education can affect in several ways: it limits access to information; without technological tools, students may have difficulty accessing online educational resources, such as digital books, educational videos, online tutorials, research tools, etc. It limits the personalized teaching-learning process; technological tools can facilitate the adoption of personalized and adaptive teaching methods, which can significantly improve students' learning experience. It also limits the development of digital skills.

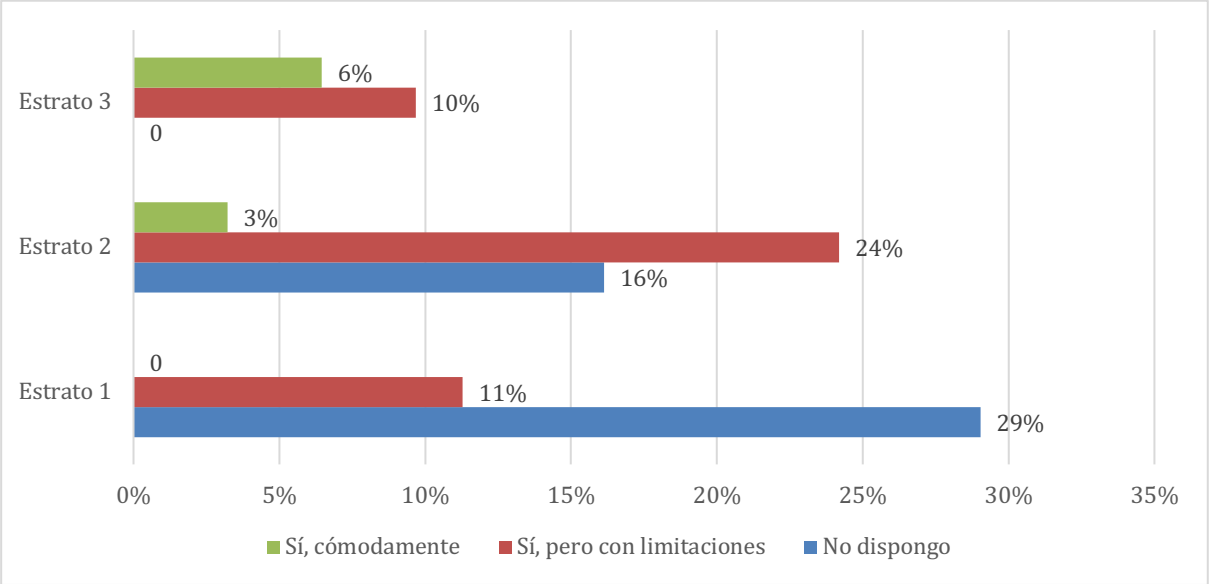
Students' perceptions towards the use of ICT in learning to read and write may vary according to their experience and familiarity with these technological tools. Some students may see the use of ICT as an interesting and motivating way to learn, since it allows access to a large number of digital resources and the use of interactive applications that make the reading and writing process more dynamic and entertaining.

On the other hand, some students may have a negative perception towards the use of ICT in learning to read and write, as they prefer more traditional methods and feel that technologies may distract them or make it difficult for them to concentrate. In addition, some students may face technical difficulties or lack of access to technological devices, which may generate an unfavorable perception towards the use of ICTs in their learning.

In general, students' perceptions of ICT use in learning to read and write will depend on a variety of factors, such as their personal preferences, their previous experience with these tools, and their level of comfort and competence in using technology. It is important for educators to consider these perceptions and seek strategies to effectively integrate ICT into the teaching-learning process, taking into account the needs and preferences of their students.

With respect to the question about the technological tools available to the student at home, a correlation was made with respect to the socioeconomic stratum of the participants, the results are presented in the following table Figure 2.

Figure 2
Technological tools vs. Socioeconomic stratum



Note. the figure represents the question "Do you have technological tools for education at home?" and the relationship it has with the student's socioeconomic status.

As the figure shows, 29% of students in stratum 1 do not have technological tools for home education, 11% have them, but with limitations. As for stratum 2 students, 16% do not have technological tools for education, while 24% have them with limitations, while 3% say they have them comfortably. Finally, 10% of students in stratum 3 stated that they have technological tools for home education, but with limitations, while 6% stated that they have them comfortably.

If students do not have technological tools at home to do their homework, they may face several challenges. Some possible consequences include: difficulties in accessing information and resources needed to complete school assignments. Limitations in communication with teachers and classmates. Difficulties in completing tasks that require the use of specific software or internet access. Unequal educational opportunities compared to their peers who do have access to technological tools. Increased stress and frustration at not being able to meet academic expectations.

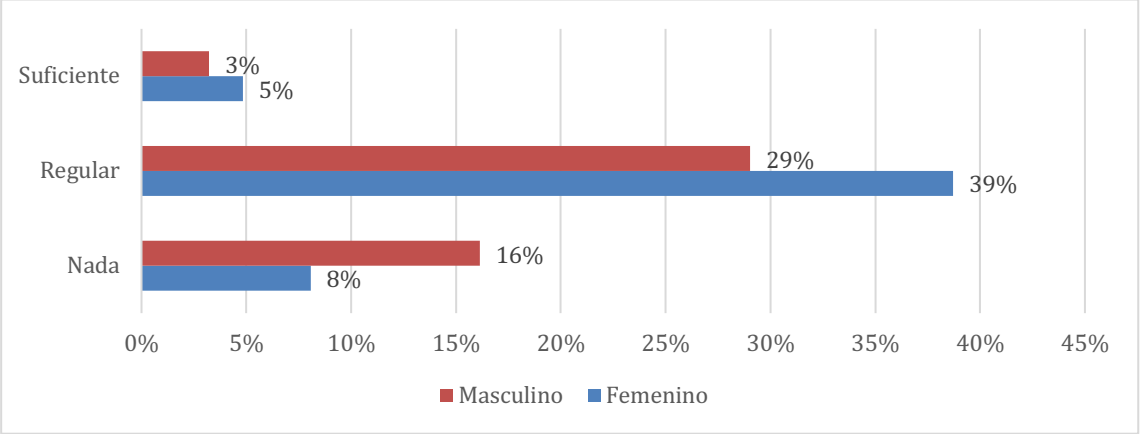
To address this situation, schools and teachers may consider providing alternatives for students without technological tools to complete their assignments, such as printed assignments or access to computers at school. In addition, it is important to work together with families to find solutions that allow students to access the technological resources necessary for their education. Prensky (2015) is an author who supports the importance of school technology tools in the home. In his book “Teaching Digital Natives,” Prensky argues that the use of technology in the home can improve children's education and prepare them for an increasingly digitized world. He also believes that technology can be a powerful tool for fostering creativity and collaborative learning.

With respect to the use of technology in education, a relationship was made between the use of technology with the gender of the student. Thus, to the question “How much do you use technology in education?”, Figure 3 shows that 3% of male students respond that their use of technology in education is sufficient, while 5% of female students consider that it is sufficient. Twenty-nine percent of male students consider their use to be regular, as opposed to 39% of female students. Finally, 16% of male students say that

they do not use technology in education, as opposed to 8% of female students. The following figure shows the results obtained.

Figure 3

Use of technology in education with respect to gender



Note. The figure represents the students' responses to the questionHow much do you use technology in education with respect to the gender of the students participating in the research.

Technology use may be related to student gender in certain circumstances. In general, it has been observed that men tend to have a greater affinity for technology and to use it more frequently than women. This may be due to a number of factors, such as gender socialization, stereotypes related to technology skills, and gender representation in the technology industry.

In addition, it has been observed that women tend to underutilize technology compared to men, which may be due to less confidence in their technological skills, less exposure to technology in their education and family environment, and less identification with technology-related stereotypes. However, it is important to keep in mind that these differences are not universal and that there are numerous exceptions in both genders. In addition, the gender gap in the use of technology is narrowing thanks to efforts to promote gender inclusion and equity in the technological sphere.

Excessive use of technology can negatively affect literacy learning in children and youth. Overexposure to electronic devices such as smartphones, tablets and computers can decrease attention span and concentration, as they are easily distracted by the many distractions offered by technology. In addition, the use of electronic devices limits the time children spend practicing traditional reading and writing, which can affect their development of language skills. It may also influence the quality of learning, as the information presented on screens is often more visual and superficial, which could affect the ability to comprehend and analyze complex texts. Therefore, it is important to establish a balance between the use of technology and traditional literacy practices to ensure a healthy development of these skills in children and youth.

These are some authors who argue that excessive use of technology can negatively affect learning: Carr (2011), author of “Superficiales: ¿Qué está haciendo Internet con nuestras mentes?” and Turkle (2017) author of “ En defensa de la conversación. El poder de la conversación en la era digital”. These authors argue that the constant use of technological devices, such as smartphones and computers, can distract people and decrease their ability to concentrate, thus affecting their ability to learn. They also point

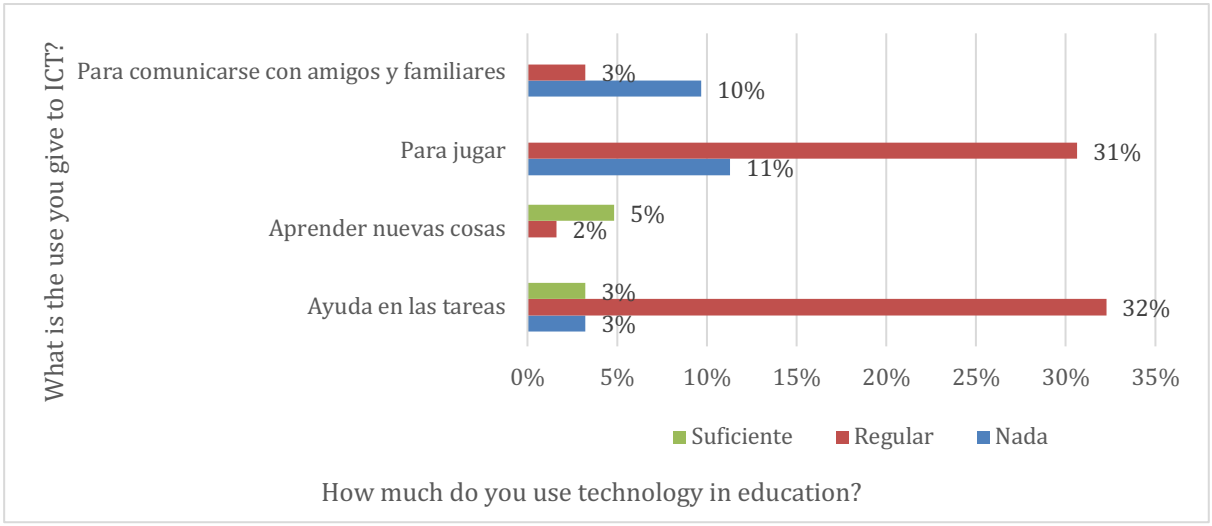
out that excessive use of technology can limit people's social and emotional skills, which in turn can harm their academic development.

For her part, Wolf (2020) author of "Lector, vuelve a casa: Cómo afecta a nuestro cerebro la lectura en pantallas" in which he studies the effects of technology on the brain and reading ability. Wolf argues that excessive use of electronic devices can impair reading comprehension and reading concentration. Likewise, Twenge (2017) author of "iGen: Why Today's Super-Connected Kids Are Growing Up Less Rebellious, More Tolerant, Less Happy--and Completely Unprepared for Adulthood--and What That Means for the Rest of Us" in which she examines how the iGen generation is increasingly connected to technology and less interested in traditional reading and writing. Twenge argues that excessive use of electronic devices can negatively affect the development of reading and writing skills.

For the question: What is the utility you give to ICT?, the response options are: Help with homework; learn new things; play games; communicate with friends and family.

Figure 4

Utility that the student gives to ICTs



Note. The graph represents the results to the question: What is the use you give to ICT?

As evidenced in the responses of the participants, the use of ICT is not for educational use, the main use that students give it is to communicate with family and friends, those who have the tool, those who do not have it, make use of those provided by the institution, but find the problem that teachers do not effectively link the technological tools.

Students use Information and Communication Technologies (ICT) in a variety of ways to facilitate their learning and improve their academic performance. These are some of the utilities that students give to ICT: Research: They use the Internet to search for information, research topics of study, access databases and academic resources, among others. Communication: They use tools such as e-mail, instant messaging and social networks to communicate with peers, professors and other members of the academic community. Organization: They use applications and online tools to organize their time, manage tasks and projects, and keep track of their academic activities. Content creation: They use content creation tools such as word processors, multimedia presentations, image and video editing software, to produce papers, presentations and creative projects. Collaboration: They use online group work platforms to collaborate with peers on academic projects and share resources and knowledge. Thus, ICTs are a fundamental tool

for students and teachers today, allowing them to access information, communicate, organize their work, create content and collaborate more efficiently and effectively.

From the above, it is considered that the professional development of teachers in digital competencies should be articulated with the institution through the provision of technological infrastructure, the design of educational materials and the construction of innovative didactic proposals that contribute to institutional management, curricular adaptation and the construction of evaluation models. Thus, the benefits of ICTs are determined by different factors that make it possible to take advantage of them, taking into account the nature of the educational environment

The incorporation of ICT in the three educational institutions—Pedro Grau y Arola, Antonio María Claret, and Antonio Ricaurte—requires a duly planned process, since the educational context of each institution must be explored in order to incorporate new technologies in the service of education and take advantage of their potential in the mediation of literacy learning and, finally, to make the teaching-learning methods of cognitive processes more effective, fundamentally in the reading and writing process, since this would benefit all areas of learning.

In this same line of thought, from the aspects discussed in the theoretical framework, empirical studies and different theories; it is up to each educational institution to decide what, how, when and how much to link ICT through an institutional plan, duly planned, that guarantees coherence with the educational reality. This implies the provision of the necessary equipment for the implementation of this plan, as well as the consideration of the priorities evaluated by the faculty, in relation to pedagogical innovation, curricular integration in all areas and the streamlining of administrative processes.

Thus, the use of ICT as a mediation strategy for literacy learning requires the management of technological resources as well as teacher training in digital competencies. The use of digital resources and technological infrastructure requires a deep knowledge of how they work and the possibilities they offer according to the pedagogical purposes, together with the knowledge of the technological skills of students, which, as evidenced in the diagnosis on the use of ICT, are scarce in terms of the educational use that students make of them.

Once the results of the diagnostic evaluation were obtained to determine the students' prior knowledge of ICT use, we proceeded to identify the reading levels of the students of the three institutions, the results of which are presented below.

Reading Level

The results of the third stage of the survey on reading levels are presented below.

Table 4
Reading levels

Item	Scale	Frequency		Percentage	
		*A	D	*A	*D
(Q1) What have you learned from this text?	That friendship is worth fighting for. That if you have a friend you should go to his country That vacations are to be enjoyed That it's okay to separate on vacation	28	34	45.2%	54.8%
(Q2) Why were Ivan and Marina sad?	Because they had to go back to school Because they could no longer be friends Because they did not know what to do Because they had to separate	25	37	40.3%	59.7%
(Q3) What are you looking forward to next summer?	That classes will end That they will continue to talk by computer Who will be one year older That they will be able to see each other again	30	32	48.4%	51.6%
(Q4) How would you like to finish this text?	They hope not to have to pack a lot of bags It will be great to meet again They are already looking forward to finishing school Hopefully there will not be too many people on the beach	25	37	40.3%	59.7%
(Q5) Why were they able to spend so much time together?	Because I was in Spain Because they did their homework together Because it was the vacations Because they wanted to meet	22	40	35.5%	64.5%
(Q6) Where did Ivan and Maria meet?	In a village in the mountains In Ivan's country In a different country In Marina's country	25	37	40.3%	59.7%

Note. *A: Hits. *D: Mistakes.

Based on the results presented in the Table 4 in this section we have organized each of the levels of reading comprehension: literal level, inferential level and critical level. The results obtained for each level are presented below.

Table 5
Results by reading levels

Reading level	Frequency			Percentage		
	Under	Medium	High	Under	Medium	High
Literal level	24	23	15	19%	19%	12%
Inferential level	18	33	11	15%	26%	9%
Critical level	23	31	8	19%	25%	6%

Note. The percentages for each level are based on the number of cases.

At the literal level, students are able to identify characters, facts and vocabulary in the text. As can be seen in Table 8, in the literal level 19% of the students are located in the low level, 19% in the medium level and 12% in the high level. At the inferential level, the student can identify implicit ideas in the text, as well as main ideas, conclusions and figurative language in the text. At the inferential level, 15% of the students are at the low level, 26% at the medium level and 9% at the high level. Finally, at the critical level, students are able to make judgments, express agreements and disagreements, and

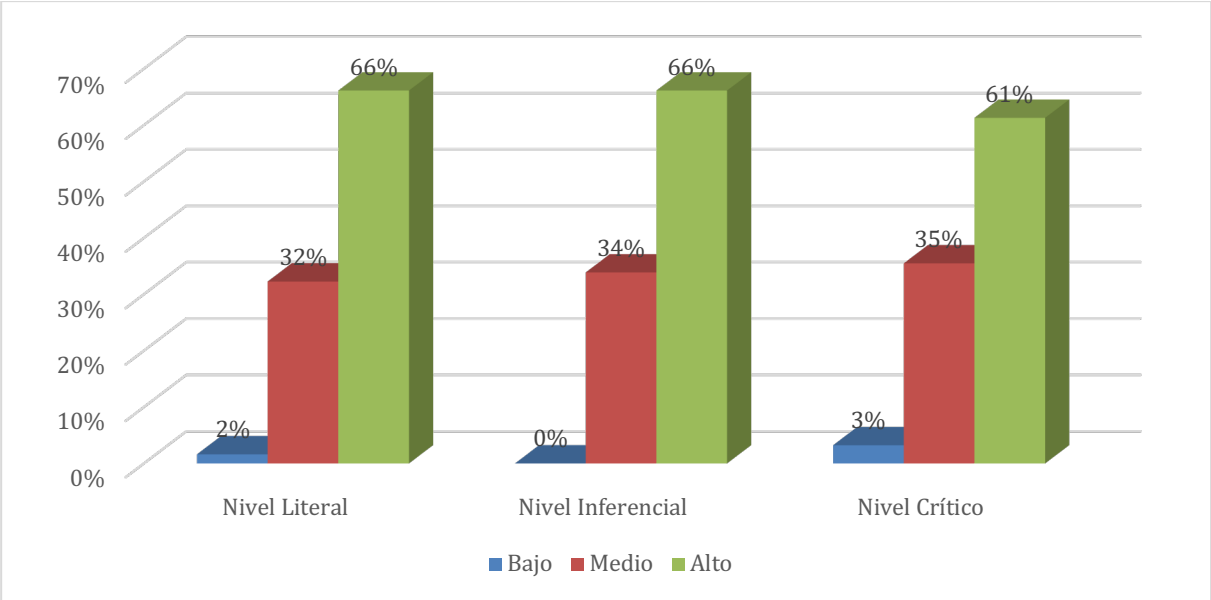
differentiate facts and opinions. At the critical level, 19% of the students are placed at a low level, 25% at the medium level and 6% at the high level.

At a general level, rural students tend to have a lower literal reading level than urban students. This is due to factors such as lack of access to educational resources, distance to schools, teacher quality and unfavorable socioeconomic conditions in rural areas. However, there are educational programs and policies focused on improving the quality of education in rural areas to reduce this educational gap.

Once the results of the diagnostic survey were obtained, the need to design ICT-supported didactic units that contribute to improving reading levels became evident. Subsequently, the didactic units are implemented and the effect of the application of these didactic units on the development of reading and writing skills in elementary school students is evaluated. The results of the evaluation of the application of the didactic strategy are presented below.

Figure 5

Evaluation results by reading level



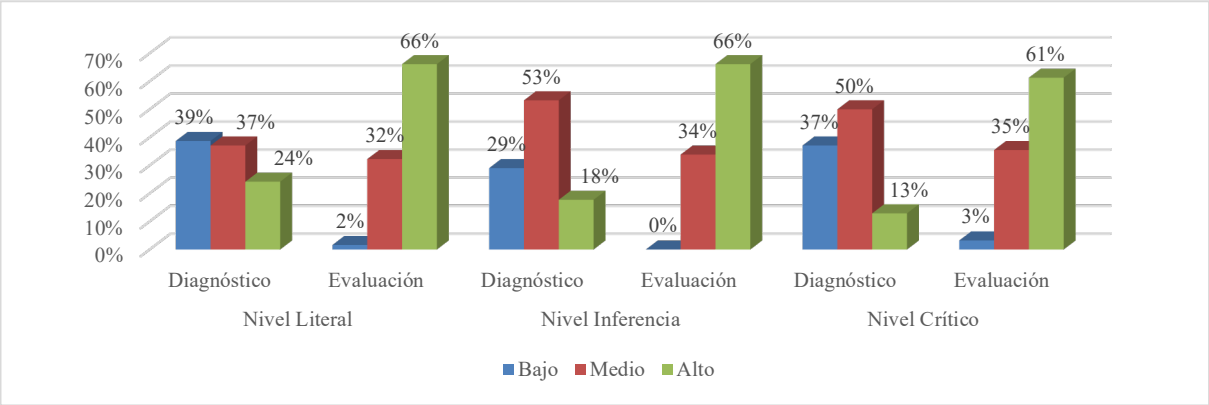
Note. The figure represents the results obtained in the evaluation carried out after applying the didactic strategy to all participants.

As can be seen in the Figure 5 the reading levels present a high score with equal percentages for the literal and inferential level (66%) and the critical level with 61%. None of the participants obtained a low score in the inferential level; however, in the literal and critical levels the percentages are very low. The results are presented below, broken down by educational institution for each of the reading levels.

Once the results of the two tests -diagnostic test and evaluation of the didactic strategy- were obtained, a comparison was made between them in order to measure the effectiveness of the didactic strategy in the participating students. In both tests, literal, inferential and critical reading levels were evaluated, making it possible to perform comparative statistical analyses. A comparison of the two tests is presented below.

Figure 6

Results Diagnostic test vs. Evaluation didactic strategy



Note. The graph shows the comparison of the results of the diagnostic of reading levels and the evaluation of the didactic strategy

It clearly shows the Figure 6 difference in results before and after the implementation of the didactic strategy. The low levels were significantly reduced in the diagnostic test with respect to the evaluation test, as were the medium and high levels.

Generate a collaborative and cooperative learning environment, in which social skills such as communication, teamwork and empathy are valued and developed, facilitating the construction of knowledge in a collective manner. They enhance the development of communicative, linguistic and cognitive competencies by promoting the use of strategies for reading comprehension, written expression, text analysis and content production, which strengthen the student's communicative skills. Consequently, didactic strategies in the teaching of reading and writing contribute to the integral development of students, fostering their autonomy, creativity, critical thinking and communication skills, and facilitating the acquisition of key competencies for their academic and personal development. The results of the Wilcoxon hypothesis test are presented below.

Table 6

Wilconxon hypothesis test

	Reading levels					
	Diagnostic Literal Level	DiagnosisInferential Level	Diagnosis-Critical Level	Evaluation Literal Level	Inferential Level Evaluation	Critical Level Evaluation
Media	0.85	0.89	0.76	1.81	1.85	1.89
	Evaluation - Diagnostic Literal Level		Evaluation - Diagnostic Inferential Level		Evaluation - Diagnostic Critical Level	
Z	-5.578*		-6.268*		-6.260*	
Asymptotic sign (bilateral)	0.000		0.000		0.000	

Note. * is based on negative ranges

With a margin of error of 0.05, it can be affirmed that the reading levels of the 62 students participating in the study have significantly improved their reading levels: literal, inferential and critical. Thus, the alternative hypothesis of the research is accepted: The use of ICT improves the learning of reading and writing in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó. This is because the didactic strategy was designed so that students would make use of ICT.

Discussion and Conclusions

Discussion

The analysis of the theoretical foundations, as well as the methodological results obtained during the research, is information that supports the research question and the proposed objectives. It should be noted that one of the purposes of the study was to develop a didactic proposal to improve the teaching of reading and writing through the use of ICT in elementary school students at the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó.

From the diagnostic test, it became evident that the educational institution attended by the students has a limited technological infrastructure. This is confirmed by all the participants, which makes it difficult to produce significant changes in current teaching, which requires the integration of ICT in the classroom. Likewise, 45.2% of the students do not have technological tools at home, which further deepens the difficulty of linking ICTs in the teaching-learning process. From the above, most of the students state that their use of ICTs is regular; when they do use them, it is to play. This turns out to be a discouraging picture, given that a large number of studies affirm the effectiveness of ICT in teaching reading.

On the other hand, the results obtained through the third part of the diagnostic test, which refers to reading levels, place the students in a medium and low level in the literal, inferential and critical levels. This is because they only respond to simple questions and inferences and identify the meaning of the text moderately. Action that responds to the objective of diagnosing the reading and writing levels of elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola Educational Institutions in the city of Quibdó.

In relation to the reading-writing levels, it can be stated that students present more difficulties in the critical level, given that they show difficulty in making judgments about the text read, accepting or rejecting it, but with arguments. This situation occurs mainly among the students of the Antonio Ricaurte Educational Institution. Likewise, it was detected that students have difficulty in identifying main ideas, not explicitly included, which should be reinforced by teachers, so that they can obtain new knowledge. However, with the implementation of the didactic strategy, the participants were able to improve their reading levels with the intervention of ICT.

These results are in agreement with those found by Canquiz-Rincón et al. (2021), who found difficulties in the inferential and critical levels of reading comprehension in the instrument applied to the students participating in the study. Likewise, they are consistent with the findings of Riveros (2020) who observed a stagnation of students in the inferential level of reading comprehension. These results are similar to those of Viramontes-Anaya et al., (2019) who examined the reading comprehension of a group of third grade students, found that most of them are placed at the literal level. Results that are also comparable to those of Bucheli-Padilla, (2019) where a group of fourth grade teachers manifested the reading difficulties of their students, the fact that they do not understand what they read. In turn, these findings are related to those of PISA 2018 tests (OCDE, 2018) where it is evident that the students evaluated in the world are placed at level two of reading proficiency, which indicates that they are able to identify main ideas of texts and recognize specific information about them.

From the above, it is corroborated that reading comprehension is an important problem to be solved by education systems worldwide. Based on the hypothesis that reading comprehension is a complex process, which students should develop at an early

age. This will allow them to adequately face the educational challenges that arise, given that these have a direct relationship with academic performance and achievement (Viramontes-Anaya et al., 2019).

Conclusions

The results of the evaluation presented in Figure 6 allow us to conclude that students improve their reading levels with the implementation of the ICT-mediated didactic strategy.

Reading comprehension and spelling are fundamental skills for proper academic performance. Good reading comprehension allows the student to understand and assimilate the information presented in academic texts, thus facilitating the learning process. On the other hand, correct spelling is essential for effective communication in both writing and speaking.

The mastery of reading comprehension and spelling directly influences the student's academic performance, since it facilitates the comprehension of the contents of the different subjects, the completion of written work and the expression of ideas in a clear and coherent manner. Therefore, it is important for students to develop these skills from early stages of their academic training in order to have a successful academic performance.

On the other hand, the condition of being male or female should not be directly associated with reading comprehension levels, since reading comprehension ability is not determined by a person's gender. However, it is true that there are gender stereotypes that can influence education and the way reading is encouraged in each gender. For example, reading has traditionally been associated with femininity, which may lead to girls being more encouraged to read from an early age compared to boys.

These differences in the way reading is encouraged can influence reading comprehension levels, since if a person has not had the opportunity to develop the habit of reading from a young age, he or she is likely to have more difficulty comprehending complex texts at later stages of his or her education.

Therefore, it is important to encourage reading equally among boys and girls, regardless of gender, so that all have the same opportunities to develop their reading comprehension skills.

Based on the above, it was possible to verify the alternative hypothesis of the research, which states that the use of ICT improves the learning of reading and writing in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola Educational Institutions in the city of Quibdó.

In relation to the reading-writing levels, it can be stated that students present more difficulties in the critical level, given that they show difficulty in making judgments about the text read, accepting or rejecting it, but with arguments. This situation occurs mainly among the students of the Antonio Ricaurte Educational Institution. Likewise, it was detected that students have difficulty in identifying main ideas, not explicitly included, which should be reinforced by teachers, so that they can obtain new knowledge. However, with the implementation of the didactic strategy, the participants were able to improve their reading levels with the intervention of ICT.

Information and Communication Technologies (ICT) can be a useful tool to improve literacy learning in elementary school students. Some ways in which ICT can contribute to this process are:

Access to educational resources: Through the Internet, students can access a wide range of educational resources such as interactive games, applications, videos and learning tools that can help them reinforce their literacy skills.

Motivation and participation: The use of digital tools and interactive activities can make the learning process more fun and motivating for students, which can increase their interest in reading and writing.

Individualization of learning: ICTs make it possible to adapt reading and writing activities to the needs and learning pace of each student, which facilitates the personalization of teaching.

Immediate feedback: Through educational platforms and apps, teachers can monitor students' progress in real time and provide immediate feedback to correct mistakes and reinforce skills.

Development of technological skills: The use of ICT in literacy learning also contributes to the development of technological skills in students, which is essential in today's society.

In conclusion, the use of ICT can be beneficial in improving literacy learning in elementary school students by providing access to educational resources, motivating and increasing student participation, personalizing instruction, facilitating feedback, and developing technological skills.

It is a priority for educational institutions to make a significant investment in the improvement of technological tools, so that teachers can make effective use of these tools for teaching and learning in accordance with the current needs of students. Likewise, an investment should be made in teacher training to provide them with the necessary digital competencies to link ICTs in the classroom and take advantage of all the benefits in teaching.

Acknowledgments

Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó

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