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Influence of information and communication technologies on the university professional training process

Influencia de las tecnologías de información y comunicación en el proceso de formación profesional universitaria

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Abstract

This study examines the influence of Information and Communication Technologies (ICTs) on higher education professional training, highlighting their potential to enable flexible, personalized, and interactive teaching-learning methods. Through systematic literature review, the research analyzes the reconfiguration of university educational environments, revealing: (a) faculty efforts to implement technology-based teaching models, (b) persistent gaps in teachers' digital-pedagogical competencies for effective strategy design, and (c) the urgent need to update teaching profiles to meet student expectations. The findings demonstrate a contrast between technological adoption and actual pedagogical integration. From a pragmatic perspective, the study concludes universities must: Critically incorporate emerging technologies. Redesign ICT-based teaching strategies. Ensure continuous teacher training aligned with current trends. The research emphasizes the ongoing challenge of balancing technological innovation with educational quality, proposing targeted faculty development as key to bridging the gap between technology access and meaningful pedagogical application

Keywords: process, training, update, information and communication technologies.

Resumen

Este estudio analiza el impacto de las TIC en la formación universitaria, destacando su potencial para favorecer métodos flexibles y enseñanza personalizada. Mediante revisión sistemática de literatura, se examina la reconfiguración del entorno educativo, identificando la necesidad de adaptación docente-estudiantil en contextos tecnológicos. Los hallazgos revelan: (a) esfuerzos docentes por implementar modelos tecnopedagógicos, (b) brechas en competencias digitales y didácticas para diseñar estrategias efectivas, y (c) la urgencia de actualizar el perfil docente ante demandas estudiantiles. Concluye pragmáticamente que las universidades deben: Integrar críticamente tecnologías emergentes. Rediseñar estrategias pedagógicas con TIC, Garantizar formación continua alineada a tendencias actuales. El estudio subraya el desafío permanente de equilibrar innovación tecnológica con calidad educativa, proponiendo como eje central la capacitación docente para cerrar brechas entre adopción tecnológica y su aplicación pedagógica significativa

Palabras clave: proceso, formación, actualización, tecnologías de información y comunicación.

Introduction

In recent decades, ICT advancements have become increasingly evident due to their widespread use across various contexts. The continuous technological changes characterizing the 21st century demand ongoing technological training processes in different domains, including education. Here, university teaching praxis necessitates reevaluating the didactic, pedagogical, and

methodological knowledge guiding instructional practices.

Consequently, it becomes imperative to assess how emerging technologies are reshaping higher education and how such innovations influence learning. This study therefore aims to analyze ICT's influence on university education while identifying opportunities and challenges in technological competencies amid these innovations.

Equally important is educational technology's role in training human talent for professional performance and its implications for 21st century knowledge societies. "An estimated 80% of higher education institutions worldwide have implemented some form of emerging technology in their academic programs" (Espinoza et al., 2024, p. 3).

Contextually, university education adopts emerging technologies as strategic alternatives to overcome temporal and spatial limitations. Institutions are implementing online learning platforms, advanced learning management systems, and collaborative tools, among others, facilitating autonomous learning. Artificial intelligence advancements also generate expectations for reshaping educational methodologies. "These forthcoming transformations will drive paradigmatic changes in science's structure" (Arbeláez et al., 2021, p. 6).

This educational approach draws from constructivist learning theories, which demonstrate knowledge construction through technological resource interaction in social and pedagogical processes. Vygotsky's social learning theory proves particularly relevant, where constructive interaction through educational technologies becomes increasingly common. "This theory maintains that learning results from individual-environment interaction" (Ortiz, 2015, p. 8).

Key findings reveal how technological innovations enhance educational quality, though success depends on implemented pedagogical models. Neuroscience contributions highlight motivation's substantive influence in training processes, while gamification strategies (video games, etc.) enable transversal competency development.

These developments lead to a crucial conclusion: the progressive ICT integration into pedagogical processes requires adaptation time due to existing gaps between technological advancements and educators' immediate technical capacity for implementation. Epistemologically, constructivist and connectivist paradigms manifest through educational technology applications. Finally, COVID-19 exposed pedagogical weaknesses while accelerating ICT adoption in professional university training.

Methodology

La investigación aplica el enfoque cualitativo, se utiliza el método analítico sintético, con la intención de escudriñar, desentrañar y comprender el impacto de las TIC en el This research employs a qualitative approach, utilizing the analytical-synthetic method to thoroughly examine, investigate, and understand the impact of ICTs on the pedagogical process of professional trai-

ning in contemporary university institutions. For this purpose, a comprehensive literature review and analysis was conducted to: identify research areas with demands in the context of educational technology, reveal weaknesses in technology use or application, highlight gaps in pedagogical processes, examine existing trends and expectations in techno-educational contexts.

In the course of the research, a careful review of academic literature and relevant theories was conducted to substantiate the study. In this process, works were selected considering specific criteria such as: application of the study methodology, relevance, timeliness, and perspectives. On the contrary, studies showing limitations or inconsistencies in the applied methodology, those with weak relevance, and those presenting high bias were not considered. From this review, a set of contributions, challenges, and reflections that integrate the research topic are valued.

Results and discussion

Technological advancements have immersed educators, prompting significant changes in their roles, academic management, and communication. Consequently, teachers are assuming new functions as guides, mediators, facilitators, and motivators in meaningful and relevant learning processes through educational technologies. This perspective highlights how the teacher's profile becomes a crucial factor in training processes, necessitating its continuous evolution.

From a historical viewpoint, the conservative teacher profile regarding ICT use is gradually disappearing due to these technologies' requirements in educational praxis (Pagés, 1994), along with their rapid expansion and application across multiple social spheres. Consequently, educational technologies have evolved to the point of adopting new paradigms, requiring teachers to permanently integrate these technologies into their pedagogical practice through various strategies (Ferrés et al., 2013).

Additionally, the study reveals an existing perception that overestimates young people's attraction to screens and exaggerates their influence, while simultaneously perceiving students as having low learning interest. However, the emotional impact generated during screen and mobile device interactions in learning processes is rarely considered, despite belonging to students' emotional dimension that significantly affects pedagogical processes. Therefore, teachers must incorporate emotionally constructive strategies in their planning.

Some studies reveal the importance of implementing classroom didactic experiences through technological resources and collaborative strategies, successfully demonstrating how students awaken interest, make their work visible, and project their knowledge (Jiménez et al., 2018). This process becomes possible through innovative and effective pedagogical strategies across curriculum areas, along with ongoing teacher training programs that must timely incorporate each technological advancement with educational relevance.

This situation reflects the growing importance of teachers' digital competence - their ability to ef-

fectively integrate digital technologies into pedagogical practice. However, educational praxis still shows limitations preventing optimal training processes, such as deficiencies in teachers' digital skills training and the rapid evolution of these technologies.

A training gap exists among university faculty regarding digital competencies, as their current technological skills often don't meet classroom requirements... Concerning digital competencies (Barragán et al., 2021, p.12).

> Consequently, ICTs' evolution and expansion have significantly impacted various social areas, including education, demanding teachers incorporate these technologies into their practice. These contribute to better academic performance and provide skills for active participation in different contexts (social, professional, academic, cultural). Therefore, technological training represents both an educational requirement and opportunity, considering human potential, trends, expectations, and opportunities across professional contexts.

Other researchers highlight the importance of emotions and motivation as determining factors in technology use, while cautioning that success will always depend on the pedagogical strategies applied (López et al., 2021). In this scenario, once again the teacher becomes the protagonist in the training process, as they must guide, motivate, articulate, and coordinate the development of pedagogical activities, including strategies that in educational practice manage to stimulate each student's motivation levels. Furthermore, this planning must be consistent with the motivation strategy but alternate in the activities to be developed to prevent repetition from becoming a factor with the opposite effect on motivation.

It is pertinent to note that motivation becomes more demanding at the university level, as it corresponds to andragogical approaches. This level requires teachers with high creativity, imagination, and innovation capacity to create and recreate highly effective strategies through the use of educational technology. For this reason, university teaching becomes a highly dynamic and interactive process, with implications that involve all social actors participating in the training process.

Another important factor to consider in the educational field is the impact of COVID-19, as it significantly boosted the use of ICTs following the implementation of global isolation measures. This phenomenon practically conditioned educational practice to the use of technological resources in educational processes. Additionally, it revealed vulnerable aspects in teachers' profiles regarding the use of educational technologies, thus showing the need for training and opportunities for improvement.

In a world where the COVID-19 pandemic has revolutionized numerous aspects of daily life, higher education has been no exception. The redefinition of post-pandemic professional training is one of the most critical aspects, highlighting the need to adapt educational approaches to the new realities of the labor market and social demands (Ramones et al., 2024, p. 2).

> The COVID-19 pandemic changed the current educational system and career perspectives,

as well as the education of future generations, implying the creation of new educational policies, as well as new training plans and strategies (Niño et al., 2021). Essentially, the use and application of these tools should be a daily practice in teacher training and performance, not just as an option in times of contingency.

Now, in a constantly innovating technological context, university teachers must strategically and permanently foster students' critical and creative thinking as a consequence of technology's impact on the reconfiguration of various fields of knowledge. This implies that new professionals will face unforeseen challenges but with better conditions and expectations for their performance. In light of these scenarios, teachers face the challenge of connecting with digital native students (González et al., 2022).

The cited study reveals the need and importance of effectively responding to the demands of digital native students. For this reason, each teacher must manage and develop training and updating strategies in the technological context, as it is not only a necessity but also a requirement. Responding effectively to these demands makes the progress and consolidation of the educational process more effective.

Consequently, this scenario also demands the design and implementation of educational policies that contribute to strengthening communication and interaction processes through adaptation in virtual environments, technological resources, devices, connectivity, logistical services, and infrastructure, facilitating professional training processes to achieve objectives.

In another contribution, the cited study shows how, through video game strategies, students manage to put transversal competencies into practice. They also recognize the importance of decision-making, their capacity for criticism and self-evaluation, teamwork coordination, interpersonal and communication skills, as well as the ability to recognize limits, apply norms, and theories in practice within the educational framework.

This advancement in technologies requires a review of educational policies, as it demands the adaptation of curricula, programs, and audiovisual media that can foster the pedagogical process through interactive strategies in virtual environments. Although it seems more suitable for preschool, primary, and secondary levels, recent studies also demonstrate the usefulness of gamification at the university education level.

On the other hand, the level of ICT knowledge applied in academic activities, as well as the intensity of use post-pandemic, reveal the importance of technological resources at the university level (Delgado et al., 2023). Thus, students' perceptions show variability in technological competency knowledge, with 84% citing social networks as the component where they have the highest level of knowledge, while 16% do not consider this component as the main one in their technological resource knowledge. In tools such as email, video conferencing, and chat, the knowledge level is 81%, while 19% are unfamiliar with these tools. Therefore, "the effective integration of ICTs in educational processes is a topic that has gained increasing relevance in recent years, given the profound

changes and social transformations derived from the digital revolution" (Ruiz, 2024, p. 1).

It is worth noting that instant messaging and social media interaction are permanently used tools in social, academic, and professional contexts. For this reason, the management and application of these tools has become a requirement in nearly all fields of human activity. Consequently, effective use of these technologies guarantees successful training processes and provides excellent advantages in professional practice.

Similarly, 80% of students acknowledge that search engines rank third in their knowledge of technological resources, while 20% do not recognize them. It is pertinent to highlight the importance and usefulness of recognizing and utilizing search engines on the web, as they represent an extraordinary advantage in information retrieval and access. On the other hand, knowledge of teaching platforms stands at 79%, while 21% confirm unfamiliarity. Therefore, "universities must transition toward more collaborative and student-centered models" (Pérez et al., 2021, p. 1).

When considering professional software and specialized packages, only 35% demonstrate knowledge, while 65% lack familiarity. Regarding the creation of virtual materials and online resources, 32% are aware of them, whereas 68% do not know these tools. As for image, audio, and video editing software, 31% possess knowledge, while 69% show no familiarity and thus do not use these tools. Finally, in data analysis software, 19% have knowledge, and 81% report no experience. In this regard, some studies indicate that "students from families with lower educational levels have fewer opportunities to use digital technologies" (Pérez et al., 2021).

The assessment reveals that knowledge of general-use tools reaches 81%, which can be considered high but improvable. However, in professional software, specialized packages, online resources, and multimedia editing, it drops to 33%, indicating a clear weakness and a loss of opportunities in human talent development within the technological component. In this sense, ICT competency becomes essential, comparable to traditional literacy. "Technological literacy has become a fundamental element; the lack of digital skills leads to a new form of illiteracy: digital illiteracy" (Murillo et al., 2024, p. 3).

After the pandemic, university students' frequency of ICT use shows 88% engagement with basic office tools (Word, Excel, PowerPoint), while 12% do not use them. Similarly, researchers highlight that 79% utilize ICTs primarily for social media (Facebook, Instagram), including communication tools, apps, web search engines, and online learning platforms for remote academic work. Researchers argue that the COVID-19 pandemic forced more frequent use of these technologies in academic activities (Núñez et al., 2021).

These advancements demonstrate the need to strengthen technological training processes in education, particularly in professional software, specialized packages, online resources, and multimedia editing, as this can significantly enhance educational praxis and make professional training more efficient. Additionally, it provides an opportunity to develop human talent potential.

Conclusions

The rise of technologies and their influence in the educational field is undeniable, becoming even more notable after their boost and utility during the pandemic period. At the university level, the acceptance of ICTs is evident, given their multiple benefits in the pedagogical process. However, weaknesses persist in teachers' didactic competencies for their use and application, revealing gaps between teaching competence and the rapid innovation and advancements of these technologies. This calls for strategies aimed at training university teachers in virtual environments, as well as in the use and application of educational technology resources.

Additionally, it can be noted that the rapid technological evolution demands that educational institutions update and adapt their policies, programs, and infrastructure. This is because technological literacy in university education goes beyond the mere incorporation of digital tools into the educational process—it requires rethinking traditional teaching and learning methodologies to effectively address demands, leverage the opportunities offered by the digital environment, and harness the potential of human talent. Therefore, effective integration and application of ICTs in university teaching are necessary to ensure transitions toward new competency-based models or approaches grounded in ICT innovation, elements that must remain a permanent fixture in the context of higher education.

Finally, it is crucial to develop a didactic framework based on ICTs as a catalyst for transforming university education. This will enable institutions to embrace changes and challenges, as well as respond to demands and requirements, in line with the opportunities and expectations of the knowledge society in an increasingly interconnected world.

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