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ANALYSIS OF THE INFLUENCE OF CHATGPT ON SECONDARY EDUCATION FROM THE PERSPECTIVE OF TEACHERS

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Abstract

In the current landscape, the rapid evolution of educational technology, particularly AI tools like ChatGPT, necessitates understanding how educators perceive their integration into the education system. This study uses a quantitative, non-experimental, descriptive-comparative, and cross-sectional study was conducted with 379 active teachers in Castilla y León, Spain. The research instrument was a questionnaire originally developed and validated by Lozano and Blanco-Fontao (2023), which had previously shown strong internal consistency and methodological rigor with minor adaptation to the population of this study. Findings reveal high awareness and exploratory use of ChatGPT among teachers, though practical implementation and specific training remain limited. Teachers acknowledge ChatGPT's potential to enhance educational processes, particularly in generating educational materials and planning tasks. However, significant concerns about plagiarism, critical thinking, and ethical use persist. Differences in perceptions are mainly influenced by specialty, age, and gender, highlighting the need for tailored training and policies to support effective and ethical AI integration in education. These insights underscore the importance of continuous professional development to harness AI's benefits while mitigating associated risks.

Keywords **–** ChatGPT, Secondary education, Artificial intelligence, Teacher perception, Technology in education, AI ethics, Teaching and learning.

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1. Introduction

The advent of new technologies, such as artificial intelligence (AI), often generates mixed reactions and societal polarization, oscillating between perceptions of their benefits and dangers, evoking both redemptive and apocalyptic scenarios. Since the early days of human-like information processing in the 1950s, led by Turing (1950), AI has experienced exponential growth. This growth took a decisive turn with the introduction of chatbots, especially following the global launch of ChatGPT-3.5 in November 2022 and its improved version, ChatGPT-4, developed by OpenAI (2022). This AI tool, based on the

Generative Pretrained Transformer (GPT) language model, is designed to generate responses that emulate human interaction. The recent evolution of AI has been enthusiastically received in various scientific fields, resulting in numerous applications that have had a positive impact on several sectors, including education (Wu & Bibault, 2024; Chapman, Wang & Wiechert, 2024; Sahu, Benjamin, Singh-Aswal & Williams-Persad, 2024; Xu, Sanders, Li, & Chow, 2021).

In the educational sector, the influence of AI has been notable from its early manifestations (Puddifoot & O'Donnell, 2019) but it has also raised significant concerns, particularly regarding authorship and academic ethics. A considerable portion of the current scientific literature in the educational field addresses issues related to authorship (Adiguzel, Kaya & Cansu, 2023; Kim & Wong, 2023; McCarthy, 2023; Goto & Katanoda, 2023) and the problems associated with potential plagiarism (Foltynek, Bjelobaba, Glendinning, Reza-Khan, Santos, Pavletic et al., 2023; Kobak, González-Márquez, Horvát & Lause, 2024; Ganjavi, Eppler, Pekcan, Biedermann, Abreu, Collins et al., 2024; Liang, Yuksekgonul, Mao, Wu & Zou, 2023). Simultaneously, there is growing ethical concern addressing issues such as responsibility, inclusion, social cohesion, autonomy, security, bias, academic integrity, and environmental impact (Stahl & Eke, 2024; Flores-Vivar & García-Peñalvo, 2023; Romo-Pérez, García-Soidán, Özdemir & Leirós-Rodríguez, 2023; Baidoo-Anu & Owusu Ansah, 2023; Yu, 2024; Duong, Can & Nguyen, 2024).

UNESCO, which committed to leveraging the potential of AI technologies to ensure inclusive, equitable, and quality education and to promote lifelong learning opportunities, has established clear guidelines within the framework of the 2030 Agenda (SDG 4) (UNESCO, 2022). These guidelines are structured around 44 recommendations covering the integration of AI in educational policy strategies; its deployment for educational administration and facilitation; strengthening AI in pedagogical practices and among the teaching community; the implementation of AI in learning processes and their assessment; promoting essential skills and values for life and work in the AI era; deploying AI to ensure universal access to lifelong learning opportunities; advocating for the equitable and inclusive use of AI in educational contexts; incorporating gender equity considerations in AI applications to promote gender equality; and ensuring ethical, transparent, and responsible management of educational data and algorithms (UNESCO, 2022).

In contexts where real political interventions are still scarce, for example, in Spain, the only document addressing these concerns dates back to 2020 (Ministerio de Educación y Formación Profesional, 2020). Several universities have already begun distributing ethical codes to regulate the use of AI in research. Some institutions have even reverted their practices to more traditional examination methods, such as written or oral tests (Acosta-Enríquez, Arbulú-Ballesteros, & Arbulu-Pérez-Vargas, 2024; Cotton, Cotton & Shipway, 2023), or have imposed complete bans on the use of such technologies (Dwivedi, Kshetri, Hughes, Slade, Jeyaraj, Kar et al., 2023; Chaudhry, Sarwary, Refae & Chabchoub, 2023) in line with solutions proposed by other educational systems outside Spanish borders. This preventive action occurred even before the European University Association (EUA) published in February 2023 its position on responsible use in university teaching, Artificial intelligence tools and their responsible use in higher education learning and teaching (European University Association, 2023). However, Spain's endorsement of the document through Crue Universidades Españolas and the Ministry of Universities has been a relatively modest step in this direction.

Derived from these guidelines, several key documents have been developed in Spain to regulate the use of AI in the educational field. The National Institute of Educational Technologies and Teacher Training recently presented the "Guide on the use of artificial intelligence in the educational field" (INTEF, 2024), which provides clear guidelines for the ethical and effective integration of AI in schools. The guide highlights the importance of training teachers in digital skills, fostering a culture of responsible and ethical use of technology, and ensuring inclusion and equity in access to these tools. It also emphasizes the need to establish clear policies on data protection and student privacy, as well as to promote the creation of high-quality educational content that leverages AI capabilities.

In parallel, EduCaixa and the Higher Council for Scientific Research (CSIC) have collaborated on developing the document "Designing a Protocol on AI in the Educational Center" (EduCaixa & CSIC, 2024), which provides a practical framework for implementing AI in educational institutions. This protocol details specific steps for integrating these technologies into the curriculum and administrative management of centers, addressing aspects such as staff training, evaluation of AI tools, and creating a safe and ethical environment for using these technologies. It also includes a section on how to involve families and the educational community in the AI adoption process, ensuring broad understanding and acceptance.

Moreover, in August 2024, the European Union will publish its first specific regulation on artificial intelligence, including detailed regulations for its use in the educational field. This regulation aims to ensure the safe, inclusive, and effective use of AI in education, promoting both innovation and the protection of students' and teachers' rights. It will establish standards for transparency in the use of algorithms, responsibility in case of misuse or failures, and the need to ensure that AI does not perpetuate existing biases or inequalities. Furthermore, collaboration between member states will be encouraged to share best practices and develop common approaches for integrating AI into education.

The guidelines outlined by UNESCO and the resulting regulations could mark the beginning of a journey towards effective regulation within the educational field, potentially influencing the quality of teacher training (UNESCO, 2022) and devising effective strategies to promote digital literacy. The OECD has echoed these sentiments, emphasizing the need for research examining the transformations brought about by intelligent technologies and their direct impact on classroom education, as well as on the management of educational organizations and systems (OECD, 2021).

1.1. AI in the Education System

Numerous interventions in the school context and recent empirical studies have begun to show promising results. Research examining the potential of these technologies to enhance communication between teachers and students, which began decades ago in the field of Computational Linguistics. Now it includes areas such as natural language processing in communicative interactions and generating contextually appropriate responses in educational settings (García Peñalvo, Hernández-García and Conde, 2024; Nazaretsky, Mikeska & Beigman-Klebanov, 2023; Tack, Kochmar, Yuan, Bibauw & Piech, 2023). The benefits encompass teaching native and foreign languages from an early age, with a special emphasis on improving written expression (Adigwe & Yuan, 2023; Cooper, 2023; Adiguzel et al., 2023). These technologies also focus on providing personalized responses and resources according to each student's level, pace, and learning style, based on individualized learning experiences (Pataranutaporn, Leong, Danry, Lawson, Maes & Sra, 2022). Moreover, their use as tools offering innovative methodologies improves teaching-learning processes, impacting both superficial and deep motivation, and potentially enhancing academic performance (Eke, 2023; García-Martínez, Fernández-Batanero, Fernández-Cerero & León, 2023; Farrokhnia, Banihashem, Noroozi & Wals, 2023). Other applications include AI's role in addressing individual differences in real-time as part of Universal Design for Learning (UDL) (Ayala, 2024); creating educational materials and resources such as texts, images, videos, 3D objects, audio, and source codes; AI's ability to understand context, facilitating greater interaction with tools and enabling more autonomous responses and a richer informational landscape; and developing intelligent tutoring systems through smart programs that simulate human tutors guiding, offering feedback, directing learning, and setting work schedules (Polak, Schiavo & Zancanaro, 2022; Long, Magerko, 2020).

Additionally, AI is considered to improve teacher productivity, reducing the time spent on asynchronous tutoring and mechanical tasks in assessment using scales or rubrics (Farrokhnia et al., 2023). It has also been examined for its capacity to facilitate automated grading of exams and automatic supervision of forums, and to provide information on student progress through continuous and formative assessment, fostering self-regulation (Flores-Vivar & García-Peñalvo, 2023; Nazaretsky et al., 2023).

Despite the potential benefits of ChatGPT in lesson planning and educational activities, there is growing concern about plagiarism and the loss of critical thinking skills (Foltynek et al., 2023; Kobak et al., 2024; Ganjavi et al., 2024). Recent studies have found that secondary school teachers believe ChatGPT can devalue the educational system and raise ethical questions about its use (Sharma & Yadav, 2022). On the other hand, there is a highlighted need for adequate training to maximize the benefits of the tool for teachers and students (Sharma & Yadav, 2022; Dilekli & Boyraz, 2024).

Current studies confirm the growing awareness and general knowledge of AI tools among educators, although there is a notable gap in formal training and practical application in classrooms (Farrokhnia et al., 2023; Polak et al., 2022). The rapid evolution of technologies surpasses training programs, and institutional support for professional development in emerging technologies is limited (González-González, 2023; Rahman & Watanobe, 2023). Indeed, Lozano and Blanco Fontao and Blanco Fontao *et al.* (Lozano & Blanco-Fontao, 2023; Blanco-Fontao, López-Santos & Lozano, 2024) have examined whether the education system is prepared for the irruption of AI, analyzing the perceptions of primary education students and teacher training master's students from a dual perspective: as current students and future teachers. This study highlights that although there is a high level of knowledge about AI tools, formal training and practical application in educational contexts are still insufficient. The authors underscore the need for adequate training for educators, as well as the development of clear policies to ensure the effective and ethical integration of AI in education.

Given that this evolutionary trajectory in education concerns all layers and agents of education, it is imperative to understand how secondary education teachers perceive these emerging AI-based technologies beyond pre-service teachers, as they may belong to different generations and may not have been fully trained in the AI era. This understanding will subsequently facilitate an analysis of the potential repercussions. These perceptions and their differences may have an impact on the future structure of the educational system, especially considering that a sector of the system is familiar with technology and has specific content within its subjects. This is the case with STEM (Science, Technology, Engineering, and Mathematics) teachers, who seem to show greater readiness and less anxiety towards teaching with AI compared to humanities and social sciences teachers, without specific content in their respective subjects (Druga, Otero & Ko, 2022; Dahlkemper, Lahme & Klein, 2023; Montenegro-Rueda, Fernández-Cerero, Fernández-Batanero & López-Meneses, 2023).

Thus, the general objective of this study is to evaluate the perception of secondary education teachers in the region of Castilla y León) regarding the prospects of using ChatGPT in education, from the dual perspective that these educators can offer as current users and as facilitators of learning. To this end, the following specific objectives have been outlined:

Objective 1: Study the level of prior knowledge of ChatGPT in the secondary education teachers.

Objective 2: Evaluate teachers' perceptions of the application of ChatGPT within the educational system.

Objective 3: Analyze whether these perceptions are influenced by teachers' specialty, experience, age, gender, or the type of institution where they work.

2. Materials and Methods

2.1. Experimental Design: Instrument, Characteristics and Application

To address the stated objectives, a quantitative, non-experimental, descriptive-comparative, and cross-sectional study was conducted by administering a questionnaire to active Secondary Education teachers in the Castilla y León region. For this study, the questionnaire was selected as research instrument because is one of the most widely used research techniques in the field of Education, it allows for the collection and analysis of information on social aspects and achieves a high degree of external validity by using representative samples of the population (López-Roldán & Fachelli, 2016). The questionnaire used in this study is an adaptation of the instrument originally designed by Lozano and Blanco-Fontao (2023), which was previously validated, and used later in the research of Blanco-Fontao et al., (2024), aimed at

analyzing the perception of university students about ChatGPT from a dual perspective: as students and future teachers, of primary education and secondary education, respectively.

The original instrument was developed following a rigorous methodological process that included item generation through expert brainstorming and subsequent validation using the Delphi technique with two rounds of expert review. The instrument demonstrated high internal consistency, with a Cronbach's Alpha of 0.801, indicating strong reliability for educational research purposes (Lozano & Blanco-Fontao, 2023). The following modifications were made to adapt the questionnaire to the target population and to the rapid evolution of the objectives in this field of study. Firstly, items related to the perception as students were removed, as they were not applicable to the current professional context (active teachers). Secondly, the part focused on the use of Chat GPT as teachers was adapted so that it referred to practicing teachers instead of future teachers. Finally, another multiple-choice question was included to analyze the challenges of the IA for the teacher's role, aspects considered in the study of García-Peñalvo, Llorens-Largo and Vidal (2024), and which can enrich this work. The modifications introduced were minimal and according to Heo, Kim and Faith (2015), when an instrument demonstrates high internal consistency (Cronbach's alpha > 0.80) and the items are tau-equivalent—that is, they are parallel and measure a unidimensional construct—there is no statistical necessity to recalculate reliability coefficients or conduct a new validation, provided that the content and measurement purpose remain consistent. From a methodological perspective, the use of the instrument remains valid in this new application, as its psychometric robustness ensures sufficient statistical power and construct stability across comparable populations

The final questionnaire adapted was structured into three blocks or sections. The first section comprises five descriptive sociodemographic questions about the sample population (teaching specialty, gender, age, years of experience, type of school where they work). The second section consists of seven questions, with yes/no answers, to study the participants' prior knowledge about ChatGPT, as well as its use or detection in classrooms. The third section consists of 8 Likert scale questions, where 1 means strongly disagree, 2 means disagree, 3 is neutral, 4 means agree, and 5 means strongly agree. These Likert-type questions are divided into three categories: A: *Access to and use of the application*, B: *Sources and quality of information*, and C: *Knowledge about the tool's functioning* (please, see Table 2 in *Perception of ChatGPT Use as Teacher* subsection). The third section includes the multiple-choice questions regarding the advantages, disadvantages, and challenges that ChatGPT presents in secondary education teaching. Once the instrument was adapted and before proceeding with its distribution, it was sent to the ethics committee of the University of León to obtain a favorable report (ETICA-ULE-058-2024).

2.2. Participant and Sample

The study population consisted of active secondary education teachers in the Castilla y León region (Spain) during the 2023-2024 academic year. The questionnaire was distributed in December 2023 and remained open until February 2024. To reach the teachers, it was sent via email to all the management teams of secondary education schools in the Castilla y León region, with this information obtained from the institutional website of the Regional Ministry of Education (www.educacyl.es). This resulted in a sample of 379 teachers from a total population of 18,481, which exceeds the minimum sample size of 377 required for a 95% confidence level and a 5% margin of error.

2.3. Statistical Analysis

Data collected from the questionnaire were processed using version 26 of the SPSS (IBM) software. Initially, the responses collected through the Likert scale were converted to qualitative values ranging from 1 to 5, with corresponding adjustments made for inversely formulated questions. Questions 1, 3, 5 and 6 of the Likert scale were inverted items, so when assigning the numerical value, the numbering was inverted for the calculation of Cronbach´s Alpha (Oviedo & Arias, 2005; Gliem & Gliem, 2003). Next, the response frequencies for each question were obtained and expressed as percentages for subsequent discussion. For the multiple-choice questions, the relative frequencies were calculated considering the total number of responses to each item.

Next, to study the influence on perceptions according to specialty, gender, age, experience, and type of high school, the Mann-Whitney U test was used. The choice of statistical analyses was guided by the nature of the research questions, which aimed to explore whether teachers' perceptions of ChatGPT varied significantly across demographic and professional variables (e.g., gender, age, teaching specialty). Given that the questionnaire responses were primarily based on Likert-type scales, and preliminary normality tests (Shapiro-Wilk, $p < 0.05$) indicated non-normal distributions for several variables, non-parametric tests were selected as the most appropriate approach. Specifically, the Mann–Whitney U test was used to compare independent samples across dichotomous variables. This test is widely recommended in educational and social science research for identifying differences in central tendency when dealing with ordinal data and small or unequal group sizes (Field, 2018; Jamieson, 2004). To perform this test and to study the influence on the independent variables, the general sample was divided into two groups of independent samples (Table 1). For specialty, the grouping was into teachers of science and technology-related subjects, including specialties in Physics and Chemistry, Biology and Geology, Computer Science, Technology, and technological branches of Vocational Training, compared to the rest of the specialties. This grouping was based on the educational curriculum contents of each subject and their relation to science and technology (Junta de Castilla y León, 2022). Regarding the age, the groupings established were teachers over and under 35 years old and regarding the experience the samples were grouped by those with five or fewer years of professional teaching experience compared to those with more than five years of experience, considering that younger and less experienced teachers might be influenced by the knowledge of these emerging technologies in a similar way that the work made by Nieto Sánchez and Blanco Fontao (in press). Another factor analyzed was gender, as previous studies have observed differences related to the affinity for technology traditionally associated with males (García-Martínez et al., 2023; Fernández-Batanero, Román-Graván, Reyes-Rebollo & Montenegro-Rueda, 2021). Finally, the type of school where the teachers worked was also considered, distinguishing between public managed schools and those privately managed privately (subsidized and private).

The percentage of the sample obtained for each group for the analysis of the independent variables can be seen in Table 1. To perform the comparative analysis between groups, the values assigned in the Likert scale responses described in the previous subsection were taken. The significance levels used as a reference in this study correspond to $p \leq 0.05$.

Independent variable		
Speciality	Related to science and technology (33 %)	Not related to science and technology (67%)
Gender	Female (28%)	Male (72 %)
Age	≤35 years (65%)	<35 years (33%)
Years of experience	≤5 years (58%)	<5 years (42 %)
Type of High-school	Public (85%)	Not public (15%)

Table 1. Independent variables under study and percentage of the sample obtained for each group (Nieto Sánchez & Blanco Fontao, in press)

3. Results

3.1. Prior Knowledge about ChatGPT

The results obtained from the second section of the questionnaire "prior Knowledge about ChatGPT" indicate a high level of prior knowledge about this tool among secondary school teachers. More specifically, the 90% of respondents stated that they know ChatGPT and the 67% of the teachers

reported having registered and conducted tests to familiarize themselves with its functionality. In contrast, the use of ChatGPT in tasks related to teaching is less frequent, with only the 37% of teachers having mentioned the use of the tool in this context.

The adoption of the premium paid version (ChatGPT 4.0) is extremely low, with only 2% of teachers indicating that they access to this version, and regarding specific training on this AI technology, the 86% of surveyed teachers have not received specific training of the tool. Concerning the detection of ChatGPT use by students, the 43% of teachers reported having identified its use among students. Finally, the integration of ChatGPT into teaching is still limited, with only the 15% of teachers using this tool to implement pedagogical activities in the classroom with their students.

These results suggest that although there is a broad knowledge and an initial willingness to explore ChatGPT among secondary school teachers, practical implementation and specific training are still areas that require further development and institutional support.

3.2. Perception of ChatGPT Use as Teacher

The results from Block 3 of the questionnaire reflect different perceptions of teachers about ChatGPT in the educational system (Table 2).

Regarding Category A: Access and Use by Teachers, the first question addresses whether they consider ChatGPT a threat to their teaching roles. The teachers do not lean towards any particular opinion, with no significant concern evident: 12.9% of respondents are completely in disagreement, 30.3% disagree, 33.0% remain neutral, and only 23.8% of the sample consider it a threat (combining the percentages of agreement and strong agreement). Concerning its utility in teaching (question 2), a small minority do not see it as a potential tool for teaching: 5.8% of teachers are completely in disagreement, and another 5.8% disagree that ChatGPT could be highly useful. Meanwhile, 28.0% are neutral, 34.6% agree, and 25.9% strongly agree that it has great potential. The last question in this category (question 3) asks teachers if they consider the use of ChatGPT by students as plagiarism. Here, 8.1% of teachers strongly disagree, 12.1% disagree, and 32.5% are neutral. Conversely, the majority do consider its use by students as plagiarism, with 21.4% agreeing and 25.9% strongly agreeing.

In terms of the use of ChatGPT for teaching purposes (Category B), most teachers report not having used it for this purpose (35.6% of teachers strongly disagree and 17.4% disagree, question 4). Additionally, 18.5% remain neutral, while 14.2% agree and another 14.2% strongly agree that they have used the tool to generate educational content. Regarding the possible devaluation of the quality of the educational system due to ChatGPT (question 5), opinions are mixed: 10.6% of teachers strongly disagree, 14.5% disagree, and 36.4% are neutral. Meanwhile, 19.8% agree and 18.7% strongly agree with this statement. Considering the moral perception of the use of ChatGPT as a teacher, 25.3% of teachers strongly disagree with using it for their professional development, and 26.4% disagree, both forming a majority. Additionally, 28.5% are neutral, 9.2% agree, and 10.6% strongly agree that its use is not morally correct (question 6).

Finally, the last category of study addresses the need to understand how the tool works (Category C). A significant majority of teachers (68.1%) strongly agree with this statement, emphasizing the importance of redesigning tasks to prevent plagiarism (question 7). Regarding the basic understanding of how artificial intelligence works to comprehend its use by students (question 8), the responses are less unanimous. In this case, 18.7% of teachers strongly disagree, 19.8% disagree, 36.4% are neutral, 14.5% agree, and 10.6% strongly agree on the necessity of this basic understanding.

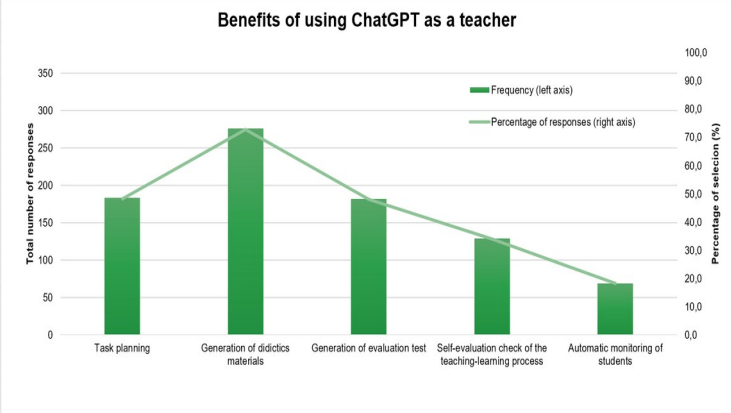
These results indicate that, although there is widespread recognition of the potential utility of ChatGPT, significant concerns on teaching and the quality of the education system about its impact still remain, as well as the moral implications of its use. The results also underline the importance of how the teachers understand these emerging technologies work in order to effectively integrate them into their teaching practices and mitigate risks such as the plagiarism.

Figure 1 illustrates the benefits of using ChatGPT as perceived by the secondary school teachers. The most prominent benefit is the generation of educational materials, with nearly 300 mentions selected by 75% of the teachers, indicating a high appreciation of its utility among the respondents. Following this, task planning and the creation of evaluation tests each garnered about 200 mentions, representing approximately 45% of the responses, and are thus also considered significant benefits. The self-evaluation of the teaching-learning process received lower frequencies (140 mentions), suggesting that these aspects are deemed less important. Lastly, automatic student monitoring is the least highlighted benefit, with 60 mentions and 15% of responses, indicating that while it is perceived as beneficial, it is the least valued aspect among the presented options.

Cat.	Questions /Likert scale*	1	2	3	4	5
A.	1. I consider the ChatGPT a threat to the teaching profession.	12.9	30.3	33.0	14.8	9.0
	2. I think it can be a very useful tool to use in my teaching work.	5.8	5.8	28.0	34.6	25.9
	3. I consider the use of the tool by students to be plagiarism.	8.1	12.1	32.5	21.4	25.9
B.	4. As a teacher, I have used ChatGPT to generate educational content for my students	35.6	17.4	18.5	14.2	14.2
	5. I consider that ChatGPT could lead to a devaluation of the quality of the education system.	10.6	14.5	36.4	19.8	18.7
	6. I do not consider it morally correct to use ChatGPT for the development of my profession.	25.3	26.4	28.5	9.2	10.6
C.	7. I believe that as teachers we must know the tool to know how to approach the tasks and be able to evaluate it in a way that prevents/detects plagiarism.	0.8	1.3	6.9	23.0	68.1
	8. I think that as teachers we should know how an artificial intelligence works in a basic way in order to understand how students can use it.	18.7	19.8	36.4	14.5	10.6

Cat. Categories: A: Access and use, B: Expectations of using ChatGPT in teaching and C: Understanding of the Tool's Functioning. Responses of Likert scale (1–5) in %. * Rate from 1 to 5 how much you agree with the following statements regarding the use of ChatGPT in class. 1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree.

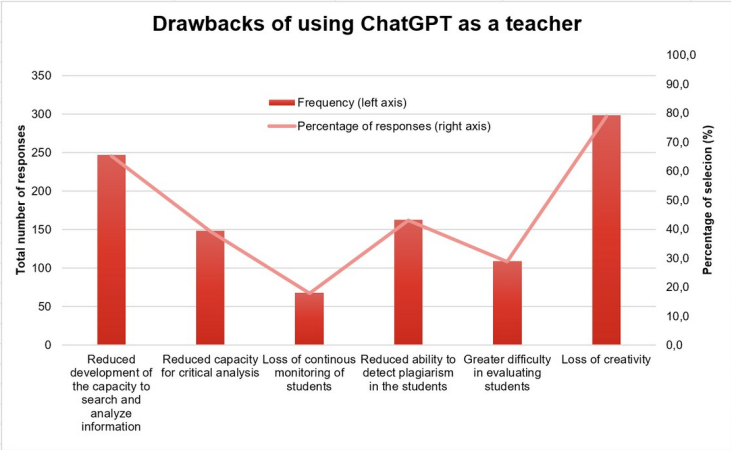
Table 2. Block 3 of the questionnaire: Perception of access and use



The bars represent the percentage of the selected possible answer among the rest (right axis) and the line represents the total number of responses (left axis). *Means statistically significant differences in some independent variables between groups ($p<0.05$), please read subsection 3.3.

Figure 1. Results on the perception of the benefits of the use of ChatGPT by teachers

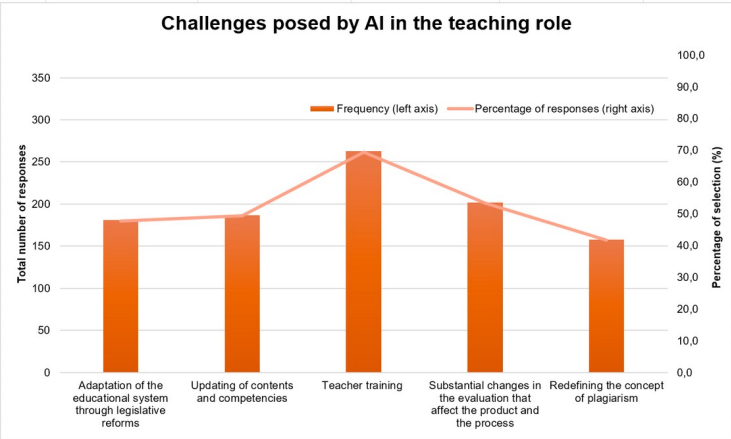
In terms of drawbacks, represented in Figure 2, teachers considered the loss of creativity to be the biggest issue posed by this technology, as it was selected by 80% of the sample. Following this, they identified the reduction in the development of the ability to search for and analyze information as the next significant disadvantage, chosen by 65% of the teachers. The reduction in critical thinking skills and the ability to detect plagiarism were similarly concerning, with each being selected by around 40% of the respondents. Lastly, the least concerning issues for the teachers were the increased difficulty in evaluation and the loss of continuous student monitoring, with these two aspects receiving response rates between 15% and 25%.



The bars represent the percentage (right axis) and the line represents the total number of responses (left axis). * Means statistically significant differences between groups ($p<0.05$), please read subsection 3.3.

Figure 2. Results on the perception of the drawbacks of the use of ChatGPT by teacher

Regarding the challenges posed by this technology in the educational system (Figure 3), teachers consider teacher training to be the most important, selected by 279 teachers. Following this, they view significant changes in assessment as the next most important challenge, chosen 200 times by 55% of the teachers. Lastly, in order of importance, are the updating of content and competencies, the legislative adaptation of the educational system, and the redefinition of the concept of plagiarism, with selections ranging between 48% and 42% of the respondents.



The bars represent the percentage (left axis) and the line represents the total number of responses (right axis).

Figure 3. Results on the perception of the ChatGPT challenges in the teaching role

3.3. Influence of Specialty, Experience, Age, Gender, and Type of Educational Center

Table 3 shows the differences observed in the independent variables under study derived from the Likert-type questions. As it can be seen, the variables that have the most influence are specialty and age, with significant differences observed in 3 of the items. In the case of gender, two questions were influenced (1 and 3) and for the variable type of education center, only one question was influenced (question 7). Finally, experience was the variable that did not influence the perceptions of ChatGPT among active teachers.

Cat.	Question	p-value (U Mann-Whitney)				
		Specialty	Experience	Age	Gender	Type of Educational Center
A.	1	0.004*	0.149	0.598	0.017*	0.308
	2	0.879	0.647	0.118	0.674	0.302
	3	<0.001*	0.103	0.002*	0.025*	0.381
B.	4	0.429	0.701	0.101	0.428	0.201
	5	0.002*	0.261	0.270	0.062	0.768
	6	0.127	0.819	0.279	0.385	0.387
C.	7	0.086	0.601	0.003*	0.615	0.033*
	8	0.465	0.064	<0.001*	0.054	0.09

* P-value < 0.05 means differences were statistically differences between experimental groups.

Table 3. Analysis of differences between the independent variables studied

Regarding specialty, it was observed that Category A was the most influenced. Teachers in scientific and technological specialties perceive ChatGPT as a greater threat to the educational system than teachers in non-scientific specialties (1.54 vs. 1.88, mean values of each group based on the Likert scale number adjudication, question 1). Concerning the consideration of its use by students as plagiarism, it is more strongly viewed as such by teachers from non-scientific areas (2.12 vs. 2.61 for scientific and non-scientific branches, respectively, according to the Likert scale mean values of each group). Finally, within Category B, scientific specialty teachers consider ChatGPT could lead to a devaluation of the quality of the education system a lesser extent than teachers from other specialties (1.97 vs. 2.36, respectively, question 5).

Regarding age, the most influenced category was Category C, where differences were observed in both questions. Teachers under 35 years old believe that they should have a basic understanding of this technology to a greater extent than teachers over 35 to understand how students can use it (4.71 vs. 4.48, respectively; question 7). Similarly, in question 8, the younger teachers feel more strongly that they need to understand the tool in depth to know how to design tasks, evaluate them, and consequently avoid and detect plagiarism, compared to older teachers (4.68 vs. 4.40, respectively). For the last question, where differences were observed belongs to Category A, the younger teachers consider the use of the tool by students as plagiarism more than their older counterparts (2.65 vs. 2.32, respectively; question 3).

The following variable in which more differences were observed was gender, affecting questions 1 and 3 of Category A. Women showed less concern regarding the threat that ChatGPT poses to the educational system compared to men (3.15 female vs 3.44 male mean values of Likert scale, question 1). Female teachers are more likely to consider the use of ChatGPT by students as plagiarism compared to male teachers (2.56 vs. 2.18, respectively, question 3).

The last variable in which differences were observed was type of educational center, only affecting question 7 of Category C. In this sense, teachers in public schools were less concerned than those in private centers about learning the tool to understand how to approach tasks and evaluate them in a way that prevents or detects plagiarism (4.53 public teachers vs 4.75 private, means values of Likert scale values).

Finally, the analysis of multiple-choice questions revealed some significant differences in benefits and drawbacks, while no differences were observed in challenges (Figure 1, 2 and 3, *means statistically significant differences in some independent variables between groups ($p<0.05$)). Regarding benefits, significant differences were observed in the option "generation of evaluation tests" between teachers from public centers and those from private institutions. Hence, 44% of teachers from public centers considered this a benefit compared to 69% of teachers from private institutions (Figure 1, p-value= 0.003).

Regarding drawbacks, differences were observed in the selection of reduced critical analysis ability determined by age ($p=0.006$). In this aspect, 45% of secondary teachers under 35 years old selected this disadvantage compared to 36% of those over 35 (Figure 2). In the case of challenges, no variable had a significant influence (Figure 3).

4. Discussion

Beginning the discussion on Objective 1 outlined in this study, which addresses the level of prior knowledge among secondary education teachers about ChatGPT, it has been observed that their degree of knowledge and utilization is high. However, both the training in this technology and its application in teaching tasks significantly decrease.

These findings align with recent studies indicating a growing awareness and general knowledge of AI tools among educators. However, a notable gap exists in formal training and practical application in classrooms (Polak et al., 2022; Long & Magerko, 2020), despite secondary school teachers recognizing the potential benefits of ChatGPT in lesson planning and educational activities (Polak et al., 2022). This discrepancy can be attributed to several factors, including the rapid pace of technological advancements outpacing formal training programs (Fernández-Batanero et al., 2021; Druga et al., 2022), and the lack of institutional support for professional development in emerging technologies (Fernández-Batanero et al., 2021).

Objective 2 of this study aimed to assess teachers' perceptions of the application of ChatGPT within the educational system. The findings reveal a spectrum of opinions among secondary education teachers regarding the benefits and challenges associated with incorporating ChatGPT into their pedagogical practices.

Teachers did not express significant concern about the negative impact of ChatGPT on their roles. Most do not see ChatGPT as a threat and acknowledge its potential usefulness. However, many teachers believe that students might use this tool to commit plagiarism. These results, from secondary education teachers, closely mirror those reported by Iqbal et al. [66] in their investigation into the perceptions of university faculty. Their research revealed that although university professors acknowledge the benefits of ChatGPT in lesson planning and assessment, they also express significant concerns about plagiarism and the erosion of critical thinking skills (Niemi, Pea & Lu, 2023; Guggemos & Seufert, 2021).

According to our study results, and despite recognizing its potential advantages, only about 25% of teachers reported having used ChatGPT for educational purposes. This limited adoption may be attributed to concerns about the tool's impact on devaluing the educational system and the ethical controversy surrounding its use, as perceived by nearly half of the educators. In line with this, Farrokhinia et al. (2023) discovered that 72.3% of teachers hold a critical view of ChatGPT's application in education, stressing the need for a proper training to maximize its benefits (Farrokhinia et al., 2023). Besides, according to Stepanechko and Kozub (2023), many educators believe ChatGPT could impede the development of critical thinking and creativity in students, potentially undermining the educational process (Iqbal, Ahmed & Azhar, 2022). Thong, Butson and WeiLee (2023) identified concerns among both students and teachers regarding the accuracy of information provided by ChatGPT and its potential to encourage excessive reliance on technology, which might weaken students' critical thinking abilities. These ethical concerns and fears about a potential devaluation of the educational system contribute to educators' hesitation to fully integrate this technology into their teaching practices.

Additionally, a significant number of the teachers, specially the youngest, are worried about understanding how the tool operates, highlighting the importance of redesigning assignments to mitigate plagiarism. These findings point to a pressing need for comprehensive training and the development of clear policies for effectively integrating ChatGPT into education. Recent studies by Khalil and Er (2023) have highlighted that ChatGPT is capable of generating original content that traditional plagiarism detection tools may not readily identify, posing significant challenges to maintaining academic integrity by Khalil and Er (2023).

Another great challenge identified by secondary school teachers is the training of educators in the use of tools like ChatGPT. This aspect is crucial not only to ensure that teachers understand how to use these technologies but also to enable them to integrate them effectively and ethically into their educational practices. Cotton et al. (2023) discuss the opportunities and challenges of using ChatGPT in higher education, emphasizing the need for appropriate policies and procedures to ensure the ethical and responsible use of these tools. Similarly, Jarrah, Wardat and Fidalgo (2023) advocate for responsible practices in the use of ChatGPT, including the need for proper citation and attribution of the tool's contributions to prevent plagiarism and maintain academic integrity. These studies underscore the importance of ongoing training and a proactive approach to integrating artificial intelligence into secondary education, ensuring that its benefits are maximized while mitigating associated risks. Indeed, the new legislative documents and guidelines for implementation in educational institutions emphasize the necessity of regulating plagiarism and the ethics of its use.

To conclude, addressing Objective 3 of this study, the research into teachers' perceptions of ChatGPT reveals that the most influential factors are the teachers' field of specialty and age, with notable differences observed in three of the measured items. It is followed by gender variable with significant differences in two questions. The type of educational institution variable only affected one of the survey questions and finally, the teaching experience did not appear to have significantly impact on secondary school teachers' views on ChatGPT.

When it comes to the field of specialty, teachers from scientific and technological disciplines tend to view ChatGPT as a greater threat to the educational system compared to their counterparts in non-scientific fields. This perception might stem from two primary considerations: firstly, the demand for accuracy and precision in scientific disciplines, where incorrect or imprecise responses from tools like ChatGPT can have substantial implications; and secondly, the possibility that educators in scientific and technical fields may have a deeper understanding of the tool's capabilities, thus leading to heightened awareness of its potential impacts (Lozano & Blanco-Fontao, 2023; Blanco-Fontao et al., 2024; Druga et al., 2022). This underscores the necessity for a critical and nuanced assessment of AI-generated outputs within educational settings, particularly in scientific contexts.

Moreover, the perception of ChatGPT's use by students as plagiarism is notably more prevalent among teachers from non-scientific areas. This is likely because disciplines such as humanities and social sciences place a high value on originality and creativity, making ChatGPT a perceived threat to these core principles (Alarcon-Llontop, Pasapera-Ramírez & Torres-Mirez, 2023) study examining initial perceptions among university faculty found that ChatGPT could facilitate higher levels of plagiarism, potentially evading standard detection methods.

Furthermore, science teachers perceive the advent of ChatGPT as less threat to the educational system than teachers from other disciplines. This distinction may indicate a higher level of acceptance within scientific fields for integrating advanced technological tools into teaching and learning practices, as they are often more attuned to the benefits and limitations of such innovations (Montenegro-Rueda et al., 2023). A systematic review has emphasized that although ChatGPT has the potential to enhance the educational experience, successful implementation hinges on educators being properly trained to use the tool effectively.

Regarding age, the study indicates significant disparities. Teachers under the age of 35 are more likely to believe that having a basic understanding of technology is crucial to comprehend how students might

utilize these tools, as opposed to their older colleagues. This insight supports previous research suggesting that younger educators often feel more adept with technology due to increased exposure during their professional training. Furthermore, younger teachers express a stronger need to thoroughly understand technological tools to design and assess assignments while also being equipped to detect and prevent plagiarism. This finding highlights the importance younger educators place on integrating technology into educational assessments and upholding academic integrity (Foltynek et al., 2023; Kovak et al., 2024; Ganjavi et al., 2024).

Additionally, it was observed that younger teachers are more inclined to view the use of technology by students as a form of plagiarism. This perception might be influenced by their heightened familiarity and understanding of how students can potentially leverage technology to gain unfair advantages in their academic work (Adiguzen et al., 2023).

The following variable where differences were noted is gender. Specifically, female teachers see the use of the ChatGPT as less of a threat, however, are more inclined than their male counterparts to view students' use of ChatGPT as a form of plagiarism. This finding suggests that female educators may be more concerned about the ethical and academic implications of integrating advanced technological tools like ChatGPT into educational settings. Several factors may account for this difference in perception. One study found that, although there are no significant differences between genders in the general perception of technology's utility, women tend to find using technology more challenging than men (Teo, Fan & Du, 2015). This additional perceived difficulty may lead female teachers to be more alert to potential technological abuses, such as plagiarism. Furthermore, another study found that women generally have more critical perceptions of technology use in education, which might affect their judgment regarding tools like ChatGPT (Islahi & Nasrin, 2019). In addition, self-assessments of digital competencies indicate that men often perceive themselves as more proficient in using information and communication technologies (ICT), which may contribute to a lower level of concern about the potential threat and the risk of plagiarism among male educators (Abella-García, Grande-de-Prado, García-Peñalvo & Corell, 2020). This disparity in perceived technological competence could influence how teachers approach students' use of technological tools.

The last variable in which differences were observed was the type of educational center, only affecting one question. In this sense, teachers in public schools were less concerned than those in private centers about learning the tool to understand how to approach tasks and evaluate them in a way that prevents or detects plagiarism. This discrepancy suggests a potential divergence in the priorities and concerns between public and private school educators regarding academic integrity. Research by Taylor and Bicak (2018) highlights that private institutions often have more stringent policies and dedicated resources to combating academic dishonesty, which could explain the heightened concern among private school teachers (Taylor & Bicak, 2018). Public school teachers, on the other hand, might be dealing with larger class sizes and fewer resources, impacting their ability to focus on individual cases of plagiarism to the same extent.

The analysis of multiple-choice responses from the study on teachers' perceptions of ChatGPT revealed significant differences in the perceived benefits and drawbacks. In terms of benefits, a notable distinction emerged between public and private school teachers concerning the "generation of assessment tests." Specifically, 44% of teachers in public schools identified this as a benefit, in contrast to 69% of teachers in private institutions. This disparity suggests that teachers in private schools may have greater access to technological resources and training, enabling them to utilize these tools more effectively in academic assessments (Garnada, 2011). Moreover, educators in private settings might be more familiar with employing advanced technologies to enhance the efficiency and accuracy of test creation and administration (Rahmatina & Zaid, 2019).

Regarding drawbacks, there were significant differences in the perception of the "reduction of critical analysis skills" across age groups. Among secondary school teachers under the age of 35, 45% selected this option as a drawback, compared to only 36% of their counterparts over 35. This difference may indicate a greater concern among younger teachers regarding the potential impact of technology on

students' development of critical thinking skills (Obafemi & Obono, 2014). This perception gap might be attributed to younger educators' heightened familiarity with digital technologies, which makes them more aware of the potential downsides (Mundy, Kupczynski & Kee, 2012).

In terms of challenges, no significant differences were observed across the analyzed variables. This suggests that the perceived challenges associated with using educational technologies are consistent regardless of factors such as specialty, experience, age, gender, or institutional type. Teachers generally face similar barriers, such as inadequate training and limited access to technological resources. These findings align with prior research emphasizing the need for enhanced support and ongoing professional development for educators (Perrota, 2013).

5. Study Limitations and Future Prospects

This study has several limitations that must be acknowledged. First, the sample size, although sufficient for statistical analysis, may not fully represent the diversity of secondary education teachers in different regions or countries. It is important to note that certain contextual variables were not considered, such as the specific geographic location of schools within the Castilla y León region or the socioeconomic level of the participating institutions. These factors could have provided a more nuanced understanding of teachers' perceptions.

Additionally, there is a potential for self-selection bias, as participation in the study was voluntary. It is possible that teachers with a greater interest in technology or stronger opinions about the use of artificial intelligence were more inclined to take part. This type of bias, common in questionnaire-based research, may have influenced the distribution of responses and should be taken into account when interpreting the results. For future research, it is advisable to implement random sampling strategies or encourage institutional-level participation to minimize such biases.

Future research should address these limitations by expanding the sample size to include a more diverse group of teachers from different regions, countries, and educational systems. Longitudinal studies could provide valuable insights into how teachers' perceptions of AI tools evolve over time and the long-term impacts on educational practices and student outcomes. Finally, research should focus on developing and evaluating training programs that help teachers effectively integrate AI tools into their teaching while maintaining academic integrity and fostering critical thinking.

6. Conclusions

This study shows that secondary school teachers in Castilla y León have a high level of awareness and familiarity with ChatGPT. However, they face difficulties integrating it into classroom practice. This challenge is similar to what other studies have found: while awareness of AI tools is growing, teachers still lack formal training and practical experience using them in education (Polak et al., 2022).

Although many teachers see ChatGPT as useful for lesson planning or creating educational materials, only 25% have used it in their teaching. This low use is mostly due to ethical concerns, such as fears of plagiarism and possible devaluation of the education system (Farrokhnia et al., 2023).

Ongoing teacher training can help bridge this gap. For example, workshops on how to design AI-resistant assignments or evaluate student work with AI assistance can empower teachers to use ChatGPT more effectively (Guggemos & Seufert, 2021). Clear policies, such as those in the INTEF Guide or EduCaixa protocols, can also provide educators with ethical guidelines and practical strategies for AI use in schools (INTEF, 2024; EduCaixa & CSIC, 2024).

This study also found that perceptions of ChatGPT vary depending on specialty, age, gender, and type of school. Science teachers worry more about ChatGPT's accuracy, while humanities teachers are more concerned about plagiarism. Younger teachers feel a stronger need to understand AI, and private school teachers are more likely to prioritize training to prevent plagiarism.

The observed influence of specialty, gender, and age on teachers' perceptions suggests the need to design differentiated training approaches. These could include specialized workshops aimed at STEM and humanities educators, specific programs targeted at teachers from different generational cohorts, and strategies specifically addressing ethical concerns expressed more intensely by female teachers. ChatGPT has great potential to improve education. But for this to happen, teachers need to be properly trained and supported by clear institutional policies. This approach will help ensure ethical and effective use of AI in classrooms, maximizing benefits while reducing risks (Cotton et al., 2023; Jarrah et al., 2023).

Declaration of Conflicting Interests

The authors declare no conflict of interest.

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