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ICT APPLIED IN EDUCATION: A SYSTEMATIC REVIEW OF LITERATURE FROM THE LAST 5 YEARS

GERARDO ALFONSO SANMARTIN ORBE[1], CHRISTIAN DAVID USHIÑA PAUCAR[2]
[1] CÉSAR VALLEJO UNIVERSITY, PERU,
EMAIL: gsanmartin@ucvvirtual.edu, ORCID: HTTPS://ORCID.ORG/0000-0001-6453-881X
[2]EMAIL: davidcdup_@outlook.es, ORCID: HTTPS://ORCID.ORG/0009-0001-0340-3556

ABSTRACT
The objective of this systematic review is to determine the potential and challenges of using Information and Communication Technologies (ICT) in learning over the past five years. The theoretical development focuses on the idea that ICTs are a very important aid in changing the way we teach. Several authors also emphasize their positive effect on individual learning, the development of thinking skills, group work, and student motivation. The PRISMA method was used to ensure rigor in the identification, selection, classification, and combination of studies. The information search was conducted in the databases Scopus, SciELO, Redalyc, Dialnet ERIH plus, and Latindex, as well as in the institutional repository of César Vallejo University, covering the period from 2021 to 2025. The results show that ICTs contribute to dynamic learning, student motivation, and the transformation of teaching methods. However, there are still problems regarding teacher competencies and the correct use of technology. Uneven integration is also evident in poor or indigenous areas; therefore, the development of fair and lasting policies is necessary to make their use more effective. This study offers new evidence on the changing role of ICTs in education, showing the importance of planning for teacher training, improving technological equipment, and creating better laws that support fair access to technology. The results can inform decisions about teaching and school management so that ICTs are used more effectively at all levels of education. This systematic review provides a clear synthesis of recent research on the use of ICTs in education, bringing together theoretical and experience-based perspectives from different situations. Its importance lies in updating what has been found after the pandemic, as well as identifying real problems that hinder the appropriate and relevant use of ICTs.

Keywords: ICT, education, pedagogical innovation, virtual teaching, technological tools.

1. INTRODUCTION

In recent years, Information and Communication Technologies (ICTs) have significantly changed teaching methods globally. The incorporation of these tools into the education system has sparked a great deal of debate about how they influence teaching and learning, as well as the challenges and opportunities they present for teachers and students (Mariaca et al., 2022).

The combination of new technological tools in the classroom has revealed clear advantages, such as increased understanding and recall of data, improved thinking skills, and improved student motivation and support (Becerra et al., 2023). In recent years, it has been seen that using techniques with technology increases motivation and success in learning; and that combining technical knowledge in teaching contributes significantly to what students do and learn.

However, despite the progress, problems persist, such as unequal access to devices and connectivity, resistance to change in traditional teaching methods, and the need to strengthen teachers' digital skills (Montalvo et al., 2022). Furthermore, the effectiveness of ICTs in improving learning remains a topic of research, particularly in terms of personalized instruction, student motivation, and the development of 21st-century skills.

Now, it should be emphasized that the use of ICTs accelerated due to the health crisis that occurred a few years ago, forcing schools, teachers, and students to rapidly shift to new ways of learning. This demonstrated both the potential of these tools and the differences that exist in their access and use. Therefore, it is a good time to study how ICTs can truly help in the ways of teaching and learning.

Based on the above, it is very important to understand the current state of the literature on the application of ICT in education, to see trends, theoretical and practical approaches, as well as the flaws and strengths that academic literature has taught in recent years. Therefore, the following research question is posed: What are the greatest potentialities and challenges of the application of ICT in education during the last five years?

Similarly, to answer this question, the general objective is to determine the potential and challenges of using ICTs in education over the past five years. To do this, the following specific objectives are proposed: to identify the main advantages of ICTs in classrooms and learning at various levels of education; to analyze the challenges and difficulties in bringing ICTs into teaching for both teachers and students; and to propose ways to improve the use of ICTs in various educational environments.

2. THEORETICAL REFERENCE

To begin this literature review, it is necessary to mention that ICTs have become important tools in today's teaching, aiding communication and interaction between teachers and students outside the classroom. According to Del Padre et al. (2022), these things make it easier to find information quickly, adapt learning to each individual, and provide unique support to those with disabilities or those with limited skills, using educational programs and virtual platforms.

In this sense, the literature found shows that the use of ICT creates places where students can work together and help each other, as well as places to learn by themselves, helping to build important learning. Espinosa's study (2024) says that ICT have made a significant change in how we teach, promoting constructive and cooperative ways where the student is very important in their learning. However, it shows that this change also brings great challenges, such as the need for constant updating of everyone in the educational system, from directors, teachers and students, to adjust to new technological and social proposals.

On the other hand, Barrios and Delgado (2021) visualize the "effects of ICTs on teaching, noting that training is very important for the growth of digital skills in teachers and students. These authors say that constant learning in new technologies and what people would like to use are key for ICTs to act as tools for educational renewal. They also say that ICTs help improve basic skills and create a student-centered learning environment, which leads to better academic performance and innovation in teaching methods.

Now, Agüero and Dávila (2023) focus their analysis on how education is managed and administered and how to properly use technological tools in basic education. These authors say that to properly use digital tools, it is necessary to have teachers with good skills and leadership that wants to try new things and improve all the time. They also point out the importance of changing the ways of teaching today's type of students, who demand more fun and dynamic methods where they can participate so that they remain attentive and motivated.

As shown in this literature review, technologies are a very useful tool for changing education, since they allow learning to be more active, collaborative, and personalized. However, their correct use requires several elements, including ongoing training and a positive attitude among teachers, dedicated leadership in schools, and methods that are adapted to the needs of today's society. It is very important to overcome the technical, social, and pedagogical barriers that hinder their use, ensuring fair access and encouraging careful consideration of teaching methods.

3. METHODOLOGY AND MATERIALS

This systematic review was conducted using the PRISMA method (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which ensures transparency, rigor, and reproducibility in the selection and analysis of the scientific literature.

This method was used because it provided a set of indicators to carefully write down each step of the reading process, from the idea of the question to the selection, detailed review, and integration of the chosen studies. It also has a graphic scheme that makes it easy to graph the path taken to search for and select the literature, ensuring that others can do the same and reducing errors in reading about ICT in teaching over the past five years.

Thus, to answer the search question and achieve the proposed objectives, a careful search was conducted in the Scopus, SciELO, Redalyc, Dialnet, Erih Plus, Latindex, and César Vallejo University databases, considering publications from 2021 to 2025. Similarly, certain inclusion and exclusion parameters were used to select the studies.

The inclusion criteria used are presented below:

1. Year of publication: Only studies published between 2021 and 2025 were selected.
2. Language: Texts in Spanish or English were analyzed.
3. Type of study: Research studies that provided real results or articles that were reviewed and showed reliable data were selected.
4. Thematic relevance: Studies that addressed the use, effects, possibilities, and problems in the application of ICTs in teaching at any educational level.

Furthermore, the following exclusion criteria were applied:

1. Year of publication: Studies published before 2021 were not analyzed.

2. Language: Documents not in Spanish or English were excluded.

3. Type of study: Editorials, personal opinion documents, and research that did not present reliable results were eliminated.

4. Thematic relevance: Articles that did not focus on education or the use of ICTs in educational contexts were excluded.

In this systematic review, Boolean operators were used as a fundamental tool to ensure a precise and exhaustive search in the selected databases. These operators allowed for the combination of key terms, the integration of synonyms, and the connection of fundamental concepts to the study object.

For example, the OR operator was used to broaden the search spectrum by incorporating synonyms and equivalent expressions such as "ICT" OR "information and communication technologies."

This strategy allowed us to find documents that used different names for the same concept. The AND operator was used to establish the relationship between the main concepts of the study, ensuring that the results simultaneously included elements such as ICT, educational processes, and levels of education.

Thus, the general search formula used in the Scopus, SciELO, Redalyc, Dialnet, ERIH Plus, Latindex databases and in the institutional repository of the César Vallejo University was the following: ("information and communication technologies" OR ICT OR "information and communication technologies" OR ICT) AND (education OR teaching OR learning OR education OR teaching OR learning) AND (integration OR implementation OR use OR integration OR implementation OR use) AND ("educational level" OR "basic education" OR "initial education" OR "secondary education" OR "higher education" OR "primary education" OR "secondary education" OR "higher education").

This formula was adapted to the specific search fields of each database, such as titles, abstracts, and keywords, and additional filters were applied to limit the results to documents published between 2021 and 2025. This ensured the relevance, timeliness, and pertinence of the selected studies in addressing the objectives of this research.

In addition to the use of Boolean operators and the search method mentioned above, the PRISMA method flowchart was also used as an important methodological tool to ensure transparency, rigidity, and follow-through throughout the review. This flowchart graphically demonstrated the path followed from the initial book search to the final selection of useful studies, showing how many documents were reviewed in each section and the criteria used to include or eliminate them.

Thus, the phases applied to this work were as follows:

1. Identification: This phase consisted of the initial search for studies using the formula proposed in the selected databases, which allowed us to gather a large number of potentially relevant publications on ICTs in education.

2. Elimination of duplicates: In this phase, the results obtained in all databases were compared, and records that appeared more than once were eliminated. This stage was essential to avoid duplication bias and ensure that each study analyzed was unique and would not distort the interpretation of the findings.

3. Initial review: In this stage, an initial review of the titles and abstracts was carried out to identify whether the studies clearly addressed the central research topic, discarding those that did not specifically address the use or impact of ICTs in educational contexts.

4. Eligibility Assessment: The full texts of the preselected articles were reviewed in their entirety. At this stage, the previously defined inclusion and exclusion criteria were applied; studies with an empirical or theoretical focus that addressed the application, integration, or impact of ICTs in teaching-learning processes at any educational level, published in the last five years, were included.

5. Final Registration: At this stage, the set of studies that met all the requirements and were considered relevant for detailed analysis was consolidated. These documents formed the final part of the review, from which the main potentialities of ICTs in education, the challenges associated with their implementation, and the proposed measures to improve their integration in various educational contexts were identified. The use of the PRISMA diagram made it possible to clearly document how many studies were excluded at each stage and for what reasons, providing methodological soundness and transparency to this study.

To better organize the information from the studies selected in the previous phase, the documents included were organized and analyzed using a data extraction matrix. This tool was essential for systematizing the information in a coherent manner, allowing for a comparative and analytical analysis of the different selected studies.

The matrix served as a structured collection of key data, facilitating the identification of patterns, common findings, and gaps in the literature on the application of ICTs in education over the past five years. The structure of the data extraction matrix used is presented below:

1. Authors.
2. Year of publication.
3. Objective of the study.
4. Methodology.

5. Results regarding the application of ICTs in education.
6. Conclusions.

This structure allowed for comparing the studies from multiple perspectives, identifying common trends across different educational contexts, and classifying the most relevant contributions based on the objectives of this review. The matrix also served as a basis for organizing the narrative synthesis of the results, establishing a clear bridge between the data obtained and the conclusions drawn. This rigorous procedure ensured a critical and objective reading of the available evidence, which strengthens the validity and usefulness of the findings obtained in this study.

4. RESULTS AND DISCUSSION

Table 1 Data extraction

Author(s)	Year	Objective of the Study	Methodology	Main Results	Conclusions
Ambuludí & Cabrera.	2021	To identify the difficulties faced by teachers at the "María del Carmen Gavilanes Tenezaca" school when using digital resources and technological tools in the educational process.	Mixed approach (quantitative-qualitative).	The results show that most of the teachers surveyed found the shift to online teaching challenging, primarily due to their lack of experience with digital tools. Qualitative interviews confirmed that the transition to virtual learning at the beginning of the pandemic was complex for educators, who felt ill-prepared to navigate these new environments, especially because the training offered was not sufficiently practical.	Despite the initial difficulties experienced during the transition to virtual learning, teachers unanimously recognize the value of technological tools in improving student learning. Consequently, there is a strong consensus among them on the need to implement an effective training plan that allows them to take full advantage of the potential that ICTs offer in education.
Mercedes & Bennasar.	2021	Study how information and communication technologies are used in educational processes at the secondary level.	Descriptive field research.	The research findings indicate that the majority of students have limited ICT proficiency, as evidenced by their limited participation in educational exchange activities that employ these tools. Furthermore, a nascent culture of using ICT as a means for collaborative learning was noted. Despite these limitations, a favorable disposition was identified among students to explore and learn about ICT as an educational opportunity.	The research concludes by suggesting the widespread adoption of pedagogical strategies that incorporate ICTs in various disciplines and in all educational institutions, regardless of the level or type of education. Additionally, the planning and implementation of training courses for teachers is considered crucial to optimize the use of ICTs as tools for improving school activities.
Bilbao.	2021	Analyze the use of ICT to implement project-based learning as an emerging strategy with a	Quasi-experimental research.	The implementation of ICT-mediated project-based learning did not demonstrate a substantial improvement in overall academic performance. However, the study did	The conclusion is that it is necessary to promote PBL and ICT in Primary Education. The combination of student-centered methodologies with engaging and

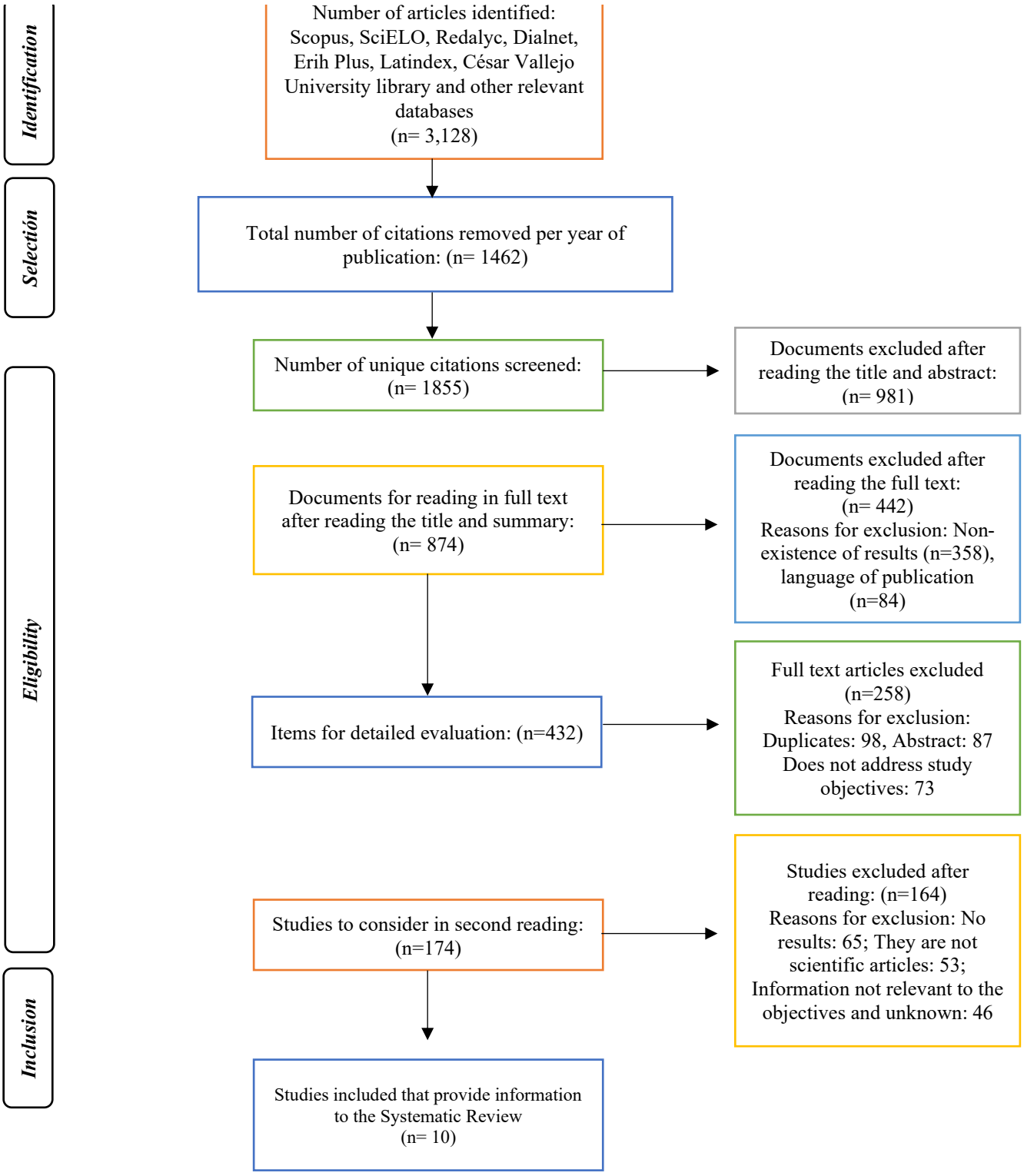
		strong impact on learning.		show statistically significant increases in content recognition, active participation, collaboration, satisfaction, and motivation among students. Through this approach and the use of technology, students develop meaningful learning through direct inquiry and reflection.	innovative resources represents a unique opportunity for educational transformation in the 21st century, where classroom knowledge is intrinsically linked to the use of digital devices.
Díaz et al.	2021	To analyze the influence of the COVID-19 pandemic on the use of ICTs for the academic development of students at the University of Guayaquil in their virtual learning modality.	Non-experimental research	The results revealed a lack of institutional and personal preparation for the abrupt shift to online classes. Despite having the technological knowledge and resources, the lack of adequate planning and difficulties in managing the platforms hindered effective interaction during synchronous classes, preventing an optimal teaching-learning process.	It is concluded that the positive perception of ICTs in teaching and learning among the Guayaquil university community represents an opportunity for the institution. However, it is recommended to provide technological tools and, crucially, improve ICT training, especially given the virtualization imposed by the pandemic.
Toala & Cevallos.	2022	To analyze the relationship between the use of ICT and virtual education in the high school of the Cinco de Junio Fiscal Educational Unit, Manta, Ecuador.	Descriptive field research.	The results show that 23 teachers reported a lack of institutional resources; however, the motivation to use ICTs is evident. All respondents recognized the positive influence of their colleagues' ICT-based teaching practices on their daily work, as many use their own resources to modernize their teaching.	All teachers agreed on the importance of ICTs for technological and didactic innovation in high school classrooms. Therefore, it is concluded that ICTs in virtual high school education foster active student participation and improve teaching performance.
Vega et al.	2021	To analyze the influence of demographic and professional variables on teachers' perceptions of the use of ICTs in inclusive education, and to validate the structure of the measurement instrument used.	Descriptive and quantitative research.	The research results indicate that, in general, teachers have a positive view of the use of ICTs in the context of inclusive education. However, it is notable that teachers specializing in Hearing and Language and Therapeutic Pedagogy have an even more positive and pronounced perception of the benefits of technology integration in this educational setting.	The research concludes that there is a high level of agreement among teachers regarding the benefits of ICTs for their professional development, indicating a potential motivation for their implementation. This finding contrasts with less consensus in the dimension related to teaching practice.

Avendaño	2021	To analyze how ICTs are used in multi-grade indigenous primary education in communities in southern Mexico.	Quantitative approach.	The study's findings indicate that multi-grade Indigenous primary school students incorporate ICTs into learning activities; however, the greatest incidence of these technologies is observed in basic and traditional tasks, such as locating information and browsing websites.	It is concluded that teachers are important in the effective use of ICTs in education because their level of integration directly influences that of students. The impact of ICTs on learning depends largely on teachers' competencies and their teaching style. Therefore, teacher training in the use of ICTs is essential to support student learning.
Gil Del Pino et al.	2023	To analyze, through an exploratory case study in a rural setting, the relationship between the use of new technologies and the academic performance of primary school students.	Quantitative research.	This study found that primary school students' use of ICTs was not negatively correlated with their academic performance. Despite significant use of computers and internet-enabled devices, primarily for recreational activities, they were also used for educational tasks. Given the overall good academic performance, this research does not support the conclusion that ICTs have a negative impact on student performance.	It is concluded that the constant development of ICTs is profoundly transforming society, exposing everyone to an accelerated process with benefits for skills development and global expansion, but also with risks if not used properly.
Arteaga.	2023	To study how ICTs influence the academic performance of secondary school students in mathematics in Chachapoyas, Peru.	Non-experimental cross-sectional descriptive correlational causal research.	Statistical analysis using Spearman's Rho test revealed a moderate relationship between the level of use of Information and Communication Technologies (ICT) and academic performance in mathematics among students at the Nuestra Señora de Guadalupe Educational Institution, located in the district of Balsas, province of Chachapoyas, department of Amazonas.	It is concluded that it is necessary to strengthen the infrastructure and strategies related to virtual technologies to enhance students' academic performance in the area of mathematics.
Mateus et al.	2023	To analyze two Peruvian experiences using ICTs for the inclusion of diverse students, in order to guide new applications in digital, inclusive, and	Qualitative research and systematic review.	The results revealed that the integration of ICTs in inclusive Peruvian educational contexts fostered pedagogical changes among teachers, developing their communication skills during the pandemic. While new technical competencies are recognized, their value lies in their combination with social	The conclusion is that the implementation of ICTs in inclusive educational contexts generates motivation and benefits for students, especially in information search and social media use. Despite the challenges ahead, progress is observed, and the importance of

	welcoming education.	and pedagogical skills, promoting self-learning and collaboration. However, gaps were identified in accessible student registration, limiting follow-up.	collaboration for more inclusive education is highlighted.

Source: Own elaboration

Ilustración 1 Search diagram



Source: Own elaboration

The results obtained in the studies by Ambuludí and Cabrera (2021), Díaz et al. (2021), and Toala and Cevallos (2022) agree that one of the most important challenges in the implementation of ICTs in educational contexts is the lack of teacher training and insufficient institutional resources.

Despite the growing recognition of the pedagogical value of ICTs, teachers face limitations ranging from limited practical training to a lack of adequate equipment. This lack of support prevents the proper and long-term use of computer tools, which causes anger and rejection among teachers. However, the same studies indicate a positive reaction to ICTs, which indicates that, with the best help, there is a place ready for great change.

On the other hand, studies such as those by Mercedes and Bennasar (2021) and Mateus et al. (2023) emphasize student motivation and openness to using technologies, even if their technical level is low. This is an important educational opportunity, as it allows digital skills to grow alongside course learning. These authors point out how ICTs in even-numbered settings not only help with learning, but also foster teamwork, social, and creative skills, creating fairer and new learning environments.

Regarding active forms mediated by ICT, the Bilbao study (2021) on PBL shows that, although academic results did not improve significantly, motivation, collaborative work, and interest in studying did increase. These new data reinforce the idea that ICT, when combined with teaching styles that put the student at the center, can bring about important changes in the educational model, achieving more useful and lasting learning.

Also, the works of Avendaño (2021) and Gil Del Pino et al. (2023) highlight how key the social and cultural context, and the level of education are in knowing how ICTs will affect. In rural or multi-grade areas, ICTs can be something positive or negative depending on the use made by teachers and the available infrastructure. What was found shows that, although students use technologies mainly for "easy" things; the opportunity to help them in the development of skills is great if teachers have good training.

Finally, studies such as those by Arteaga (2023) and Vega et al. (2021) provide evidence of how ICTs impact clear subjects such as mathematics and in education for all settings. Both examples show that the proper use of technology helps improve school work and the professional growth of teachers. However, there are also structural problems and ways of doing things that need to be solved with clear school rules, ongoing training programs, and more money for technical resources.

5. CONCLUSIONS

In summary, this systematic review identified that Information and Communication Technologies offer great potential for education, especially in promoting active methodologies, strengthening student motivation, and improving educational quality in diverse contexts. Studies such as those by Bilbao (2021), Mateus et al. (2023), and Vega et al. (2021) demonstrate how ICTs can transform learning environments when used with a clear pedagogical purpose and under appropriate conditions.

However, challenges persist. The digital divide, unequal access, and lack of teacher training remain significant obstacles, as noted by Ambuludí and Cabrera (2021), Díaz et al. (2021), and Toala and Cevallos (2022). These limitations primarily affect rural communities, indigenous education settings, or centers with limited institutional resources, where the use of ICTs has not yet been fully consolidated.

Another key aspect is the need for comprehensive educational policies that promote ongoing teacher training, equitable access to technologies, and methodological innovation based on the responsible and strategic use of ICTs. The recommendations of Avendaño (2021), Arteaga (2023), and Gil Del Pino et al. (2023) agree that teachers are central to achieving the effective integration of technologies into teaching.

Therefore, it is concluded that, to fully exploit the opportunities offered by ICTs in education, it is essential to move toward a critical, pedagogical, and contextualized integration of technologies, which considers both the strengths and weaknesses of the educational environment. Only in this way will it be possible to consolidate a more inclusive, innovative education adapted to the demands of the 21st century.

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