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Inteligencia Artificial Generativa e identidad (pos)digital docente

Generative Artificial Intelligence and (post)digital teacher identity

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RESUMEN

Este estudio explora las actitudes y percepciones docentes sobre su identidad (pos) digital en relación con la Inteligencia Artificial Generativa (AIGen) y las tecnologías inteligentes (TI). Se utilizó un diseño no experimental con un enfoque mixto, que incluyó un cuestionario, grupos focales y una entrevista en profundidad. La muestra de 177 enseñantes, principalmente de España y Estados Unidos, abarcó todos los niveles educativos. Los resultados muestran un alto grado de fiabilidad del instrumento utilizado ($\alpha = 0.847$) y una correlación significativa ($p< 0,01$) positiva fuerte ($r = 0,525$) entre el nivel de conocimiento y experiencia con TI y las actitudes y percepciones docentes hacia estas herramientas. Aunque el profesorado tiene una actitud mayoritariamente positiva hacia estas tecnologías, más del 50 % considera que su conocimiento y experiencia son limitados. Las percepciones del profesorado oscilan entre la cautela y el optimismo respecto al impacto de las TI en su aplicación práctica, destacando la necesidad de cambios individuales, sociales y metodológicos para facilitar una innovación educativa efectiva. El análisis sugiere que la educación mediática es clave para superar las barreras que dificultan la adopción de estas herramientas. La investigación concluye que, para que el profesorado asuma su identidad posdigital, es esencial reflexionar sobre cómo integrar estas tecnologías de forma crítica, inclusiva y ética, fortaleciendo su papel en una sociedad más justa y en la adaptación a los nuevos paradigmas tecnológicos.

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PALABRAS CLAVE

Identidad digital; inteligencia artificial generativa; tecnologías inteligentes; posdigital; docentes; alfabetización mediática crítica.

ABSTRACT

This study explores teachers' attitudes and perceptions regarding their (post)digital identity in relation to Generative Artificial Intelligence (GenAI) and Smart Technologies (ST). A non-experimental design with a mixed approach was used, including a questionnaire, focus groups and an in-depth interview. The sample consisted of 177 teachers, mainly from Spain and the United States and included all educational levels. The results show a high degree of reliability of the instrument used ($\alpha = 0.847$) and a significant ($p < 0.01$) strong positive correlation ($r = 0.525$) between the level of knowledge and experience with ST and teachers' attitudes and perceptions towards these tools. Although teachers hold a mostly positive attitude towards these technologies, more than 50 % consider their knowledge and experience to be limited. Teachers' perceptions oscillate between caution and optimism regarding ST´s practical impact, emphasizing the need for individual, social and methodological changes to facilitate effective educational innovation. The analysis suggests that media education is key to overcoming barriers that hinder the adoption of these tools. The research concludes that, for teachers to embrace their postdigital identity, it is essential to reflect on how to integrate these technologies in a critical, inclusive, and ethical manner, thereby strengthening their role in fostering a more just society and adapting to new technological paradigms.

KEYWORDS

Digital identity; generative artificial intelligence; smart technologies; postdigital; teachers; critical media literacy.

1. INTRODUCTION

Smart Technology (ST) and (AI), although often used interchangeably, have key differences in scope and application. AI, a term coined by J. McCarthy in 1955, refers to the creation of systems capable of performing human intellectual tasks. ST comprises a wide range of tools and systems that use data and algorithms to optimize efficiency and decision-making, although they do not always integrate AI. As automation, and information and communication technologies advance, ST is also evolving, expanding our understanding of the world and creating new opportunities (Liz Gutierrez, 2020).

Smart devices and the Internet of Things (IoT) are central to the 4th Industrial Revolution. A smart device is one that can operate autonomously, sense the environment and connect to it to exchange data (Silverio-Fernandez et al., 2018). IoT refers to a network of interconnected devices that can collect and process large volumes of data in real time (Cheng et al., 2021). Its versatility enables applications in areas such as home automation (Adhikary et al., 2024), healthcare (Mohammed & Hasan, 2023), agriculture (Yap & Al-Mutairi, 2024), and road safety (Alalwany & Mahgoub, 2024). It is also gaining ground in the field of Educational Technology (ET) (Xie et al., 2023), showing potential to improve teaching processes, optimize learning and student experience at all levels (Al-Taai et al., 2023; Khan et al., 2023).

1.1. AI in Education and the transformation of the Professional Digital Identity

AI is playing a pivotal role in the path toward new educational paradigms, facilitating instruction and administrative decision making (Hwang et al., 2020). Over time, GenAI has evolved from ba-

sic systems to advanced educational solutions, such as humanoid robots and chatbots, which assist in learning, assessment, and administrative tasks (Chen et al., 2020; Chiu et al., 2023). As GenAI is integrated into digital environments, it transforms the way people interact with emerging technologies, generating a more complex perception of tools such as chatbots, which are now considered interaction partners (Business Wire, 2024; Huerta & Domínguez, 2023).

Digital identity, defined as the way in which technology mediates the experience of personal identity, is directly impacted by this technological transformation (Almazán-López & Osuna-Acedo, 2023). As technologies advance, so do the attributes that define our presence in digital environments, integrating algorithmic identities within a postdigital framework, where digital technologies interact with social and commercial factors (Aran-tes, 2024). Concerns such as privacy (Fernández, 2023) and emotional well-being are common (Caltrider et al., 2024), thus requiring direct action to avoid ethical risks. In the educational domain especially, GenAI presents dangers for data privacy and equity (Rivera-Vargas et al., 2024), as algorithms developed in specific contexts may not be suitable for universal implementation (Nsoh et al., 2023). Furthermore, datafication of education could reduce human interaction with data, promoting a mechanized approach to learning (Nemorin et al., 2023). GenAI, too, may facilitate misinformation by generating content that appears truthful but may lack accuracy (Chen & Shu, 2023) or be tailored to the preferences of users who do not verify results (Wei et al., 2024).

1.2. Opportunities of ST and objectives of this research

Despite these challenges, ST and GenAI offer significant opportunities in education (Peñalvo et al., 2024), enabling efficient analysis of large volumes of data, which facilitates personalized and adaptive learning that can enrich the educational experience (Chen et al., 2020; Gillani et al., 2023). This approach has driven smart education, where global learning environments integrate advanced tools, such as cloud computing, learning analytics, IoT, and smart classrooms, transforming traditional educational practices (Chen et al., 2021; Cheung et al., 2021). This approach not only seeks to personalize learning, but also to develop skills relevant to the digital economy (UNESCO IITE, COL, & BNU, 2022), and stimulate higher-order thinking (Zhang et al., 2023).

However, to successfully integrate ST, it is essential to consider the acceptance and trust of teachers, as they play a central role in the implementation of these changes (Katshuna & Shikalepo, 2023). Understanding the perceptions and challenges faced by teaching teams is crucial for educational institutions to design effective training and support strategies aligned with the demands and opportunities of this new technological paradigm.

The main objective of this research is to identify the attitudes, perceptions and challenges of compulsory and non-compulsory education teachers in the implementation of ST, considering its impact on the construction of their digital identity and their role in the postdigital paradigm. Three specific objectives are established:

1. To assess knowledge and perceptions: To analyze the level of knowledge and experience of teachers, as well as their attitudes towards ST, including their assessment of the impact of ET on learning, and considering ethical, privacy and equity aspects.
2. To explore relationships and patterns: To investigate associations between the variables studied, to identify patterns or cause-effect relationships.
3. Reflect on the new teaching role: To critically examine the new educational demands and the changes needed for teachers to build a postdigital identity according to the new educational paradigm.

2. METHODOLOGY

The research adopts a non-experimental, cross-sectional design with a mixed sequential approach. The sequential explanatory design allows us to use the results of the initial questionnaire to guide the focus group questions and the in-depth interview.

2.1. Questionnaire and Correlations

The ad hoc questionnaire was validated by five experts from Spanish universities virtually (Galicia Alarcón et al., 2017). It consists of 32 items in three categories (C): 3 informed consent items and 14 more relating to sociodemographic data (CI); an 11-item Likert scale to assess knowledge, attitudes and perceptions about ET and ST from 1 (low) to 5 (high) (CII); and 4 open-ended questions to clarify answers and express concerns and opportunities regarding ET and ST (CIII).

The questionnaire was completed in English or Spanish by 177 teachers. The composition of the sample was as follows: 63.8% from Spain, 28.2% from the USA and 8% from other countries. Of the total, 81.3% were 40 years of age or older, 55.4% were women, 42.4% were men, and 2.2% were non-binary.

The survey was disseminated through different social networks to teachers at all educational levels from kindergarten to university.

Given that the Likert scale ratings are ordinal data, Spearman's correlation was applied to analyze the relationships between the 11 variables, without assuming normality in the distribution, which is in line with the nature of the data.

2.2. Focus groups and in-depth interview

Of those who completed the questionnaire, 34 people agreed to participate in focus groups. Eleven were selected considering their diversity in ET knowledge, location, age and gender as follows: High level of knowledge 36.4%, moderate 54.6% and low 9.1; 54.6% from Spain, 36.4% from USA and 9.1% from elsewhere; between 30 to 39 years old 36.4%, 40 to 49 years old 18.2% and over 50 years old 45.5%; 45.5% were women and 55.5% men. Two groups were formed: FG1 for compulsory education, pre-school and primary 27.3%, secondary 18.2%; and FG2 for non-compulsory education, high school 9.1% and university 45.5%. An in-depth interview was conducted with a participant with advanced experience and divergent opinions. The moderator used a semi-structured script to complement and triangulate the survey data.

2.3 Data Analysis

The closed-ended survey responses were analyzed with SPSS Statistics 25, and the content of the open-ended questions, along with the transcripts of the focus groups and the in-depth interview, were examined using Atlas.Ti 24.

3. RESULTS

The analysis of the results is divided into two sections: quantitative analysis, which explains the origin of the sample, details about the instrument used and its reliability, as well as the analyses carried out based on the assessment constructs and their correlations; and qualitative analysis, which shows the data obtained from the focus groups and the in-depth interview based on two semantic networks that illustrate the perceptions and assessments of the teaching staff.

3.1. Quantitative Analysis

3.1.1. Sample and scale reliability

The survey was answered mostly through the X social network by people with an active profile in this network and presumably an interest in digital technologies, which suggests a positive bias towards these tools.

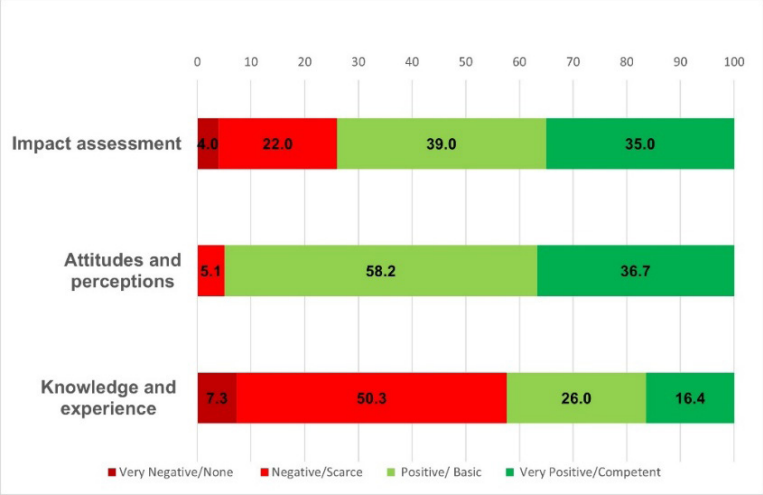
In terms of education, 55.4% had a master's or postgraduate degree, 28.8% had a university degree and 15.8% had a PhD. 68.9% had at least moderate knowledge of ET and 72.3% had more than 11 years of teaching experience. Regarding their place of work, 66.7% worked in public institutions, 14.1% in private and 19.2% in charter schools. 42.9% of survey respondents taught in kindergarten or primary school, 32.8% in secondary school, 20.2% in college and 4.1% in other schools. 85.5% of their students were diverse in race, gender, special needs, or socioeconomic status.

The Likert scale in the survey showed a Cronbach's Alpha of 0.847, indicating high reliability.

3.1.2. Appraisal constructs

The charts in Figure 1 were generated by grouping the results of the Likert scale into 4 levels to identify trends.

Figure 1. Constructs of the surveyed teachers' assessment on ST.



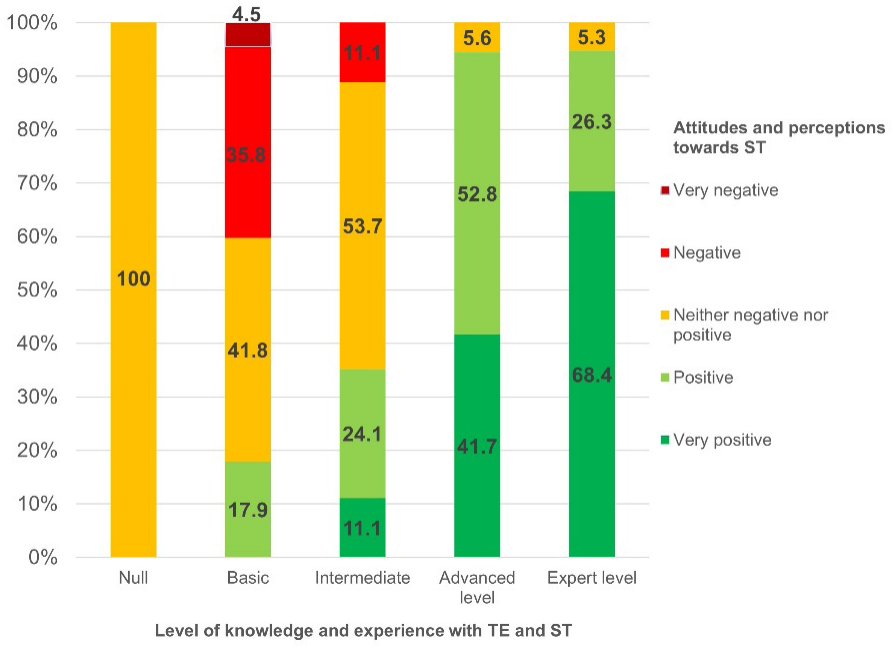
Source: Own work.

Figure 1 shows three key aspects of teachers' evaluation of ST, based on the self-assessment of 177 respondents. Regarding knowledge and experience, the majority perceived themselves as having little or no knowledge (50.3%) or none (7.3%), while 26.0% rated themselves as having basic knowledge. Only 16.0% considered themselves competent. Regarding attitudes and perceptions towards ST, the vast majority had a positive (58.2%) or very positive (36.7%) view, and only 5.1% expressed a negative perception. Finally, regarding the impact of ST in the classroom, most of the respondents rated it as positive (39.0%) or very positive (35.0%), although a small group perceived it negatively (22.0%) or very negatively (4.0%).

3.1.3. Correlation between variables

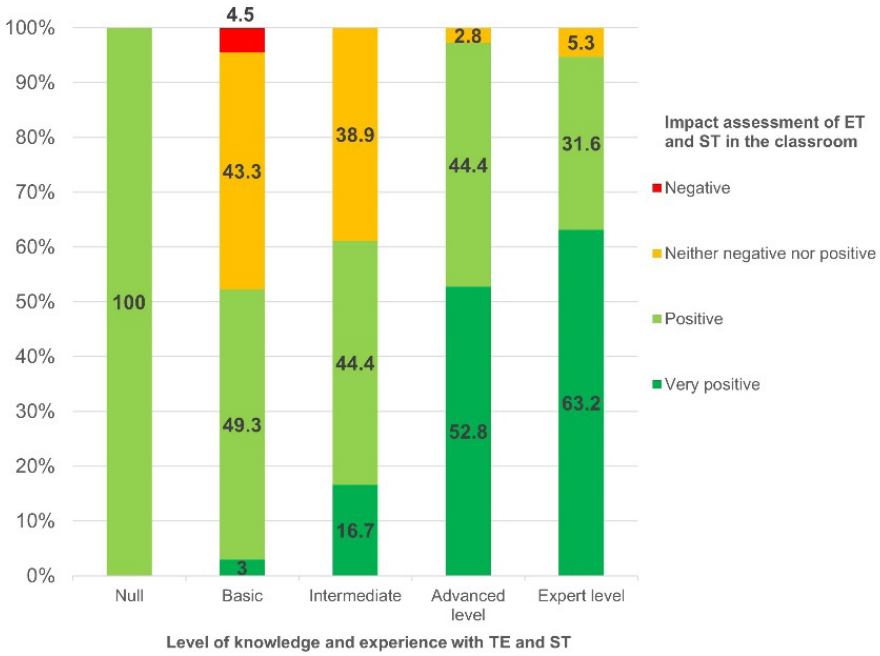
From the matrix of recoded variables grouped into a single value per category, significant bilateral correlations were obtained ($p < 0.01$): strong positive ($r = 0.525$) between self-assessment of the level of knowledge and experience with ET and ST and attitudes and perceptions towards ST (see Figure 2); moderate positive ($r = 0.437$) between self-assessment of the level of knowledge and experience with ET and ST and the assessment of the impact of the application of ET and ST in the classroom (see Figure 3); and also moderate positive ($r = 0.413$) between the evaluation of the impact of the application of TE and ST in the classroom and their attitudes and perceptions toward ST (see Figure 4).

Figure 2. Level of knowledge and experience with ET and ST in relation to attitudes and perceptions towards ST.



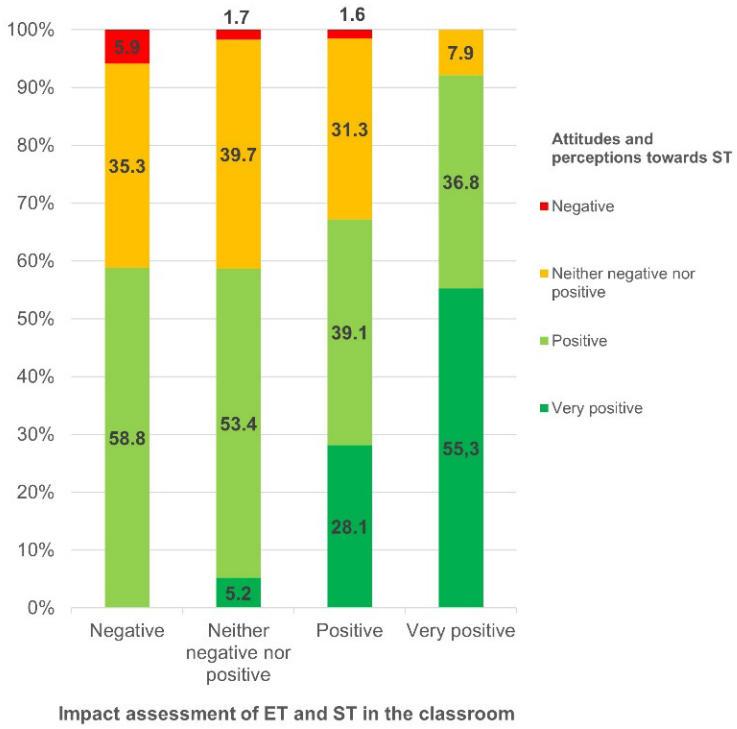
Source: Own work.

Figure 3. Level of knowledge and experience with ET and ST in relation to the assessment of their impact.



Source: Own work.

Figure 4. Impact assessment of ET and ST in the classroom in relation to attitudes and perceptions toward ST.



Source: Own work.

3.2. Qualitative analysis

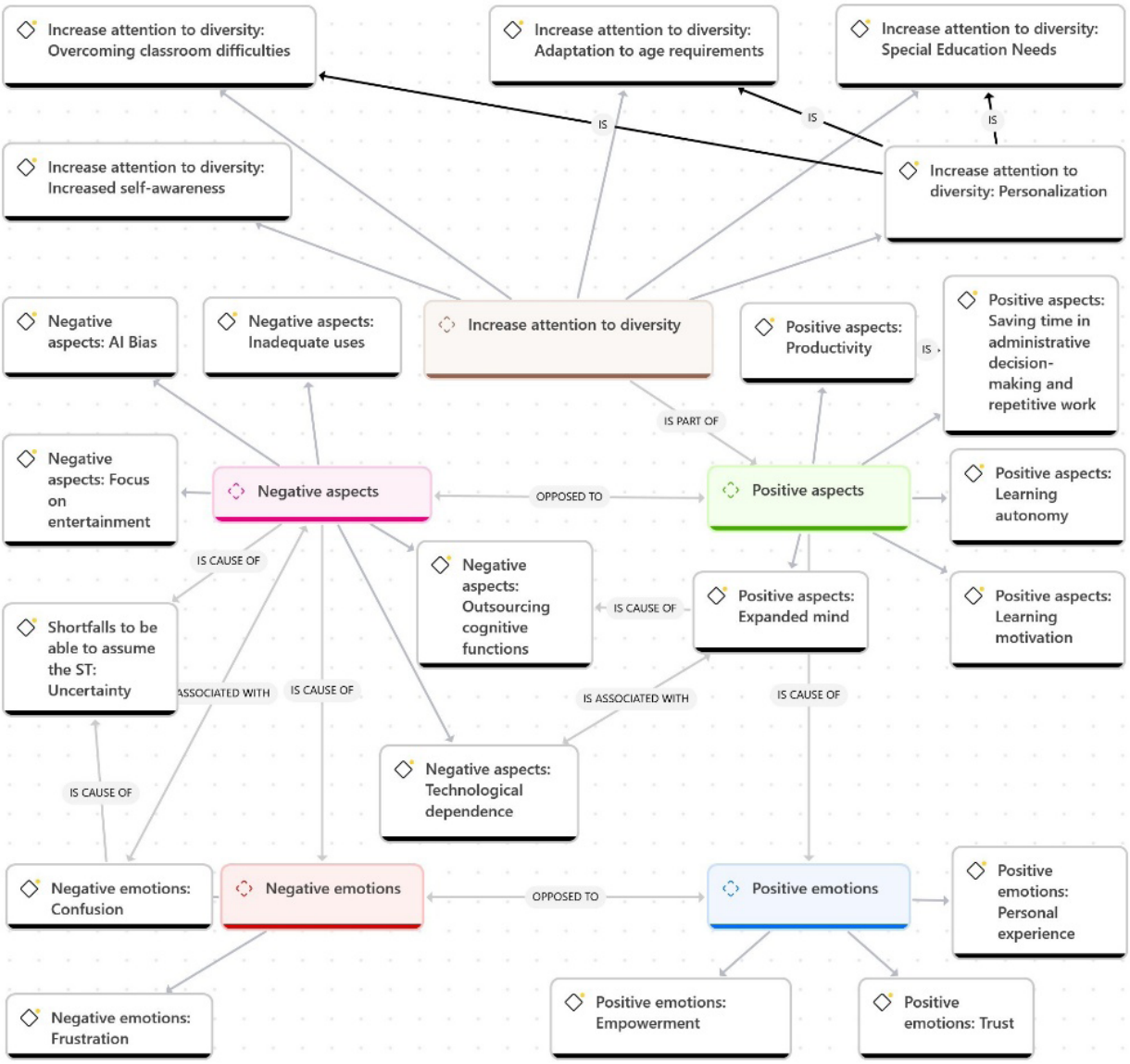
3.2.1. Focus groups and in-depth interview

From the transcripts of the focus groups FG1, FG2 and the in-depth interview, 12 main codes and 175 subcodes were identified. Based on the analysis of the most salient themes in both groups and in the interview, these codes were organized into semantic networks for better understanding.

3.2.2. Negative and positive aspects

The semantic network illustrates teachers' perceptions and evaluations of the integration of intelligent technologies in both compulsory and non-compulsory educational settings. Two opposing poles are identified in the network: negative and positive (see Figure 5).

Figure 5. The negative and positive aspects of ST integration in Education.



Source: Own work.

The negative aspects that educators identified about the integration of ST reflect several concerns linked to emotions, such as frustration and confusion:

- GenAI biases: They fear that GenAI may have biases that affect the student body.
- Inappropriate uses: They are concerned that technologies are not being used appropriately in the classroom.
- Focus on entertainment: They fear that technology may focus too much on entertainment and not on learning.
- Technological dependence: There is a risk that students will become overly dependent on technology.
- Externalization of cognitive functions: They fear that technology may reduce the need to develop certain cognitive skills.

On the other hand, perceived positive aspects include:

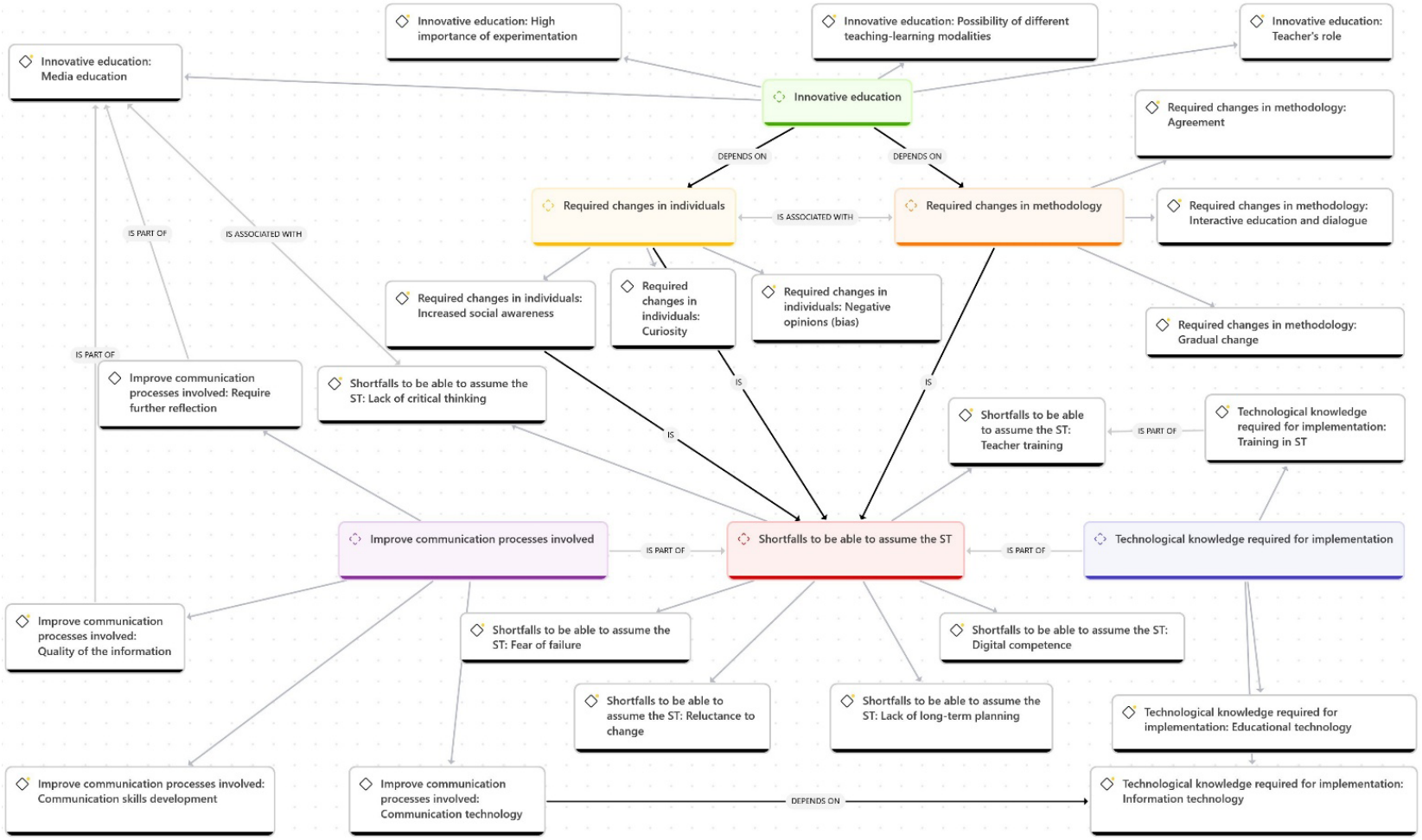
- Productivity: Technologies can improve efficiency in teaching and learning, saving time on administrative tasks.
- Expanded mind: Technology has the potential to expand cognitive capabilities and access to co-knowledge.
- Autonomy in learning: They allow students to have greater control over their learning process.
- Motivation to learn: Smart Technology can increase student interest and motivation.

The teachers also highlighted how these technologies make it possible to better address diversity, facilitating the personalization of learning according to individual differences. However, they face challenges such as integration in diverse classrooms and the risk of widening the digital divide. Positive emotions, such as empowerment and confidence, are associated with these positive aspects.

3.2.3. Innovative Education

The semantic network shown in Figure 6 focuses on the challenges and needs for implementing innovative education, encompassing both the required changes in people and in the methodologies and technologies applied. At the center of this network are the concepts of "Required changes in individuals" and "Required changes in methodology", which connect key areas such as "Educational Innovation", the "Technological knowledge required for implementation" and the need to ''Improve communication processes involved''. These last two factors are seen as ''Shortfalls to be able to assume the ST.

Figure 6. Requirements and deficits for Innovative Education with ST.



Source: Own work.

The network shown in Figure 6 highlights the importance of individual and social change as a precursor to educational innovation. Connections are identified that indicate the need to increase social awareness, curiosity and to overcome prejudices or negative attitudes. At the same time, barriers appear, such as the lack of skills to assume change and fears associated with failure or resistance.

Educational innovation is closely linked to changes in teaching methodology. The network nodes point out the need for technological knowledge to apply educational technologies, emphasizing that teacher training is essential. These methodological changes must not only be gradual, but also consensual and negotiated among all parties involved, promoting collaborative and well-communicated change.

The network also highlights media education as a fundamental pillar of innovative education, especially for its role in improving communication skills and information management. This relevance is reflected in the connections between media education, individual and methodological change. Media education is perceived as crucial for the development of critical thinking and social awareness, evidenced by the nodes that underline the need for reflection and overcoming deficiencies in information management.

4.DISCUSSION

This study explores the relationships between teachers' knowledge and perceptions of ST, aiming to identify patterns and cause-effect connections to address new educational demands related to their role. Based on the results presented in the previous section, we present the key aspects discussed by the scientific community, drawing on findings from other quantitative and qualitative studies. From a critical perspective, we reflect on how these technologies are redefining teachers' identities and transforming their roles in an increasingly interconnected environment. Finally, we outline the study's limitations and propose future research directions to address the pedagogical and ethical implications of GenAI.

4.1. Quantitative analysis

The data indicate a favorable tendency of teachers toward ST, although with a moderate perception of competence. Most feel capable of adopting these changes and see ST as allies in their work, without fear of being replaced by machines. However, they recognize limitations in their knowledge of the pedagogical use of these technologies, due to insufficient institutional training.

These results are consistent with other studies, where teachers perceive GenAI as a complementary tool for teaching, but recognize that they need more preparation and knowledge about its applications (Álvarez-Herrero, 2024; Ha & Lee, 2019; Sánchez-Vera, 2023). Worldwide, the Global Workforce of the Future 2023 report, which surveyed 30,000 workers in 23 countries, revealed that 62% believe that AI will facilitate a focus on more meaningful tasks, alleviating operational burdens (The Adecco Group, 2024). A Microsoft survey (2024a) stated that 75% of knowledge workers use GenAI at work today and that GenAI helps them save time (90%), focus on their most important work (85%), be more creative (84%), and enjoy their work more (83%). However, in another Microsoft study on digital security (2024b), only 20% of respondents consider themselves very familiar with GenAI, underscoring the need for more training in this technology.

The correlational analysis indicates that there is a positive relationship between teachers' knowledge and experience in ET and ST and their perception of the impact of these technologies in the classroom. Teachers with greater familiarity and experience in these areas tend to have more favorable attitudes and to value more positively the use of ST in learning. This suggests that familiarity with and confidence in technologies can significantly influence how their educational potential is perceived.

These results are consistent with previous research showing that teaching digital competence is associated with a more positive attitude toward GenAI, regardless of factors such as educational

level, gender, age, or years of experience (Galindo-Domínguez et al., 2024; Ha & Lee, 2019). The Microsoft (2024b) survey reveals that as familiarity with GenAI grows, so does enthusiasm for its applications. Similarly, in the other aforementioned Microsoft study (2024a), four profiles of users were identified, ranging from skeptical to advanced users. The more advanced users perceive that GenAI makes it easier to manage their workload (92%), increases their creativity (92%) and allows them to focus on important tasks (93%), as well as increasing their motivation and enjoyment of work (91%). In contrast, the less advanced ones report fewer benefits, underscoring how the frequency and depth of GenAI use can affect its perceived impact in the workplace.

4.2. Qualitative analysis

The content analysis of the transcripts of the focus groups and the interview shows coincidences in the challenges and concerns of the teachers. The semantic network on "the negative and the positive" offers a balanced approach to ST in education, highlighting expectations and concerns. Concerns related to emotions such as frustration and confusion suggest that there are significant emotional concerns. In contrast, positive emotions such as empowerment and confidence are associated with the favorable aspects, indicating a recognition of the potential of these technologies to strengthen education. This reflects a balance between caution and optimism regarding the future impact of ST.

The semantic network on ST and "innovative education" highlights the interdependence between human and technological development to achieve transformative education. Barriers such as lack of adaptative skills and fear of failure or resistance appear, suggesting that any move towards innovative education must proactively address these concerns. The implementation of new methodologies and ST requires profound changes in mindsets and educational practices and underlines the importance of media education to develop critical communication and information management skills in a technological environment. To achieve successful adoption, both personal and methodological challenges need to be addressed.

As noted in previous studies, fears and reservations persist about the unknown effects of these technologies (Álvarez-Herrero, 2024), with an emphasis on the need for teacher training. Other studies point out that, in primary and secondary education, ST are mainly used to create content, while in higher education they are focused on academic and technical uses, supporting research and experimentation (Galindo-Domínguez et al., 2024). However, there remains a wide margin to explore the possibilities of these technologies in and out of the classroom (Sánchez-Vera, 2023).

In general, there is a mixture of expectations and reservations about ST in education (Hadi Mogavi et al., 2024), highlighting the need to balance enthusiasm for these technologies with critical reflection on their practical, pedagogical and ethical implications, as concluded by other authors (Álvarez-Herrero, 2024; Sánchez-Vera, 2023).

4.3. Critical reflection: (Post)digital teacher identity

Although AI has been in education for more than 30 years, its pedagogical appropriation or its implications, especially in terms of rights and autonomy remains a challenge for teachers (Arantes, 2024). What is important is that, from the appearance of GenAI, at the end of 2022, the debate has been activated. Effective integration requires solid training and clear theoretical frameworks at the competitive and ethical levels (F. Miao & Cukurova, 2024; Peñalvo et al., 2024). Teachers are fundamental in the implementation of educational innovations and their participation in evaluation is key to ensuring good results (Katshuna & Shikalepo, 2023). GenAI redefines its role (Arantes, 2024), they are no longer only guardians of knowledge, but facilitators of access to it that promote multidisciplinary development (Duan et al., 2023).

The incorporation of ST implies guiding the reflective use of technology (Arantes, 2024), fostering critical, inclusive and collaborative education (López-Rey, 2024). This requires teaching methods adapted to the students, promoting creativity and holistic learning (Habib et al., 2024) in stimulating environments that avoid potential pitfalls (Abbas et al., 2024). TS can reduce the teaching

load through optimized planning and personalized feedback (Mollick & Mollick, 2023). To take advantage of them, teachers must act as data leaders and analysts, monitors of student progress, and technological adapters (Miao & Yao, 2021) by focusing on the quality of thinking with more diversified educational content, and more flexible and richer teaching methods (Xue & Zhou, 2021).

The teacher-learner relationship should not be limited to the transmission of data for GenAI systems (Nemorin et al., 2023). In the postdigital era, which connects biological, environmental and social aspects, knowledge is conceived as a dynamic network, favoring collaborative learning and overcoming traditional hierarchies (López-Rey, 2024). Postdigital Ecopedagogy highlights the interdependence between humanity and technology from a critical pedagogy where teachers must assume an active role in the construction of a more just society by being agents of change towards bioinformatic social justice (Jandrić et al., 2023). In this context, teachers must guide in the critical selection of information, promoting creativity, empathy and collaboration, maintaining their essential role of educating people (Nsoh et al., 2023).

Continuing education ensures its adaptation to technology to maintain its fundamental role in education (Xue & Zhou, 2021). A re-evaluation of education in general is necessary to adapt it to the new technological paradigm (Almazán-López & Osuna-Acedo, 2024) and to ensure that the human relationship remains at the center of the formative process (Miao & Holmes, 2024; Peñalvo et al., 2024).

4.4. Limitations of the study and future lines of research

The main limitation of this article arises from the absence of a comprehensive educational theory that allows a holistic approach to the human, technological and natural aspects, to understand systemically how each one influences the complex phenomenon of education. This study focuses on the attitudes and perceptions of teachers but does not consider the diverse contexts in which they find themselves. Research should continue to investigate in a multidimensional way to access a more integrated knowledge of the educational reality.

The scientific community must address the knowledge gap generated by the lack of longitudinal studies with a solid pedagogical basis, with a predominance of descriptive and pilot research from a technological approach. It is necessary to move towards research that integrates ST with a critical approach within pedagogical frameworks, instead of focusing on specific instrumental applications.

It is crucial to consider the challenges posed by the adoption of AI in the teaching-learning process as a technical infrastructure, considering the budgetary constraints and its rapid progress, the resistance to change of some professionals, and ethical issues. In particular, the challenges of privacy must continue to be explored in order to develop alternative and fair digital ecosystems that do not put the people involved at risk.

Future studies should probe the benefits associated with the use of AI, comparing the dynamics of use in various fields of knowledge and genders to examine possible differential effects. In addition, the effects of these technologies on the learning experiences, cognitive skills, and assets of students, faculty, and research staff need to be probed. This would contribute to nuance the growing discourse on the role of AI in education.

International comparative studies could shed light on the differences in the implementation of GenAI and its effect on teaching, not only for students, but also for the initial and continuous training of teachers, focusing on the development of pedagogical and technological skills. In this sense, it is necessary to improve the evaluation and feedback processes. In other words, it is particularly relevant for the scientific community to explore how GenAI facilitates the personalization of learning and its adaptation to individual needs, as well as to better understand the perceptions of non-specialized audiences about GenAI and its best pedagogical practices.

5. CONCLUSIONS

Teachers' perceptions of the impact of ST in education are diverse and vary according to the context and needs of each classroom. A complex picture is revealed in which AI in education is seen as a driving force for innovation and efficiency, but also faces ethical, emotional and professional challenges that need to be addressed for successful integration in the classroom.

We live in a postdigital society and education should adapt to this circumstance, adapting its role to the new technological paradigm from a multidimensional perspective. This perspective cannot be reduced to its mere technical functionality or social instrumentalization, since it affects the integral identity of individuals.

The postdigital teacher's identity is related to their competence at the human, technological and pedagogical levels, as well as their attitude to adapt, use and teach with and about ST in the educational environment.

It is imperative to foster learning for, about and with ST in all educational settings and levels. This will enable students to acquire effective and critical skills in the face of this new paradigm. Education must also become the socializing agent of the 4th Industrial Revolution, which requires adequate teacher training in the use of ST in general and GenAI in particular.

From a critical media literacy, which shapes digital identities prioritizing ethical and collective values over economic and individual ones, service to people must be prioritized over other interests.

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AVAILABILITY OF DATA AND MATERIALS

The data analyzed during the present study and supporting findings are available from the authors upon request.

STATEMENT ON ETHICS

Informed written consent was secured from all participants, adhering to the ethical standards of the Declaration of Helsinki.

AUTHORSHIP CONTRIBUTION

Each author listed has made a substantial, direct, and intellectual contribution to the work in all the phases of the project: Conceptualization, data curation, formal analysis, methodology, drafting and writing. Each author has approved it for publication.

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