Integration of the use of information and communication technologies in the tracking process

Integración del uso de las tecnologías de información y comunicación en el proceso de enseñanza

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Abstract

The learning process in educational institutions is the result of the development and society changes in benefic of the state. For this reason, the education system require changes to adapt to the needs of the education environment. With the digital age, the technologies are been used in all spaces of the daily life, including education, they are more frecuent, because it can be used it inside or ourside the classroom. In that sense, the porpouse of this investigation is manager to analize the technological tools used for the integration of ICT in the teaching process. The theoretical context that underpins the research contributed to the description of theories and concepts based on the technological tools implemented by teachers for pedagogical development. The research was developed with a qualitative methodology, with an interpretive approach, under the hermeneutic method in order to collect information from bibliographic reviews. It is concluded that there are various technological tools known to students, but they are not addressed in a timely manner by teachers. They help in collective work, self-training, research, critical and reflective thinking, developing creative skills and actively participate in the development of the class.

Keywords: Integration of ICT in education, technological tools in pedagogy, pedagogical development of ICT, Educational innovation with ICT.

Resumen

El proceso de formación de las instituciones educativas es el reflejo del desarrollo de la sociedad y de los cambios sociales en beneficio del Estado. Para ello, se requiere del sistema educativo que se adapte a las necesidades del entorno educativo. Con la era digital, el uso de las tecnologías en todos los espacios de la vida cotidiana incluyendo el educativo se hace más frecuente, ya que, son muchas las herramientas tecnológicas que se pueden usar dentro y fuera del aula de clase. En este sentido, el propósito de esta investigación está dirigido a analizar las herramientas tecnológicas usadas para la integración de las TIC en el proceso de enseñanza. El contexto teórico que fundamenta la investigación contribuyó a la descripción de teorías y conceptos basados en las herramientas tecnológicas implementadas por los docentes para el desarrollo pedagógico. La investigación se desarrolló con una metodología cualitativa, de enfoque interpretativo, bajo el método hermenéutico a los fines de recabar la información desde las revisiones bibliográficas. Se concluye que existen diversas herramientas tecnológicas conocidas por los estudiantes, pero no se abordan de manera oportuna por los docentes. Ayudan en el trabajo colectivo, la autoformación, la investigación, el pensamiento crítico y reflexivo, a desarrollar habilidades creativas y participar activamente en el desarrollo de la clase.

Palabras clave: Integración de TIC en la educación, herramientas tecnológicas en la pedagogía, desarrollo pedagógico de las TIC, Innovación educativa con TIC.
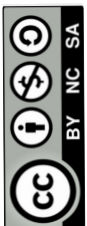
Introduction

ICTs are developing in all areas of society, where new methods and technological forms are being incorporated to help individuals in their daily lives, fostering dependence on technologies in scientific, work, social, and educational activities. In this way, the integration of ICTs in the pedagogical process is continuously growing, creating innovative resources for actors to use in the school environment, as stated by Araya & Majano (2022), "The use of technological tools and the application of the virtual classroom in the didactic process are means that facilitate learning" (p.5).

Thus, the integration of ICTs in education promotes personalized learning, based on the fact that each student has different realities and learns in different ways, encouraging the development of creative skills, autonomy, and responsibility for developing knowledge, critical and reflective thinking, problem-solving, through the teaching strategies of educators in learning spaces, with educational technological tools that are available and easily accessible to the actors involved in the pedagogical act.

In this sense, digital resources in the educational field for the integration of ICTs are feasible for both teachers and students, facilitating communication among the actors in the process. These include various technological tools with or without web connection, with diverse applications in the educational field. These range from virtual environments, software, and educational games, to information search and sharing, apps, multimedia content, and online communication.

Furthermore, these technological tools are used for solving academic activities through the consensus of ideas, in interactive forms, in real-time, and remotely. Hence, the need arises to identify the technological resources to be applied by teachers that adapt to the content in order to address individual weaknesses presented during the class.

It is important for teachers to update themselves in this digital area to reduce the gap caused by technological illiteracy among educators. Since innovations in didactic resources are not aligned with teacher training, while young people, as digital natives, handle technologies naturally from home. They use mobile devices, computers, and tablets with multiple applications for the development of their daily and academic activities.

In this context, the current teaching process is traditional, oriented toward fulfilling objectives, as classical exams and mechanistic learning prevail to achieve subject approval. This limits the effective incorporation of ICTs in classrooms due to teachers' resistance to educational innovations. This contributes to the practice of banking education and students' reluctance to use ICTs as a medium for sharing knowledge inside and outside the classroom.

Therefore, the researcher decides to intervene in the issue that daily arises in classrooms, motivated by the lack of technological strategies in the educational process. Hence, the following question arises: What technological tools are used for the integration of ICTs in the teaching

process? These tools should be directed by teachers in a didactic way to improve students' academic performance, enhance sociability, and promote comprehensive education to keep up with the digital age.

Methodology

The methodology applied is framed within the qualitative paradigm using an interpretative approach, with the aim of analyzing the technological tools used for the integration of ICTs in the teaching process. The design employed is documental, through consultations of authors in peer-reviewed journals available on the web over the last 9 years, which provide an updated view of technological innovations in the educational field.

In this regard, keywords were used, including: integration of ICTs in education, technological tools used in pedagogy, pedagogical development in ICTs, and educational innovations with ICTs. Likewise, an inductive-deductive analysis was conducted for data treatment.

Results

The integration of ICT has fostered human dependence in all daily activities of society, according to Montoya et al. (2019). Therefore, education and the teaching process must stay at the forefront of the digital age, as mentioned by Flores (2020), "The information and knowledge society has driven the use of information technologies in our work, personal, and academic activities" (p. 45). In this way, in the academic field, ICTs are the means through which the teacher uses any technological resource so that the actors socialize knowledge before, during, and after the pedagogical act, through didactic strategies that enhance the teaching process.

In the field of education, the application of ICT by teachers and students presents a wide variety of resources for educational spaces, according to Toro (2017). First, without web connectivity, mobile devices, computers, and tablets can be used as technological tools to watch videos, use software and educational games, slideshows, infographics, and multimedia content. Terms such as gamification emerge: it involves teaching and solving problems through educational games that motivate students to learn in a creative way, according to Espinoza et al. (2023).

At the same time, technological resources with internet use offer a range of technological tools, such as virtual environments like Moodle, Canvas, and Classroom: these allow teaching classes and workshops remotely, sending multimedia content, assigning activities, tracking tasks, and evaluations. They also allow forums and personalized tutoring. During activities, students can interact with the teacher in real-time and also with each other to create any content.

Similarly, with internet use, interactive courses, multimedia content, virtual libraries, educational software, online training, and personalized tutoring are available, allowing for the assignment and evaluation of academic activities, improving collaborative work, and individual learning, as stated by Pandolfi (2024). Additionally, AI-powered chatbots create systemic learning processes
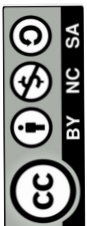
to reinforce the unique aspects of each student, according to Caballero & Brítez (2024).

Similarly, Mejias & Gómez (2017) point out that internet use in the daily activities of society is very frequent, and in the educational field, it is used by both students and teachers as a means to transmit or search for information to develop a topic, learn new content, or reinforce what was learned in class, as highlighted by Gómez *et al.* (2021) and Céspedes *et al.* (2020). Furthermore, there are many pedagogical activities (educational games, forums, chats, videos, among others) for online study and continuous learning, providing teachers with the ability to constantly update their academic training, as stated by Caballero & Brítez (2024) and Kerr & Mckensy (2022).

On the other hand, in this digital era, the educational realities of students shape the teaching and learning process, the level of comprehension, and decision-making, improving individual activities effectively, as noted by Céspedes *et al.* (2020). In the technological field, with a variety of innovative resources, the teacher must train and educate students in the use of ICT tools, as mentioned by Tapia *et al.* (2023). Moreover, they bring significant advantages such as personalized training using social networks, reinforcing content through multimedia forms available on the web, simulation of practices, and collaborative work, as noted by Montoya *et al.* (2019).

In the same way, the correct use of social networks in the educational field brings benefits as it makes the teaching process more flexible, according to Chávez & Barahona (2024). The student takes ownership of the learning process based on their learning level and becomes involved in study communities through video and interactive chat, allowing them to attend conferences, workshops, and personalized tutoring, which increases class participation and dialogue for educational purposes among peers, as noted by Gil & Calderón (2021) and De La Hoz et al. (2015).

Moreover, social networks create paradigms for teaching methods, with WhatsApp, YouTube, or Facebook being the most used networks for entertainment or personal interests, as noted by Céspedes *et al.* (2020). They are also used as study groups for common activities, sharing content (chat, audio, video, and text), and conducting academic practices or training workshops in real-time from different locations, as noted by Gil & Calderón (2021).

Flores (2020) emphasizes that through ICT tools, the contents of one or more curricular units can be made known, offering students multimedia activities and participatory classes that capture their interest in learning, according to their learning channels and styles. Reinforcing content at home can be improved through didactic strategies recommended by teachers using ICT tools for the topics assigned in class, creating study autonomy in the learning process, as noted by Montoya *et al.* (2019).

In this regard, the constant use of the virtual world requires an innovative and technologically updated teacher. The educational field presents a challenge due to the existing digital divide between teachers and students, as noted by Pandolfi (2024) and Kerr & Mckensy (2022). Hence, there is a need for teachers to constantly train through various virtual platforms available on

the internet, which provide information on various topics to develop pedagogical skills in the area of ICT, as stated by Caballero & Brítez (2024).

Finally, the integration of ICT tools during class development should establish clear planning regarding what is intended to be achieved by using the technological resource. Additionally, time management should be organized before, during, and as a reinforcement after the pedagogical act. Furthermore, processes should be incorporated to provide technical support to students during the use of technological tools, as noted by Cerna & Maguiña (2022). Likewise, the relevant resource should be selected based on the content that is functional for the class and well-known by the students. All of this requires constant updating of teaching staff for the effective use of ICT during the teaching process.

Discusion

In the new technological landscape, teachers are immersed in a pedagogical paradigm where the teaching process faces challenges with the incorporation of ICT as a means to present content. This article addresses alternatives proposed by various authors that provide answers to which technological tools are used to integrate ICT into the teaching process, utilizing technological resources with or without internet connection for the development of teaching work. Educational institutions must innovate to become attractive to students, streamline educational processes, and make them more effective and efficient.

To begin, regarding digital resources, Araya & Majano (2022) mention that there are many technological tools that allow teachers to innovate in content development. At the same time, Izquierdo (2021) points out that resources implemented as didactic strategies that allow the transmission of knowledge in an enjoyable and engaging way for students can be considered a technological innovation in class development.

In fact, Montoya et al. (2019) state that all these devices, such as phones, tablets, and computers, are used by individuals in their daily lives. However, the use of these resources in the pedagogical field enables meaningful learning, as related to Flores et al. (2024) and Gómez et al. (2021). Additionally, the use of educational software on these technological devices in specific curricular units provides great relevance in achieving objectives for class development, as noted by Flores (2020).

Thus, it is affirmed that within ICT tools, there are resources, software, and games used in the pedagogical act without an internet connection to solve various academic activities. In this context, teachers incorporate videos and slides through video beams to display content. They use educational games for different tasks such as recognizing letters, teaching addition, learning languages, and more. They also download books and virtual libraries for reading and research offline, both in and out of class, aiming to create innovative pedagogical processes that engage
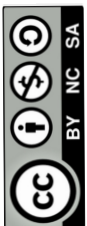
students' interest in the class and improve academic performance, in line with Paredes *et al.* (2024).

On the other hand, with the incorporation of the internet as an ICT tool, there is greater capacity for using technological resources, software, information search, and online learning. Thus, the internet has enabled technological advancement, leading to the emergence of the digital age. Izquierdo (2021) portrays the internet as a new vision of teaching due to its ability to interconnect borders through the virtual world and the vast amount of available content: chat, audio, video, text, and images, which can be used remotely, in any space, and in real time, as emphasized by Kerr & McKensy (2022); Mejias & Gómez (2017); Céspedes *et al.* (2020).

Furthermore, given the potential of the internet in the academic field, teachers, using different virtual platforms, can generate didactic strategies for the teaching process that strengthen critical thinking, self-education, continuous research, and the proper use of technological resources at home, as discussed by Mesa *et al.* (2019) and Cerna & Maguiña (2022). Therefore, it is argued that the internet breaks the barriers of the traditional classroom, creating new learning environments without existing borders, with multidisciplinary content in multimedia forms for different students, each with their own limitations, in real time.At the same time, with the use of the internet, social networks emerged as the most widely used communication technological tool in all areas of society and as a teaching process for students and teachers. Authors Gil &Calderón (2021); Chávez & Barahona (2024); Flores *et al.* (2024) reflect on how these new study environments allow participants to create autonomy based on their learning pace, enabling knowledge sharing through collaborative workspaces where everyone contributes to solve academic activities assigned by the teacher.

Also, De La Hoz *et al.* (2015) emphasize the importance of collaborative work manifested in social networks, where through virtual groups, students self-learn, learn from their peers, and contribute knowledge of the content studied in real-time (Céspedes *et al.,* 2020). Based on the above, the researcher affirms that social networks, when properly used in the teaching process, influence the creation of students with independent learning processes and stimulate teamwork by providing real-time content to build consensus in the development of academic activities.

Regarding the teacher's role, Flores *et al.* (2024) and Montes (2023) highlight that teachers must be researchers, guides, and mediators who help students understand their realities, reinforce what they've learned, and contextualize it with the environment around them to obtain useful learning in the pedagogical field and in their professional, social, and cultural lives (Cerna & Maguiña, 2022). Similarly, a creative teacher produces positive results by seeking different ways to plan, including ICT in the pedagogical work through clear objectives, a methodological and technical process of what, how, and when ICT tools will be used to develop the class, as pointed out by Gómez *et al.* (2021) and Acuña e*t al.* (2024).

Rosendo *et al.* (2023) argue that educational institutions, according to their technological capabilities and existing realities, are experiencing changes by incorporating innovative resources

into the training process. At the same time, Paredes et al. (2024) state that teachers must break the paradigm of traditional teaching methods because, in some cases, the technological illiteracy of teachers reduces the use of didactic resources in the teaching process. However, with the use of a systematic process through virtual environments where they are trained in technological skills, it may help reduce the existing gap, according to Rosendo et al. (2023).

Therefore, the analyzed articles reveal that there are different tools for integrating ICT into the teaching process during the student's training period. They also demonstrate that technologies are widely known and used by students to assist in the development of various academic activities. In fact, it is affirmed that technology helps foster independent learning for students and creates new learning environments.

Nevertheless, there are currently limitations when incorporating ICT into the teaching process due to the lack of teacher training in managing technological resources. Teachers are not prepared to use technology in their daily activities, as they do not have technical support on how and when to apply technological resources in the classroom. To address this, teachers must be encouraged to engage in continuous research and use of ICT tools in the teaching process.

Finally, the benefits of correctly applying ICT tools in learning spaces result in participative, research-driven students with the capacity to innovate in the academic process, allowing them to take research beyond the knowledge provided by the teacher, with multiple applications and virtual environments for students' self-education in any area of knowledge, and applying it in daily contexts.

Conclusions

The ICT tools are the means by which teachers socialize content in a creative, multimedia, real-time, and remote manner. Therefore, these technological resources, such as mobile phones, computers, and tablets, can be used without internet connection in the development of the lesson, projecting educational videos, scientific content, and various information, in addition to slides, infographics, games, and educational programs that simulate interactive exercises and activities.

On the other hand, technological devices with internet connection offer scientific information in multimedia form or in updated and interactive digital databases, distance learning, educational games and software, emails, chat, blogs, virtual environments, and social networks. All of this helps reinforce students' weaknesses and needs, motivate interest in individual learning, and promote idea exchange between peers and teachers.

Furthermore, virtual environments such as Moodle and Classroom provide distance learning processes with interactive and personalized classes, allowing for activity scheduling and evaluation recording. Similarly, social networks create study communities or groups for collaborative work, consensus-building of ideas, and information exchange between students and teachers
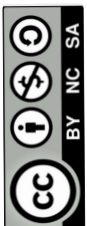
via WhatsApp, Facebook, or various applications found on the web.

Additionally, there are educational games and software that simulate real-life content, such as Duolingo (an app for learning languages), along with programs for coloring, vowels, puzzles, math, and physics simulators, among others. These devices allow access to various applications like slides, infographics, educational videos, forums, and conferences, which can be incorporated as didactic strategies in the pedagogical act through tutoring between teachers and students inside and outside the classroom.

Finally, the integration of ICT tools into the teaching and learning process will directly depend on the teacher's training and preparation in this area. Therefore, it is recommended that educators continually update and research the use of ICT tools in teaching, enabling the inclusion of innovations during the pedagogical act to create competitive educational programs in the digital age, helping students build autonomous learning processes and develop both collaborative and individual work.

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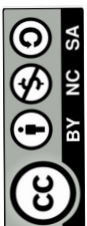
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