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Use Of Information And Communication Technologies In Reading Comprehension: A Systematic Review

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ABSTRACT

The present documentary review arises from the need to analyze from secondary sources the use of Information and Communication Technologies (ICT) in reading comprehension, so the question arose: Does the use of information and communication technologies improve understanding? reading comprehension in students?, which allowed us to formulate the research objective: Describe the use of information and communication technologies that improve reading comprehension in students.
The method adopted in the research was a review of the scientific literature, based on a documentary design, involving the stages that include exploring the sources, carrying out the filtering process to select the most significant and relevant studies, then interpreting the results and subsequently analyzing them. The type of research was a systematic, retrospective, observational review. The databases considered were Scopus, Scielo, EBSCOHOST and Sciencedirect. As inclusion and exclusion criteria, studies from the last 5 years were taken into account, which considered the research variables taking them in a general or specific way and no books, theses or conference documents were taken. The presentation of the results was used following the PRISMA method adapted from 2020.
In conclusion, Information and Communication Technologies (ICT) offer significant improvements in reading comprehension by providing dynamic and adaptive learning environments. The integration of these technologies not only makes reading more attractive, but also facilitates the understanding of complex concepts, at different levels.

Keywords*: Information and Communication Technologies (ICT), Reading comprehension.*

I. INTRODUCTION

The acquisition of high reading comprehension is of paramount importance for students at any educational level (Liu et al., 2023[1]). This skill set goes beyond simple word decoding; it involves the ability to understand, interpret and analyse texts critically (Cadme et al., 2020). Strong reading comprehension is the foundation for academic success across disciplines (Smith et al., 2020). Despite the crucial importance of reading comprehension in the educational process, there are unfortunately significant difficulties in this aspect among students, according to a report by the World Bank-UNICEF, in collaboration with UNESCO, which reveals that four out of five secondary school students in Latin America

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and the Caribbean (LAC) are expected to do so. 78% and 79%, respectively, do not reach the minimum level of reading comprehension (World Bank and UNICEF, 2022).

As a result, it has become essential to adopt innovative approaches to address this challenge. In this context, communication and information technologies have emerged as powerful tools to adapt to educational reality and mitigate barriers to reading comprehension by creating interactive experiences that stimulate interest and comprehension (Jiménez et al., 2023). By leveraging these technologies, it seeks not only to reduce difficulties in reading comprehension, but also to cultivate a dynamic educational environment that empowers students to develop critical reading skills effectively in the digital age (El Haddad et al., 2023).

Thus, this has aroused great interest in conducting research that has explored the effectiveness of the use of ICT in improving reading comprehension in students of different educational levels (Budianto et al., 2022). These studies have addressed both the comprehensive analysis of the set of technologies and the individualized evaluation of specific tools (Pérez & Barreto, 2021). This multifaceted approach allows for a more holistic understanding of how ICTs can influence the acquisition and improvement of reading comprehension skills, providing valuable insights to inform educational practices and guide future research in this area.

Given the vital importance of the topic, it is imperative to carry out an exhaustive compilation of the data presented by the latest research on the relationship between the use of information and communication technologies (ICT) and the improvement of reading comprehension in students (Armijos et al., 2023). This compilation effort seeks to synthesize and highlight the most recent contributions and advances in the field, providing an up-to-date view of the trends, challenges, and opportunities arising from the intersection between ICT and reading proficiency. Based on this, this article is proposed, which is formulated as a general question: Do the use of information and communication technologies improve reading comprehension in students? Specific questions arise: What are the information and communication technologies that are currently used to improve reading comprehension in students? What are the current challenges that arise from the use of information and communication technologies in reading comprehension in students?

It is important to carry out this review article on the use of information and communication technologies (ICT) in reading comprehension because it represents a significant contribution to the educational field by addressing a critical need to synthesize and organize the abundant and dispersed existing research. Although numerous field studies have explored the relationship between ICT and reading comprehension, the lack of a comprehensive summary of these efforts limits global understanding and makes it difficult to identify patterns and trends.

Thus, through this review article I could offer a detailed overview of current advances, the ICTs that are mostly used, and the challenges that countries, education systems and teachers are currently facing. In this sense, this review would contribute to informed decision-making in the design of pedagogical strategies and educational policies for the optimization of the use of ICTs to improve reading comprehension in current educational environments.

II. METHODOLOGY

The research methodology adopted for this study was based on the documentary design and the method of reviewing the scientific literature. The procedure was carried out through an exhaustive search for relevant studies, followed by a meticulous filtering process to select those that met the criteria of relevance and quality. The 2020 PRISMA method was used, ensuring a systematic and transparent approach in the presentation of the findings.

The search stage involved the exploration of various sources, including academic databases, specialized journals, and books pertinent to the research topic. In the search for information for this study, the use of reliable databases was prioritized, among which Scopus, Scielo, EBSCOHOST and ScienceDirect stand out. These databases were selected

for their reputation and credibility in the academic community, ensuring that rigorous and up-to-date information was obtained to support the research in question. The diversity and breadth of these sources allow for a thorough and well-founded review of the existing literature on the topic of interest.

First, the choice to conduct a systematic review involves a thorough and structured analysis of the available literature on the research topic. This methodology makes it possible to systematically synthesize existing evidence and critically evaluate the findings of previous studies (Ciapponi, 2021).

On the other hand, retrospective observational design involves analyzing previously collected data to identify retrospective patterns, relationships, or associations (Figueroa, 2020). This combination of methods provides a complete and detailed perspective of the phenomenon under study, taking advantage of the rigorous synthesis of the scientific literature along with the retrospective analysis of observational data to comprehensively address the objectives of the research.

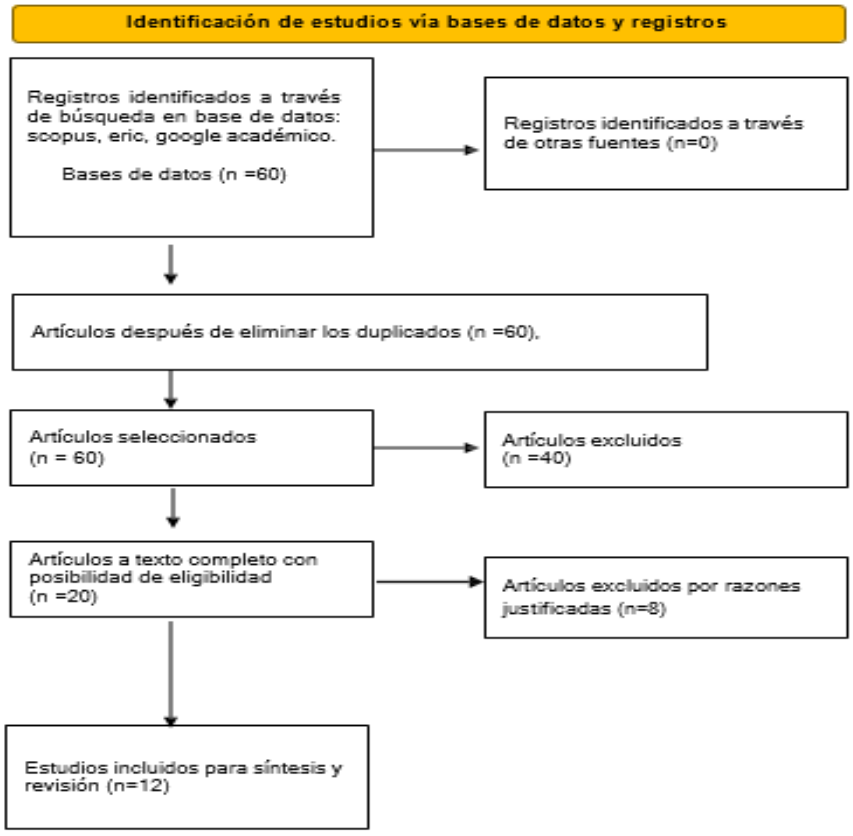
Inclusion criteria

The inclusion criteria used for the selection of studies in this research were meticulous and aimed at ensuring the relevance and timeliness of the information. Studies published in the last 5 years were considered, which allows us to capture the most recent trends at the intersection between the use of Information and Communication Technologies (ICT) and reading comprehension. In addition, articles from indexed journals of national and international origin were prioritized to ensure the quality and academic recognition of the sources consulted. The focus on the inclusion of specific research on the use of ICT in reading comprehension, either in a general way or in specific aspects, ensures a precise and detailed perspective on the topic of interest.

Exclusion Criteria

As an exclusion criterion, studies with publication dates prior to the established period were discarded, thus guaranteeing the temporal relevance of the information collected. In addition, theses, books, and conference papers were excluded in order to focus the review on research published in indexed scientific journals, which typically undergo peer review processes and meet rigorous academic standards. These criteria have been applied to ensure the consistency and relevance of the reviewed literature in the specific context of ICT and reading comprehension that is directly related to the variables studied. Figure 1 shows the process of selecting the documents.

Figure 1. Identification of studies. In Spanish language



III. RESULTS (DISCUSSION)

Key steps of this methodology included the initial identification of registries, the application of inclusion and exclusion criteria for study selection, the extraction of relevant data from included studies, and the synthesis of results in a structured manner.

The use of the PRISMA method guarantees coherence and rigor in the presentation of the results, facilitating the interpretation and understanding of the systematic review. This methodological approach contributes to the quality and transparency of the review process, allowing readers to critically assess the validity and relevance of the studies included in the research (Ciapponi, 2021).

Table 1 Number of documents included

Fountain	**Scanned Files**	**Files Included**
Scopus	12	2
Scielo	16	6
EBSCOHOST	22	3
ScienceDirect:	10	1
Total	60	12

Note. Of the articles found, 50% belong to Scielo, 25% belong to EBSCOHOST, 16% belong to scopus, 9% to ScienceDirect in the system review carried out of the study variables.

In the analysis of the documents consulted, it can be indicated that a total of 60 documents were reviewed, which were adjusted to the inclusion and exclusion criteria, of which 12 scientific articles were extracted from Scopus sources, 16 scientific articles from the Scielo source, 22 scientific articles from EBSCOHOST and 10 scientific articles were taken from Sciencedirect. Of this total, a total of 12 papers were taken and used to discuss the results of the study, which were adjusted, clear and precise to perform the analysis.

Table 2. Number of documents consulted

Fountain	File Number	General Question	Specific Question 1	Specific Questions 2
Scopus	12		2	0
Scielo	16	2	2	2
EBSCOHOST	22	1	1	1
ScienceDirect	10		1	0
Total	60	3	6	3

Note: These are the selected articles from the scopus, scielo, Ebscohost, and Ebscohost database on the review article variables.

In the findings of this review, we found that 25% of authors answer the first question, 50% of authors answer question 2, and 25% of authors answer question 3.

Table 3. Information Technology Data Content

Title	Author	Year	Fountain	Contribution
The Effect of ICT on Educational Performance: The Analysis of Reading Comprehension	Formichella, M. M., & Alderete, M. V.	2020	Scielo	Conclusion: ICTs linked to the home, especially broadband access, as well as those related to school, have a significant and positive effect on the results of the reading test.
Strengthening reading comprehension through the use of ICT as a learning strategy.	Mojica, A. M. P., Sierra, Y. P., Acosta, A. M. N., & Montaña, A. M. G.	2021	EBSCOHOST	Conclusion: the level of reading comprehension reached a high level through the use of the ICT-mediated learning environment
Factors that affect the reading	Pérez Benítez, W. E., &	2022	Scielo	The integration of ICT for learning is identified as a

comprehension of primary school students and their connection with ICTs.	Ricardo Barreto, C. T.			factor that improves reading comprehension.

Note: Articles extracted from scielo and EBSCOHOST

In the findings of this review, we found that 67% of authors agree that the use of technology tends to improve reading comprehension and 33% state that there is a link between technology and reading comprehension.

Table 4. Content on reading comprehension.

Title	**Author**	**Year**	**Fountain**	**Contribution**
The Use of Information and Communication Technologies and Reading Comprehension: Trends	Sánchez Domínguez, M. G., Pérez Hernández, J., & Pérez Padrón, M. C.	2020	Scielo	He emphasizes that educational software is the most used to improve reading comprehension.
The Impact of Video Games: "Age of Empires II" on Students' Reading Comprehension on Narrative Texts	Amin, F., & Wahyudin, A.J.	2022	Scopus	The effect of video games can be reflected in the high reading comprehension score.
Effect of Augmented Reality Applications on High School Students Reading Comprehension and Permanence in Learning.	Bursali, H., & Yilmaz, R. M.	2019	EBSCOHOST	AR apps can be effectively used as educational aids to improve reading comprehension.
Potential of Podcasting and Blogging to Cultivate Reading Comprehension of Advanced Iranian Students of English as a Foreign Language (EFL)	Azizi, Z., Namaziandost, E., & Rezai, A.	2022	Sciencedirect	The use of blogs and podcasting improves reading comprehension, and is perceived positively by students.

Flipped Classroom with Edpuzzle to strengthen reading comprehension	Briones, N., & Vera, C..	2021	Scielo	Flipped Classroom, which together with the Edpuzzle tool are consolidated to get the most out of teaching comprehension
The use of the flipped classroom model in reading comprehension.	Fahmi, R., youlia Friatin, L., & Irianti, L.	2020	Scopus	The flipped classroom as a learning strategy is directly related to high levels of reading comprehension.

Note: Articles taken from scopus, scielo and EBSCOHOST.

In the findings of this review, we found that 50% of authors agree that the use of software improves reading comprehension and 50% state that technology is a strategy to improve reading comprehension.

Table 5. Content on the scope and challenges of technology

Title	Author	Year	Fountain	Contribution
The Integration of ICT to Improve Reading Comprehension Skills: A Systematic Review of the Literature	Bin Noordan, M. & Yunus, M.	2022	EBSCOHOST	It highlights the need to provide teachers with technological literacy in order to properly integrate ICT into the teaching of reading comprehension.
Didactic strategy and the use of ICT for the development of reading comprehension in 6th year students of General Basic Education in Ecuador	Acosta, J. M. Z., Lucas, T. E. C., & Fernández, L.	2021	Scielo	The main challenge is to reduce the digital divide that exists in order to properly integrate ICTs in the teaching of reading comprehension.
Methodological strategy based on ICTs to	Gálvez, D., Leyva, J., Barrezueta, S., & Zavala, C.	2021	Scielo	Highlights the need to improve the quality of the

promote reading comprehension.	content on display

Note: Articles extracted from Scielo and EBSCOHOST

In the findings of this review, we found that 67% of authors agree that one of the main challenges of technology is to fill gaps and achieve educational quality, while 33% say that technology is a fundamental need for society.

Discussion

Reading comprehension has been a crucial area of focus in education, and its importance has led to the adaptation of learning strategies with the advent of information and communication technologies (ICTs). As these technologies evolved, they were progressively integrated into educational environments as tools to improve reading comprehension. This study is carried out with the purpose of answering the fundamental question: Does the use of information and communication technologies really improve reading comprehension in students? Exploring this question is essential to understand the effective impact of ICTs on the development of reading comprehension skills and to guide the strategic implementation of these technologies in educational environments, thus contributing to the continuous improvement of the quality of education.

Based on this, the study conducted by Formichella and Alderete (2020), which covered a large sample of 52 countries participating in the Programme for International Student Assessment (PISA), provided conclusive evidence that the adaptation of Information and Communication Technologies (ICTs) has had a positive and significant impact on students' reading comprehension internationally. By exploring this large sample, the researchers were able to observe consistent patterns that support the idea that the strategic integration of ICT in educational settings is positively linked to the development of reading comprehension skills.

On the other hand, in an experimental study carried out by Mojica et al. (2021), where an experimental group and a control group were managed, configuring two learning environments, ICT was integrated in one and not in the other. These authors corroborated that a higher level of reading comprehension was achieved in those students who developed in an environment integrated by ICT compared to those who managed in a traditional environment, therefore it is evident that ICTs significantly improve reading comprehension in students.

In fact, in the research carried out by Pérez and Barreto (2022), information and communication technologies (ICTs) are not only perceived as simple educational tools, but have been identified as a determining factor that can significantly improve reading comprehension in students. The findings highlight the importance of actively considering ICTs in education policies and school planning. The results of this study suggest that the strategic integration of ICT in education can not only enrich the learning experience, but also has the potential to positively boost students' reading comprehension skills. These findings highlight the need to adapt and optimize education policies to effectively incorporate ICTs, recognizing their crucial role in the development of foundational competencies such as reading comprehension.

The significant contribution of Information and Communication Technologies (ICT) to improving reading comprehension levels has been supported by several studies, evidencing that a technology-mediated learning environment not only favors, but enriches students' reading comprehension. This research underscores the importance of considering technology as an essential component to enhance reading comprehension skills in students,

supporting the notion that an appropriate and thoughtful use of ICTs can significantly enrich the educational process.

In response to the specific question, what are the information and communication technologies that are currently used to improve reading comprehension in students? Sánchez et al. (2020) consider that among the topics addressed are the ICTs most commonly used in educational institutions, which represent a pedagogical strategy of great help for students to improve their reading comprehension due to their ability to offer interactive and personalized learning experiences. These programs provide adaptive activities that are tailored to each student's skill level, allowing for an individualized approach.

In addition to this, other technological tools that have proven effective in improving reading comprehension and that were found in the search for documents can be indicated, such as: video games (Amin & Wahyudin, 2022) and augmented reality (Bursali, H & Yilmaz, 2019), as they provide immersive contexts that promote exploration and reading comprehension. Educational and postcasting blogs (Azzi et al., 2022) as they offer access to diverse perspectives and presentation styles, promoting the diversification of reading. Educational platforms (Briones & Vera, 2021; Fahmi et al., 2020) They integrate multimedia elements and adaptability, personalizing learning.

According to the second specific question: What are the current challenges that arise from the use of information and communication technologies in reading comprehension in students? Bin and Yunus (2022) demonstrate the effectiveness of ICT not only in students' reading comprehension but also in the motivation required to achieve it, therefore, they point out as a challenge the need to make teachers technologically literate so that they properly use ICTs as strategies and that the expected effect can be achieved and everyone's attitude improves so that learning is achieved expected.

For Acosta et al. (2021), after carrying out the results obtained from applying ICT-based strategies that improved the reading comprehension of elementary school students, the main challenge is to reduce the digital divide that exists, since not all students have access to technological resources and in fact not all educational institutions have the means to adapt ICTs to the teaching of reading comprehension by students. Therefore, policies that include everyone in the incorporation of ICT in education should be promoted. For their part, Gálvez et al. (2021) state that in order to use ICT as a tool to improve reading comprehension, it is necessary to improve the quality of the content that is exposed, since the content will not necessarily be effective for reading comprehension, so that a thorough review of the content must be made so that through it the levels of reading comprehension in people can be improved.

IV. CONCLUSIONS

After analyzing and reviewing the articles consulted in this study and in order to respond to the objectives formulated, the following is concluded:

1. Information and Communication Technologies (ICTs) offer significant improvements in reading comprehension by providing dynamic and adaptive learning environments. The integration of these technologies not only makes reading more engaging, but also facilitates the understanding of complex concepts, at their different levels. In addition, the ability to access a wide variety of digital resources and platforms allows for personalization of learning, adapting it to students' individual styles and paces. This flexibility can have a positive influence on motivation and commitment, turning out to be a predisposing factor to achieve a substantial improvement in reading comprehension skills.
2. ICTs play a crucial role in education, with educational software being the most widely used tool, followed closely by video games, educational blogs, podcasts, augmented reality and educational platforms. Educational software offers a wide range of interactive and personalized resources, while other technologies, such as video games and augmented reality, add immersive elements to the learning experience. Blogs,

podcasts and educational platforms, on the other hand, diversify access to information and promote the active participation of students, creating a more dynamic educational environment adapted to individual needs.

3. The effective implementation of ICT in improving reading comprehension faces several fundamental challenges. First, it is essential to address the need to make teachers technologically literate, providing them with the necessary training and skills to effectively integrate ICTs. In addition, the digital divide represents an obstacle, as it is essential to reduce disparities in access to technology to ensure that all students have equal opportunities. Likewise, improving the quality of digital content is crucial to maximise the impact of ICTs on reading comprehension, ensuring that resources are relevant, reliable and tailored to specific educational needs.

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