The role of the teacher in the digital age

(es) El rol del docente en la era digital

(port) O papel do professor na era digital

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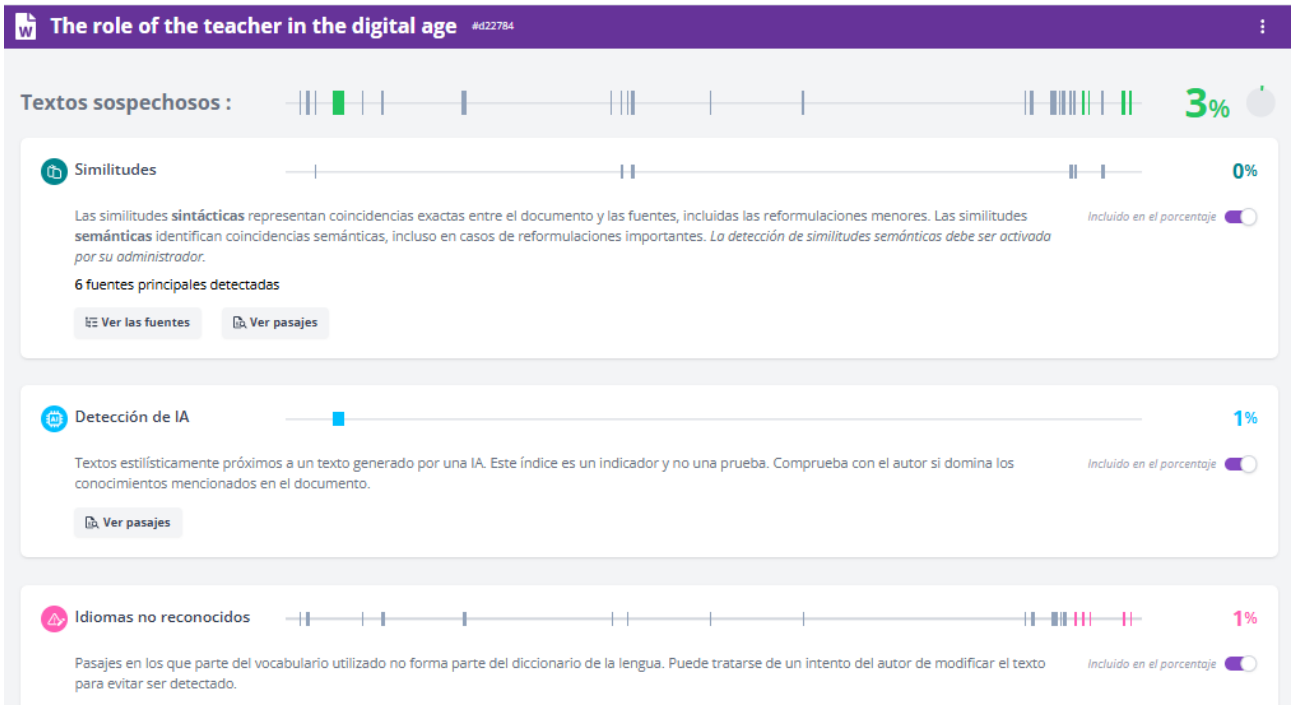

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Abstract (en)

This document analyzes the integration of Digital Information, Communication, Knowledge, and Learning Technologies into the educational process at the higher education level and the role of the teacher in the digital age. A mixed-methods research approach was conducted, applying quantitative and qualitative tools. The sample consisted of 22 teachers from the Bachelor's Degree Program in Tourism at the Autonomous University of Zacatecas. Using a Likert-type instrument, the topic was addressed based on Puentedura's (2009) theoretical model of Substitution, Augmentation, Modification, and Redefinition. The analysis categories were: Presence of Technology in the Classroom, SAMR Model and Incorporation of ICTs in Teaching Practice, Use of New Digital Tools Enriched with AI, and the Role of the Teacher in the Digital Age. The literature was reviewed to identify research on the topic and compared the results obtained. Among the key findings, we found that teachers in the 21st century, in addition to being content facilitators, represent agents of change who must adapt to a constantly evolving environment to guide students in building meaningful learning and prepare them for the challenges of an increasingly digital world.

Keywords: SAMR model; TICCAD; teaching practice; teacher's role.

Resumen (es)

El presente documento analiza la integración de las Tecnologías de la Información, Comunicación, Conocimiento y Aprendizaje Digitales al proceso educativo en el nivel de educación superior y el rol del docente en la era digital. Se realizó una investigación con un enfoque mixto, aplicando herramientas cuantitativas y cualitativas. La población estuvo conformada por 22 docentes pertenecientes al Programa Académico de Licenciatura en Turismo de la Universidad Autónoma de Zacatecas. Con el apoyo de un instrumento tipo Likert se abordó el tema con base en el Modelo teórico Sustitución, Aumentación, Modificación y Redefinición del autor Puentedura (2009). Las categorías de análisis fueron las siguientes: Presencia de la Tecnología en el aula, Modelo SAMR e Incorporación de las TICCAD en la práctica docente, Uso de nuevas herramientas digitales enriquecidas con IA, Rol del docente en la era digital. Se revisó la literatura para identificar investigaciones acerca de la temática y se contrastó con los resultados obtenidos. Dentro de los principales hallazgos encontramos que el docente en el siglo XXI además de ser un facilitador de contenidos, representa un agente de cambio que debe adaptarse a un entorno en constante evolución para guiar a los estudiantes en la construcción de aprendizajes significativos y prepararlos para los desafíos que conlleva un mundo cada vez más digitalizado.

Palabras claves: Modelo SAMR; TICCAD; práctica docente; rol del docente.

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Resumo (port)

Este documento analisa a integração da Informação Digital, Comunicação, Conhecimento e Tecnologias de Aprendizagem no processo educacional no ensino superior e o papel do professor na era digital. Foi conduzida uma abordagem de pesquisa de métodos mistos, aplicando ferramentas quantitativas e qualitativas. A amostra consistiu em 22 professores do Programa de Graduação em Turismo da Universidade Autônoma de Zacatecas. Utilizando um instrumento do tipo Likert, o tema foi abordado com base no modelo teórico de Substituição, Ampliação, Modificação e Redefinição de Puentedura (2009). As categorias de análise foram: Presença de Tecnologia na Sala de Aula, Modelo SAMR e Incorporação de TICs na Prática Docente, Uso de Novas Ferramentas Digitais Enriquecidas com IA e o Papel do Professor na Era Digital. A literatura foi revisada para identificar pesquisas sobre o tema e comparar os resultados obtidos. Entre os principais achados, constatamos que os professores do século XXI, além de serem facilitadores de conteúdo, representam agentes de mudança que precisam se adaptar a um ambiente em constante evolução para guiar os alunos na construção de aprendizados significativos e prepará-los para os desafios de um mundo cada vez mais digital.

Palavras-chave: modelo SAMR; TICCAD; prática de ensino; papel do professor.

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Introduction

Technological advances have permeated all areas of human life, from the way we communicate to how we work and entertain. In the last decade, a dizzying advance has been observed, such is the case of the arrival of generative artificial intelligence in daily life from 2023; its impacts are increasingly evident. In the educational field, technology has been implemented gradually and constantly, bringing with it modifications in the teaching-learning process. This generates challenges for higher education institutions, in the sense of facing other forms of communication and access to knowledge (Poveda-Pineda & Cifuentes-Medina, 2020).

During the pandemic caused by COVID-19, teachers used Information and Communication Technologies (ICT) to carry out the educational process, which developed new digital skills in both the teacher and the student. From then on, both teachers and students have a more open mind to adapt to the changes and challenges that arise in the digital age.

In a scenario in which access to information is increasing, imparting knowledge in the classroom is a complex task. It is necessary for the teacher to plan digital strategies embodied in the didactic sequences. As Villarreal-Villa et al., (2019, p. 11) state, "the inclusion of technology in the training process should not occur randomly, in contrast, the digital competencies and skills that the teacher possesses will favor or hinder the strategies that are designed". In addition, these strategies must be oriented to a specific purpose and take into account the needs and characteristics of the group to generate significant learning in the student.

In this order of ideas, Herrera (2015 cited in Sánchez-Otero et al., 2019, p.2 83) mentions that:

> The teaching-learning process is the interaction between the elements of the teacher, student, content, strategies, environment, context and environment. Didactic strategies are the actions, structures or steps planned by the teacher to develop actions seeking to promote training and achieve the learning goal. Currently, a model that focuses on the student is promoted, so the teacher designs the activities, teaches how to learn and evaluates, while the student performs the activities, builds his or her own learning and self-evaluates.

In recent decades, the issue of the incorporation of ICT in higher education has gained relevance. Thus, authors such as Mollo-Torrico, Lázaro-Cari, & Crespo-Albares, (2023); Arias, Torres, & Yález, (2014); Licona & Veytia, (2020); Sánchez-Otero et al., (2019); Murillo et al., (2024); Poveda-Pineda & Cifuentes-Medina, (2020) have studied everything from the use of ICTs to their impact on the teaching-learning process, as well as the pedagogical strategies that can be implemented and the challenges that teachers face.

Nowadays, it is necessary for teachers to know and analyse the potential for the use and application of ICT in educational practice. In this sense, Colorado and Edel (2012 cited in Villarreal-Villa et al., 2019, p. 8) mention the following benefits of the use of ICT within the educational field:

> 1) Interactivity: provides communication skills in a bidirectional and multidirectional way in virtual environments, in such a way as to facilitate the interrelation between users of the technological resource; 2) Collaborative learning: facilitates the formation of communities of users in which

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> cooperative and collaborative work is developed, allowing various types of exchanges between users that favor learning; 3) Multidirectionality: the capacity for transmission and exchange of information offered by ICTs allows simultaneous transit between multiple recipients; 4) Freedom of editing and dissemination: It facilitates the dissemination, exchange and collaboration for the editing of content among a multitude of users on the network.

Although the incorporation of ICT entails important benefits within the teaching-learning process, it is necessary to orient it to the learning objectives. The value of planning didactic strategies lies in the fact that "although technology offers powerful tools to transform education, it is essential that these changes are guided by a clear pedagogical vision. Technology alone does not improve education; it is the way in which it is integrated and used in the teaching-learning process that can lead to significant improvements in educational outcomes" (Murillo et al., 2024, p. 175).

It should be noted that within the field of education the concept of ICT has evolved into ICCCAD:

> In the educational context, the Ministry of Public Education (SEP) has updated the terminology regarding ICTs, proposing the term "information and communication technologies for knowledge and digital learning" (TICCAD), underlining their importance for learning and knowledge management in a digital environment (SEP, 2021). The adoption of ICTs requires continuous updating of skills and knowledge by users, who must quickly adapt to new technologies and functions (Ochoa-Alcántar et al., 2024, p. 60)

The above quote highlights the need for adaptation, training, and updating by teachers in order to incorporate ICCCADs into the educational process. This change for teachers represents a challenge that demands them to leave the routine and the already known to enter the field of innovation, in which actors are in contact with various applications and various devices regardless of time, distance, or means in synchronous or asynchronous communication environments (García, 2021). This allows students to acquire knowledge autonomously and flexibly, allowing them to make the most of digital tools.

TICCAD

The presence of technology in the higher education field is observed through the use of learning platforms such as Moodle, Google Classroom, Blackboard, which allow teachers and students to interact online, share materials, conduct assessments and receive feedback. Programs have also been added to create more dynamic and attractive presentations for students and other visual materials such as Canva and Prezi.

The use of these tools places the student in a new and different context from the traditional one and generates greater interest in the learning process. According to Escamilla (2010), the use of this type of didactic support can increase the creativity and emotional intelligence of students. As Brunner (2005) mentions, the inclusion of technologies in higher education has gained ground and has become an indispensable tool for the development and change of society.

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There are several models that facilitate the integration of technology in the classroom, such as the pedagogical model proposed by Rubén Puentedura, known as the SAMR Model, whose acronym stands for Replace, Increase, Modify and Redefine. Puentedura began to design a guide that would help people incorporate technology into their respective activities. In 2003 he created a blog in which he shared his opinions on technological integration. Thanks to his vast experience in education, he developed the SAMR Model in 2006 (Cepeda & Argudo, 2022).

The SAMR model uses hierarchical levels to incorporate technology into educational processes. At the first level *of substitution*, technology acts as a direct substitute for the tool, with no functional change. At the second level *of augmentation*, technology acts as a direct substitute for the tool, with functional improvement. At the third level *of Modification*, technology allows for an important redesign of tasks, and at the fourth level *of redefinition,* technology allows the creation of new tasks, previously inconceivable (Puentedura, 2009). The first two levels signify improvements in the educational process, while the last two levels represent a transformation in this process (Cepeda & Argudo, 2022).

The first step, *Substitution*, acts as a direct channel to change traditional tools for digital ones. For example, handing out printed materials is replaced by sharing Google Docs documents or any PDF format sent via email (Sindi Alivi, 2019 cited in Cepeda & Argudo, 2022). The second step, *Augmentation*, also replaces technology by allowing teachers and students to use it differently. For example, teachers assign an assignment to students, and they must use technological devices to complete the activity (Hamilton et al., 2016 cited in Cepeda & Argudo, 2022). In the next steps, *Modification* and *Redefinition*, teachers should implement tasks that require higher-level thinking skills using technology. For example, a group of students writes an essay using ICT tools such as Google Docs, which helps them work together immediately on the task (Sindi Alivi, 2019 cited in Cepeda & Argudo, 2022).

In this sense, the role of the teacher in the digital age demands the incorporation of TICCAD in the educational process, a theme that is reflected in the National Digital Educational Agenda and in the General Education Law in Mexico.

> In Mexico and Latin America, there are numerous experiences and projects on the use of technologies in education, ranging from the initiatives of each teacher or school to improve their educational practices and experiences, to national policies and initiatives that seek to address the different gaps that persist beyond the digital (Garduño, 2021, p. 205).

Currently, some of the technological tools used by teachers have been enriched with Artificial Intelligence, transforming the way in which teaching and learning are done, saving teachers time and offering a greater variety of resources to students.

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Methodology

Paradigms guide research on the basis of assumptions to understand the phenomenon studied:

> The quantitative approach in the social sciences originates in the work of Auguste Comte (1798–1857) and Emile Durkheim (1858–1917). They proposed that the study of social phenomena required to be scientific, that is, susceptible to be acquired through the application of the scientific method and they maintained that all phenomena could be measured, this current was called Positivism, the cornerstone of science according to positivism is the data (observable, positive). The qualitative approach had its origin in Max Weber, (1864–1920) also within the social sciences, this current recognized that in addition to the description and measurement of social variables, subjective meanings and the understanding of the context where the phenomenon occurs should be considered (Vega-Malagón et al., 2014, p. 524).

For his part, Hernández Sampieri (2014) states that the mixed approach involves the combination of qualitative and quantitative methods in a single study to obtain a more complete and in-depth view of a research phenomenon, taking advantage of the strengths of each method and compensating for their limitations. In this research, a mixed approach was applied to analyze the integration of Digital Information, Communication, Knowledge and Learning Technologies to the educational process at the higher education level and the role of the teacher in the digital age.

It is a descriptive type of research. For Sabino (2014), the main objective of this type of study is to describe some fundamental characteristics of homogeneous sets of phenomena, using systematic criteria that allow the structure or behavior of the phenomena under study to be revealed, thus providing systematic information that is comparable to that of other sources.

First, a Likert-type instrument was constructed, which was made up of 11 items with the main variables related to the incorporation of ICCCAD to the educational process at the higher level. On the other hand, the documentary review of scientific articles in recognized databases, mainstream journals, repositories, among other relevant secondary sources, was used to collect sufficient information on the topic raised.

The population was made up of higher education teachers of the Bachelor's Degree in Tourism of the Autonomous University of Zacatecas, for reasons of convenience and limitations of the study, a non-probabilistic intentional directed sampling was applied (Otzen & Manterola, 2017) made up of 22 teachers.

The study was organized based on the theoretical model Substitution, Augmentation, Modification and Redefinition of the author Puentedura (2009) based on the following categories of analysis: Presence of Technology in the classroom, SAMR Model and Incorporation of TICCAD in teaching practice, Use of new digital tools enriched with AI, Role of the teacher in the digital era. For the interpretation of the data obtained, the descriptive statistical method was used, summarizing the data through sector graphs, starting with an individual analysis and then studying the relationship between the different categories.

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Results and Discussion

Presence of Technology in the classroom

In the first section of the instrument, the presence of technological tools in the classroom (both in the teacher and in the student) was analyzed in a general way. In this sense, it is observed that 80% of teachers consider that the support of these tools is very important, while the other 20% indicate that it is important, which shows the need for teachers to acquire the necessary training to be able to keep up with technological advances.

When inquiring about which of the following areas teachers consider that their students apply technology, 53.7% considered that they apply it in entertainment and leisure, 26.7% in expression and communication and 20% in learning and professional development. This shows us the importance of students relating the use of technology to the learning process and not only for entertainment, this would be achieved with the frequent use of tools within the educational process.

MRSA Model and Incorporation of TICCAD in Teaching Practice

In relation to the level – according to the SAMR Model – at which the surveyed teachers have incorporated ICCCAD into their teaching practice, the results were as follows: 26.7% have changed some of the traditional tools for digital ones, that is, they are in the first level, *Substitution*. Most of the teachers surveyed are in the second level, *Increase*, since 53.3% answered that they have added functional improvements to the teaching process. The remaining 20% are in the third level, *Modification*, stating that they have modified class methods, implementing tasks that require higher-level thinking skills using technology. No teacher answered that they had created new teaching methods, generating activities that could not be carried out without the use of technology, which represents the fourth level, *Redefinition*.

Use of new AI-enriched digital tools

When inquiring about which digital tools teachers currently use most frequently, the results were as follows: learning platforms such as Moodle, Google Classroom, Blackboard, 100%; videoconferences on platforms such as Zoom, Teams and Meet 93.3%; creation tools such as Canva and Prezi 73.3%; social networks such as Facebook, Twitter, Instagram, LinkedIn 46.7%; use of academic databases such as Google Scholar, Scopus, PubMed 33.3%; video editing 33.3%; podcasts 26.7%; data analysis software such as SPSS, and Python 20%; simulators and virtual laboratories 13.3% and blogs such as WordPress and Blogger platforms 13.3%.

The following responses were obtained in relation to the AI-enriched tools that teachers plan to use in the next school term, such as EdutekaLab: an educational tool for creating curricula and lesson plans; Genially: a tool for building interactive and gamified experiences; Gamma: a tool for creating AI-powered presentations and creating web pages; Krea: a tool for generating images with AI; Chat GPT: an advanced chatbot for AI-

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coherent conversations, with teachers considering that the ones they will use the most are Edukalab with 46.7%, followed by Gamma with 26.7%, Genially with 20%, and Chat GPT with 6.7%

Role of the teacher in the digital age

Finally, the following open question was asked to the teachers surveyed: The role of the teacher in the digital age is linked to being a guide and facilitator of content. In addition to this function, what other activities do you consider the teacher performs within the teaching-learning process?

When analyzing the responses, it is observed that the role of the teacher goes beyond just being a guide and facilitator of content, since there are multiple and very diverse activities carried out. Among the main ones are the following.

The teacher in Higher Education participates in the *Design of Curricula and Programs*, which represent the foundations of learning and of each specific profession. It also participates in the *Design of the didactic sequence*, which is a detailed guide to the teaching process, dosing the contents of the Programs and structuring learning activities aimed at students acquiring the necessary knowledge and skills in each of the subjects.

"The Internet is extremely valuable if you know what you are looking for... and you have some framework of understanding that directs you to certain things and allows you to put others aside..." (Chomsky, 2012, cited in Garduño, 2021, p. 205). The above quote exposes another of the functions of the teacher in the digital age, since he or she acts as a *Content curator*, selecting the best resources and materials for their students, which involves searching, evaluating, and organizing relevant and up-to-date information. This is closely related to another of the activities, *Creating spaces for reflection* and analysis of ideas that contribute to the student's reasoning and critical thinking process.

In this sense, it can be said that the teacher is the conductor of the orchestra in the classroom, that is, he or she performs all the *Management of the educational process*, establishing the times, space, resources, and interactions between students to create an optimal learning environment. Here, too, the teacher's role as *Content Facilitator* that generate meaningful experiences and stimulate students' curiosity. Assessment is a fundamental tool for measuring student progress and adjusting teaching. The teacher also carries out the *Evaluation process* to obtain a complete view of learning. Along with the above is the *Feedback Process*, since the teacher must provide students with information about their performance, strengths and areas for improvement.

Another of the functions that the teacher performs is everything related to the *Administrative activities*, such as attendance at meetings, training courses and updating and filling out forms. The above is part of the process of continuous improvement, which implies a constant commitment to professional development and pedagogical practice. Likewise, the higher level teacher serves as *a Support and Guide for students in the process of incorporation into the workplace,* motivating them to commit to giving greater results, being also an example to follow of how they should conduct themselves in an ethical and professional way.

At the same time, there is an aspect that is becoming increasingly relevant in the current era, the *Social-emotional support* that the teacher provides to the student. Teachers act as guides and models, significantly influencing how students perceive the world, interact with others, and manage their own emotions.

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Conclusions

In conclusion, the role of the teacher in the digital age has evolved into a more complex profile. In order to be a facilitator of knowledge and achieve significant learning, it is necessary to carry out multiple and diverse tasks that guide the educational process with the support of technology.

Although the incorporation of ICCAD in higher education has made it possible to create more dynamic, interactive and motivating learning environments, it is necessary to develop different skills in the student since access to information is not enough, but it is necessary to know how to identify, discern and validate reliable information.

The final reflections hint, in accordance with what was stated by Villareal-Villa et al., (2019) the importance of planning strategies aimed at the construction of significant learning, since the inclusion of technology in the training process should not occur randomly. This shows the relevance of the training of the teaching staff to stay informed of the latest educational trends in the field of ICCCAD. During the development of this research, it was observed that the surveyed teachers are very interested in the training of students, which entails a commitment between the teacher and the educational institution in the subject of updating.

Based on the findings, it is pertinent to highlight the role of the teacher as a facilitator of spaces for reflection and analysis that allow the construction of critical thinking in the student. This is consistent with what is cited by Murillo et al., (2024, p. 177)

> University teachers in the technological scenario of constant transformation assume an essential responsibility, their role goes beyond the mere transmission of knowledge and content, delving into the promotion of skills such as critical thinking, the formulation of questions of preconceived ideas, pedagogical strategies must adapt them to prioritize dialogue, debate and active inquiry, enabling students to face problems from different perspectives and build novel solutions, in this way, the incorporation of ICT in the university environment has led to the emergence of innovative pedagogical approaches that distance themselves from conventional methods (Salcines-Talledo et al., 2020).

Another relevant finding is the interest shown by the surveyed teachers in the use of tools enriched with Artificial Intelligence. At this point, it should be noted that the present study only collected data related to the intention that teachers have to use these tools in future courses, so it is not yet possible to analyze the impact they may have on the teaching-learning process, which generates possible future lines of research.

Nowadays, Artificial Intelligence offers ample possibilities to add value to educational practice, increasing student motivation. "The new era of artificial intelligence has begun, which has the capacity to face some of the greatest challenges in education, which is to develop innovative teaching and learning practices, and to accelerate the progress of inclusive, equitable, and quality education, promoting learning opportunities" (García, 2022, p. 34).

In short, the incorporation of ICCADs in the higher education process is a topic that leaves doors open to continue studying since technology advances at a dizzying pace and increasingly enriching learning experiences are created.

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