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Research Article

Portuguese secondary school students' perceptions regarding the use of ChatGPT

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ABSTRACT

The rapid spread of generative artificial intelligence (GenAI) in contemporary society calls for a rethinking of education. This study investigates Portuguese secondary students' perceptions of chat generative pre-trained transformer (ChatGPT) in education. In 2024, we surveyed 114 students (aged 16-17) from one school in 2024 using a 15-item questionnaire (closed- and open-ended items) covering five dimensions: (1) knowledge of AI and ChatGPT; (2) use of ChatGPT; (3) perceived accuracy of ChatGPT-generated outputs; (4) the potential of ChatGPT for teaching; and (5) ethics and academic integrity. Responses to closed-ended items were analyzed descriptively and open-ended responses underwent content analysis. The results indicate that, although most students are familiar with AI and ChatGPT, their demonstrated knowledge is largely utilitarian and superficial. Students predominantly use ChatGPT for schoolwork and attribute high reliability to its outputs, often without the necessary critical evaluation. We also identified weaknesses in their ethical understanding, particularly regarding academic integrity and plagiarism. We argue for critical AI literacy and teacher professional development to support pedagogically grounded and ethical integration of GenAI. Education for the ethical and responsible use of these technologies proves essential to prepare young people for future challenges.

Keywords: ChatGPT, generative artificial intelligence, students' perceptions, secondary education

INTRODUCTION

Artificial intelligence (AI) is the field of computer science that studies the programming of computer systems to enable them to perform intelligent tasks, such as learning, judgement, and decision-making (Ali et al., 2024). According to Popenici and Kerr (2017), AI encompasses "computing systems that are able to engage in human-like processes such as learning, adapting, synthesizing, self-correction and use of data for complex processing tasks" (p. 2).

Generative artificial intelligence (GenAI) is a subcategory of AI that enables the creation of content–such as text, images, sounds, videos, music, computer code, or combinations of these different types of content (Chan & Hu, 2023; Farrelly & Baker, 2023)–from large volumes of data. GenAI and specifically chat generative pre-trained transformer (ChatGPT), is a family of large language models (LLMs) developed by OpenAI that is distinct from previous chatbots, which merely responded based on the static information available in their

databases at the time of creation; by contrast, ChatGPT does not "learn" from each prompt but conditions its outputs on the prompt and prior context; unless explicitly updated or fine-tuned, its parameters remain fixed. This paradigm represents a significant technological advance in natural language processing and in LLMs. LLMs are trained on large datasets. Dwivedi et al. (2023) highlight that GenAI applications are capable of producing high-quality text, which can sometimes appear indistinguishable from human conversation. It was with the public and free availability of ChatGPT by OpenAI in 2022 that the spread of GenAI in contemporary society began.

Alongside the potential and benefits of GenAI, several authors warn of the impact that this technology may have on global employability as a result of its use within organizations (Adeshola & Adepoju, 2023; Chen et al., 2024; Dempere et al., 2023; Polyportis & Pahos, 2024). These authors also point out that digitalization and AI create opportunities for students, teachers, and institutions. However, these transformations may entail new challenges and drawbacks, such as increased inequality of opportunity and a widening global divide in access to these technologies. It is within this context that the acquisition of skills to work with AI calls for an education system that integrates interactive and advanced educational technologies, innovative pedagogical approaches, and new teaching and learning methods in which AI plays an integral role.

Within this framework, the OECD (2023) highlights the need for the education sector to equip students with various skills related to the use of AI, particularly GenAI, including ChatGPT, to prepare a workforce that is highly flexible and adaptable to technological change.

Several authors (e.g., Adiguzel et al., 2023; Antonenko & Abramowitz, 2023) state that the society of the future depends on AI-related skills and that this will have a major impact at the level of education. According to Antonenko and Abramowitz (2023), "to best prepare students to be AI savvy, policymakers, researchers, and educators must develop strategies to infuse AI tools, skills, and processes into the K-12 curriculum" (p. 65). Despite this, Bitzenbauer (2023) and Shamsuddinova et al. (2024) consider that the use of AI, particularly GPT (Generative Pre-trained Transformer) models, in classrooms with primary and secondary school pupils is still in its infancy. This position is corroborated by other authors, such as Adiguzel et al. (2023) and Halaweh (2023). Increasingly, in contemporary society, GenAI is embedded in a large number of systems, and the education sector likewise cannot ignore ChatGPT and other GenAI systems at any educational level, as students with internet access can readily access them. Therefore, students must learn to use these tools appropriately and responsibly under the guidance of their teachers

ChatGPT IN EDUCATION

The literature on the use of ChatGPT in primary and/or secondary education, although expanding (e.g., Araújo & Saúde, 2024; Garcia Castro et al., 2024; Levine et al., 2025; Powell & Courchesne, 2024; Rutherford et al., 2025), is still scarce. However, there is already a substantial body of literature regarding the application of ChatGPT in higher education, in fields as varied as law (e.g., Ajevski et al., 2023; Choi et al., 2023), engineering (e.g., Nikolic et al., 2023; Tsai et al., 2023), statistics and data science (e.g., Ellis & Slade, 2023; Laker & Sena, 2023), linguistic studies (e.g., Kohnke et al., 2023; Javaid et al., 2023; Zhang et al., 2023a, 2023b), pharmacy (e.g., Boonrit et al., 2024; Fergus et al., 2023), physics (e.g., Beltozar-Clemente, 2024; Bitzenbauer, 2023; Dahlkemper et al., 2023), management (e.g., Lim et al., 2023), journalism (e.g., Pavlik, 2023; Lopezosa et al., 2023), marketing (e.g., McAlister et al., 2023), mathematics (e.g., Wardat et al., 2023), medicine and nursing (e.g., Currie & Barry, 2023; Gilson et al., 2023; Xu et al., 2024), and chemistry (e.g., Alasadi & Baiz, 2023; Araújo & Saúde, 2024; Ardyansyah et al., 2024; Clark, 2023).

To move beyond a broad catalogue of applications, our review foregrounds evidence that is directly probative for secondary education and the constructs we investigate (students' trust, verification, and willingness to reuse AI outputs). Recent K-12 studies report perceived gains in conceptual understanding and engagement when chatbots support physics and mathematics learning, alongside recurring concerns about accuracy and over-reliance (Alarbi et al., 2024; Egara et al., 2025; Fadillah et al., 2024). This sharper focus provides a conceptual bridge between international findings and our Portuguese context.

Empirical work in secondary settings converges on explanation-seeking uses and drafting/solution support. In high school physics, a quasi-experimental study in the UAE found significantly higher post-test scores and engagement when ChatGPT scaffolds were used to learn Newton's second law (Alarbi et al., 2024).

Indonesian high school students report that ChatGPT helps clarify concepts and correct misconceptions in physics (Fadillah et al., 2024). In mathematics, mixed-methods data from Nigerian secondary schools indicate perceived benefits for problem solving but persistent worries about inconsistencies and error propagation (Egara et al., 2025). Together, these studies delineate the pattern of utility and risks that motivates our measures of trust, verification, and academic integrity.

By contrast, the higher-education corpus–larger in volume and scope–emphasizes uses such as brainstorming, summarizing, and information seeking, and documents wide variation in disclosure and integrity norms (Chiu et al., 2023; Kasneci et al., 2023; Kohnke et al., 2023; Zhang et al., 2023a; 2023b). These syntheses underscore how higher education-dominant lenses risk obscuring secondary-level specificities (e.g., classroom verification routines and teacher scaffolding) and therefore justify a targeted focus on adolescents' perceptions in school settings like ours.

The motivation to use ChatGPT in such diverse areas of higher education stems from its status as an extremely versatile tool with a wide range of capabilities. Indeed, this tool has the potential to contribute to various activities, such as searching for information, responding to user questions in a human-like manner, maintaining contextualized conversations through multiple interactions with users, and writing creatively, for example, poetry or fiction, as well as acknowledging errors (Fergus et al., 2023). Other ChatGPT capabilities include text writing and editing, summarizing long texts, machine translation, allowing it to operate in multiple languages (Halaweh, 2023), computer code generation (Górecki, 2024; Groothuijsen, 2024), performing calculations and statistical analysis (e.g., Qu & Wang, 2024; Raja et al., 2025). Furthermore, ChatGPT can perform other tasks such as explaining complex topics and concepts (Adiguzel et al., 2023; Eke, 2023).

In this sense, Chiu et al. (2023) also emphasize that the application of GenAI in education holds enormous potential as it contributes to improving learning, teaching, assessment/grading, and administrative tasks related to student management, offering students opportunities for more personalized and adapted learning, facilitating teachers' understanding of students' learning processes, and providing answers to questions at any time and from anywhere.

Several authors thus highlight ChatGPT's ability to create personalized, dynamic, and innovative learning experiences, enriching the teaching-learning dynamic (Andrade-Girón, 2024; Beltozar-Clemente, 2024; Ipek et al., 2023; Rahiman & Kodikal, 2024); to develop materials that can be adapted to students' specific needs, whether according to the professional profiles they aim to pursue or their learning requirements (Rahman & Watanobe, 2023). ChatGPT also provides feedback on students' questions about problems and exercises they need to solve, helping them identify where they make mistakes and what their alternative conceptions are; that is, it also acts as a complementary tutor available 24 hours a day, seven days a week (Crompton & Burke, 2024; Mageira et al., 2022). Tafazoli (2024) further states that ChatGPT is a promising tool for language learning, as it enables users to improve their language skills.

In this regard, it is worth emphasizing that in today's technological context, strategies in education should be redesigned, considering the real world, where technology occupies a fundamental place and plays an increasingly significant role in shaping human behavior and decision-making, just as happened with the arrival of the Internet and the advent of smartphones. It is essential that students, throughout their academic journey, learn to use GenAI tools, understand their limitations, and practice applying them ethically. This will be a more pragmatic approach and will yield better results than if education tries to ignore or even oppose the use of tools brought into our daily lives by GenAI. If teaching develops while ignoring this reality and the entire contemporary technological environment, students are not being prepared for the future. If the education sector embraces GenAI tools, numerous benefits can be achieved as they are incorporated responsibly and ethically into the learning process. This enables students to explore the potential advantages and limitations of the new technology (Alasadi & Baiz, 2023).

It is important to understand the limitations and potentialities of tools such as ChatGPT, which can assist teachers and students in optimizing their use while simultaneously mitigating potential risks. According to Lim et al. (2023), for both teachers and students, ChatGPT can be regarded as a tool that has transformed the ways of teaching and learning. Increasing knowledge about how this tool is transforming the Education sector can only be achieved if both teachers and students use it for teaching and learning, and if debates with

students are promoted about the pros and cons of using such tools, rather than banning them (Lim et al., 2023).

Thus, ChatGPT can be seen as a driver of innovation and growth in education, ensuring that citizens are well prepared and their future professional roles and place in society are safeguarded. However, as education is a sensitive area, there are still some risks, weaknesses, and/or limitations in using ChatGPT in this context. For example, Elkhatat et al. (2023) state that academic "misconduct", such as plagiarism, is gaining prominence in students' work–including reports, homework, and projects. According to these authors, despite the enormous usefulness of ChatGPT in supporting students in preparing texts for academic assessment, there is growing concern about the originality of the content generated by this system for academic evaluation, as it is often difficult to distinguish between text produced by students and text generated by the system.

Thus, it makes sense to understand how the main actors in the teaching and learning process use ChatGPT and perceive the integration of this GenAI tool in the school environment, and this premise underpins the present study. Given the scarce literature on the use of ChatGPT in secondary education, it becomes pertinent to seek to understand the knowledge that a group of secondary school students (in Portugal) have about this GenAI tool and its potential, the way they use ChatGPT, and their perceptions of the accuracy and reliability of the information generated, as well as issues concerning ethics and integrity in its use.

We interpret students' perceptions through two complementary lenses: DigComp 2.2 (information/data literacy and problem solving in digitally mediated contexts), and AI4K12's "five big ideas" (age-appropriate AI literacy, including learning from data and representation) (Touretzky et al., 2022; Vuorikari et al., 2022). Taken together, these frameworks support our operationalization of verification, source appraisal, and ethical reuse.

Despite fast-growing commentary and higher education-centered syntheses, empirical studies at secondary level remain scarce, often single-site and self-report-based, and rarely disaggregate students' verification routines or integrity practices beyond attitudes. There is also a need to operationalize AI-relevant literacies for adolescents using frameworks such as DigComp 2.2 and AI4K12 and to link these to observable critical-thinking processes during the evaluation and reuse of AI outputs. Our study directly addresses these gaps in a Portuguese secondary-school setting.

METHODOLOGY

Setting and Participants

We employed a convenience sample comprising five classes (N = 114; 65 girls and 49 boys; ages 16–17) from the same secondary school where one of the authors was undertaking the supervised teaching practicum as part of the initial teacher education program during the 2023/2024 school year. This setting was selected in line with the exploratory nature of the study and the ethical and logistical constraints associated with conducting research involving minors in authentic classroom environments. Moreover, it ensured ecological validity, as data were collected prior to any formal introduction or exploration of ChatGPT within the school context, thereby capturing students' baseline perceptions. We recognize that recruiting students taught by one of the authors can introduce selection, expectancy, or social-desirability bias. To mitigate these risks, participation was strictly voluntary, and responses were anonymous and self-administered on students' personal devices during class time. We emphasized that participation (or refusal) carried no academic consequences. Even with these safeguards, residual bias cannot be ruled out; accordingly, we interpret findings cautiously and refrain from claims of generalizability beyond the participating school.

The students in each of the five classes were invited to participate in the study, with an emphasis on the voluntary nature of participation and reassurance that there would be no penalties for those who chose not to participate. As the participants were minors, informed consent was also obtained from their parents or legal guardians, outlining the purpose of the study and authorizing their involvement. This document additionally guaranteed anonymity and the confidentiality of the data collected, in compliance with national data protection legislation. In this way, both consent and assent were obtained from all students in the participating classes. The study was also reviewed and approved by the school's decision-making bodies.

Table 1. Questionnaire on students' perceptions of AI and ChatGPT and its use in educational contexts

Dimension	Questions	Type of answer
A. Knowledge of AI and ChatGPT	1. Have you ever heard of AI?	☐ Yes ☐ No
	2. Can you provide three concrete examples of where AI can be used?	[Open-ended]
	3. Do you know what ChatGPT is?	☐ Yes ☐ No
	4. How did you first hear about ChatGPT?	[Open-ended]
	10. How would you rate your knowledge of ChatGPT?	☐ Very limited ☐ Limited ☐ Moderate ☐ Good ☐ Excellent
B. Use of ChatGPT	6. How often do you use ChatGPT?	☐ Never used it ☐ Rarely use it ☐ Occasionally use it ☐ Frequently use it ☐ Use it daily
	7. If you use ChatGPT, what tasks do you usually perform with it?	[Open-ended]
	8. Do you use ChatGPT for independent learning?	☐ Yes ☐ No
	9. If yes, briefly explain what kinds of topics or tasks you usually use it for.	[Open-ended]
C. Accuracy of ChatGPT-generated outputs	11. In your opinion, do you consider ChatGPT's responses to be appropriate for the questions posed?	☐ Inappropriate ☐ Somewhat appropriate ☐ Appropriate ☐ Completely appropriate ☐ No opinion
	12. Are the data provided by ChatGPT accurate?	☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly agree ☐ No opinion
D. Potential of ChatGPT (for teaching)	5. What is your opinion regarding the potential of ChatGPT?	[Open-ended]
	15. In your opinion, how can ChatGPT improve education?	[Open-ended]
E. Ethics and integrity	13. If you were completing an assessment task using ChatGPT, would you directly use the information provided by ChatGPT?	☐ Yes ☐ No
	14. If you were completing an assessment task using ChatGPT, would you indicate in the references that you used ChatGPT?	☐ Yes ☐ No

Instrument: Questionnaire on Students' Perceptions of AI and ChatGPT

Given the objectives of the study, an initial complete version of the "Questionnaire on students' perceptions of AI and ChatGPT and its use in educational contexts" was developed. This version emerged from discussions within the author team, which has experience in the use of GenAI in educational settings.

The questionnaire was first drafted by the research team and underwent expert review by four secondary-school teachers and cognitive pretesting with four students of the same age range who were not part of the study. Feedback from these procedures informed minor wording and sequencing adjustments, resulting in the final version used in the field. Because the closed items were single-item indicators (e.g., frequency of use, perceived adequacy, perceived correctness) rather than multi-item scales, internal-consistency coefficients (e.g., Cronbach's alpha) were not computed. Instead, we ensured content validity through expert review and response-process validity via cognitive pretesting, and we report item-level distributions to maximize transparency. The questionnaire items presented in **Table 1** correspond to the final version generated after the validation process.

This questionnaire contains 15 questions, of which 6 are open-ended and 9 are closed-ended (including 4 five-point Likert-type scales). These questions were designed to gather information on students' opinions and knowledge regarding AI and ChatGPT, as well as their perceptions and expectations regarding the use of ChatGPT for academic activities. To facilitate the analysis of student responses and in line with the study's objectives, the questionnaire items were grouped into five dimensions:

1. Knowledge of AI and ChatGPT,
2. Use of ChatGPT,

3. Accuracy of ChatGPT-generated outputs,
4. Potential of ChatGPT (for teaching), and
5. Ethics and integrity, as identified in **Table 1**.

Data Collection Procedures

Access to the online version of the questionnaire was provided to students via a QR code (and the corresponding URL) during a class session. Students completed the questionnaire using their smartphones. The average response time was 8 minutes. Before completion, all necessary instructions for accessing and completing the questionnaire were provided, and the anonymity and confidentiality of responses were emphasized. Students were encouraged to provide honest opinions and positions on the questions posed, free from any judgment or assessment.

Data Analysis

The quantitative data obtained from the closed-ended questions were subjected to descriptive statistical analysis using Microsoft Excel (Microsoft 365) software. Meanwhile, the information collected from the open-ended questions was subjected to content analysis procedures (Bardin, 2024).

Open-ended responses were analyzed using qualitative content analysis following Bardin's three broad phases (pre-analysis; exploration/coding; treatment and interpretation) (Bardin, 2024). We developed a codebook that combined deductive categories (aligned with our five analytic dimensions) with inductively derived sub-codes emergent from the corpus. Two researchers independently calibrated their coding on a subset of responses to stabilize category boundaries and decision rules; discrepancies were discussed until consensus, and the codebook was iteratively refined. The remaining responses were then coded with periodic peer checks and analytic memos to preserve an audit trail. Given the brevity and categorical nature of most answers, we prioritized consensus-based reliability and analyst triangulation over a separate reliability coefficient; category frequencies are reported descriptively in the results.

RESULTS AND DISCUSSION

The "Questionnaire on students' perceptions of AI and ChatGPT and its use in educational contexts" was administered to all classes involved in this study to gather data related to the research problem. It is important to emphasize that this data collection took place before any exploration of ChatGPT by these students in school. This section presents the analysis and discussion of the questionnaire responses, aiming to gain deeper insight into students' interaction with AI and ChatGPT, as well as their perceptions of this tool.

Knowledge of AI and ChatGPT

Within the five questions that comprise this dimension (questions 1, 2, 3, 4, and 10), the first two address students' general knowledge of AI. From the responses to the first question, it was observed that all students, with the exception of one, reported having heard about AI at some point or in some form. Subsequently (question 2), they were asked to provide three examples of where AI is present. Of the 113 students who reported familiarity with AI, 339 responses were recorded for this question. Blank responses (when students did not provide the three requested examples) or answers such as "I don't know" were included in the "no response" category. **Figure 1** summarizes all student responses to this question.

From the analysis of **Figure 1** (question 2), it is evident that, apart from the "Other applications" category, which includes less frequent student responses, the main AI references students identified were ChatGPT (mentioned in 14.1% of responses) and its potential for generating text and images (13.2%). Approximately 8% of students indicated that AI enables information searches, similar to an internet browser, and an equal percentage recognized that AI assists them in completing school tasks, including research, summarizing, reporting, and even performing calculations. Still within the educational context, students mentioned that these tools support brainstorming (1.3% of responses) and answering queries (2.0%). Additionally, students frequently highlighted AI's potential in diverse areas such as "healthcare" (7.4%), "IT" (6.4%), and "marketing and advertising" (4.7%).

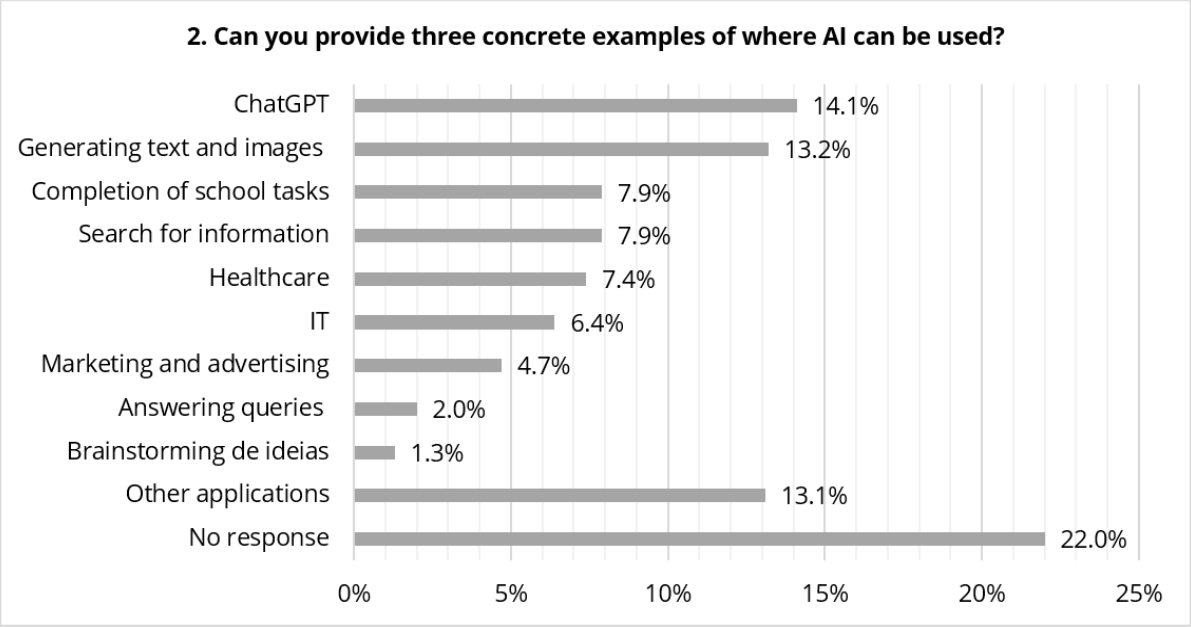

Figure 1. Students' responses to the question "2. Can you provide three concrete examples of where AI can be used?" (Source: Authors' own elaboration)

Beyond the high number of missing responses (22.0%), suggesting students' possible lack of awareness regarding AI's integration across various societal domains, particularly in science and technology, students' primary responses reduced AI largely to GenAI, particularly its most well-known tool–ChatGPT–which, due to its free access, availability, and innovation, has brought AI to the public and now features in numerous everyday tasks (Dahlkemper et al., 2023; Lim et al., 2023; Wu et al., 2023). These findings underscore the relevance of the present study, which, in the subsequent questions, focuses more closely on students' perceptions of ChatGPT, arguably the most widely used AI tool among the public.

Thus, in line with the previous question, and unsurprisingly, 111 out of 114 participating students answered "yes" to the question "3. Do you know what ChatGPT is?". ChatGPT can be described as a chatbot/virtual assistant employing GenAI, specifically the Generative Pre-trained Transformer language, trained to process natural language resembling human communication and to generate responses, based on statistical data and probabilities (predictive models) (Baidoo-Anu & Ansah, 2023), that are coherent and contextually appropriate to complex queries (Lim et al., 2023). However, given the nature of the response to this question, it is not possible to infer students' depth of knowledge regarding this tool.

Nevertheless, considering the responses to the question "10. How would you rate your knowledge of ChatGPT?" (only about 30% of students reported having limited (25.4%) or very limited knowledge (5.3%); a similar proportion (32.5%) reported moderate knowledge, and the remaining students, a slightly higher proportion (36.8%), described their knowledge as good (22.8%) or excellent (14.0%)), as well as responses in dimension B. Use of ChatGPT, it became evident that many students' knowledge of ChatGPT was moderate or (very) low, focused mainly on its common functionalities that facilitate information searching and/or completing academic tasks.

Additionally, as shown in **Figure 2** (question 4), most students reported learning about ChatGPT through friends and classmates (39.5%) or family members (15.8%). Social media and the internet also appear to have been significant sources, with over 25% of participants reporting these as channels through which they became aware of this AI tool. Only 7% of students reported discovering ChatGPT at school, yet, as evidenced in responses to questions 7 and 8, most students reported using this tool for schoolwork.

In an increasingly technological society, where AI skills are expected to be essential (Antonenko & Abramowitz, 2023), this latter finding should prompt reflection on the school's role in preparing young people to face the challenges of today's and tomorrow's world.

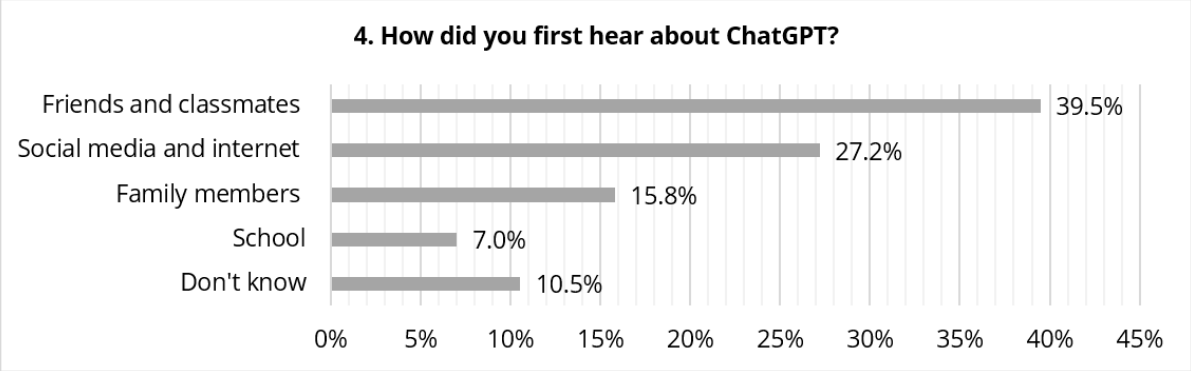

Figure 2. Students' responses to the question "4. How did you first hear about ChatGPT?" (Source: Authors' own elaboration)

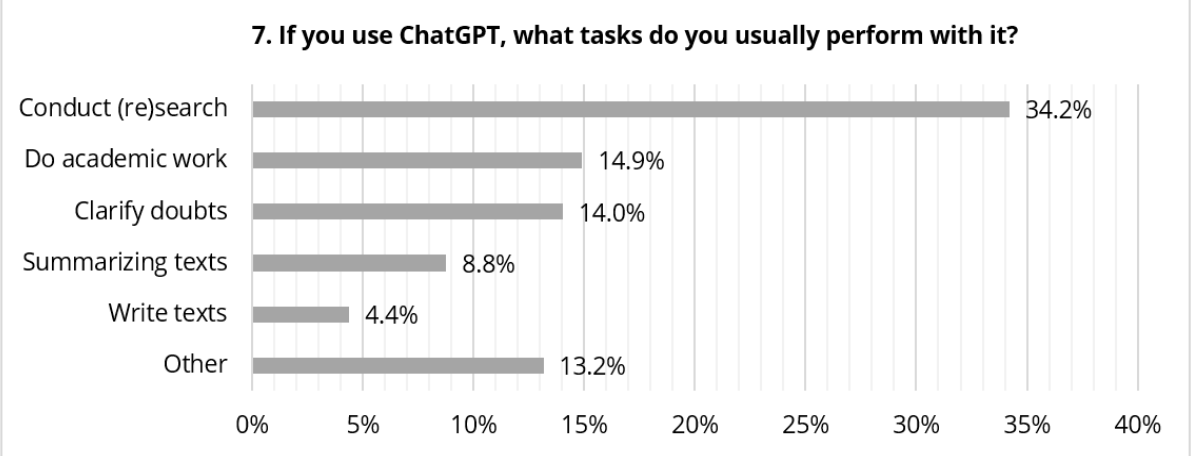

Figure 3. Students' responses to the question "7. If you use ChatGPT, what tasks do you usually perform with it?" (Source: Authors' own elaboration)

Use of ChatGPT

Questions 6 to 9 of the questionnaire refer to students' knowledge regarding the Use of ChatGPT (dimension B) (**Figure 3**). Regarding usage frequency (question 6), it was found that 10.5% of students reported never having used ChatGPT, and 20.2% used it rarely. Most reported using the tool occasionally (45.6%), with a considerable percentage stating they used ChatGPT regularly (21.1% frequently and 2.6% daily). These results align with findings from Zafar et al. (2024), suggesting that the use and exploration of this tool are part of students' daily lives.

Next, students who used ChatGPT were asked which tasks they performed with the tool (question 7). The responses closely matched evidence from the literature (Araújo & Saúde, 2024; Fergus et al., 2023; Halaweh, 2023; Zafar et al., 2024). This analysis excluded the 12 students (10.5%) who had answered "Never used it" to the previous question. Notably, question 7 was an open-ended item allowing students to list multiple uses. As shown in **Figure 3** (question 7), nearly 50% of students reported using ChatGPT for searches (34.2%) and to clarify doubts (14.0%); 14.9% indicated using it to complete homework ("do academic work"), and just over 13% mentioned using it to summarize (8.8%) and write (4.4%) texts. Finally, 13.2% referred to other applications, such as "translating texts" or "generating ideas" on a topic. All these responses reflected school-related uses, indicating that ChatGPT's presence in educational contexts is already a reality.

In response to the question "8. Do you use ChatGPT for independent learning?", students' answers were almost evenly split, with 49.1% responding "yes" and 50.9% "no". Among the 49.1% who reported using ChatGPT for independent learning (question 9), all stated they used it to learn subject-related content, and 27.2% also used it to learn about other everyday topics.

This result, combined with responses to dimension C. Accuracy of ChatGPT-generated outputs, raises concerns regarding students' unsupervised exploration of ChatGPT. Experience and literature tell us that, despite its potential to produce well-constructed, fluent, and authentic texts, ChatGPT sometimes deviates from the given inputs (faithfulness) or lacks factual accuracy (factualness) (Kiryakova & Angelova, 2023; Meyer et al., 2023; Tlili et al., 2023). Thus, it can also produce incorrect or misleading responses, which, due to their eloquent formulation, may lead to the learning of inaccurate concepts. Given that approximately half of the students report using ChatGPT for independent learning, and as evidenced by responses to questions 11 and 12 (explored in more detail under dimension C), the vast majority consider the outputs (very) appropriate and accurate (with none considering them inappropriate or inaccurate), these findings suggest that students tend to trust the information obtained uncritically, which may lead to the acquisition of misconceptions or erroneous understandings of certain topics.

Accuracy of ChatGPT-Generated Outputs

Dimension C, accuracy of ChatGPT-generated outputs, includes the questions: "11. In your opinion, do you consider ChatGPT's responses to be appropriate for the questions posed?" and "12. Are the data provided by ChatGPT accurate?" Regarding the first, the vast majority of students considered ChatGPT's responses to be "appropriate" (71.1%) or "completely appropriate" (14.9%). Only five students out of the 114 respondents (4.4%) rated them as "somewhat appropriate," and no student considered them "inappropriate." Additionally, 9.6% of students reported having no opinion.

Similarly, on the other item within this dimension, the majority of students agreed (62.3%) or completely agreed (8.8%) that the information obtained from ChatGPT was accurate, while only 9.6% of students disagreed with this statement. A further group of students (19.3%) indicated that they had no opinion on the matter.

As previously discussed, although ChatGPT offers various opportunities, particularly in the field of education, its use requires critical engagement due to potential model hallucinations. According to Guo and Lee (2023), one of the most important applications of GenAI in the education sector lies in its contribution to expanding students' learning experiences and promoting the development of critical thinking skills, which are among the most essential competencies that education should foster, and which are well articulated in current curriculum documents (Martins et al., 2017).

Several factors may help explain why students' trust in ChatGPT remains high even as the tool can generate inaccurate responses. First, the fluency and coherence of LLM outputs likely act as cues of credibility: prior work notes that well-formed, contextually appropriate prose can mask factual inaccuracies, encouraging acceptance without verification. In our data, this is reflected in the juxtaposition between students' favorable judgments of appropriateness and accuracy and the reminder that models can deviate from inputs or facts (e.g., Kiryakova & Angelova, 2023; Meyer et al., 2023; Tlili et al., 2023).

Second, students' knowledge profile appears largely utilitarian: many self-rate their knowledge of ChatGPT as moderate or very limited, focusing on common functionalities that facilitate task completion. Such shallow familiarity can sustain overconfidence in outputs while underweighting verification costs.

Third, diffusion pathways matter. Most students learned about ChatGPT via peers, family, social media, and the internet, with only approximately 7% reporting school as the source. This pattern of informal diffusion–combined with the finding that roughly half use the tool for independent learning–helps explain why social proof and convenience might substitute for explicit checking routines.

Regarding Portuguese contextual factors, two points stand out. On the one hand, data collection occurred before any formal classroom exploration of ChatGPT at the participating school, which plausibly reduced opportunities for teacher-scaffolded verification and disclosure norms. On the other hand, Portuguese curriculum guidance emphasizes critical thinking and digital competence (e.g., the *perfil dos alunos à saída da escolaridade obrigatória* [profile of students at the end of compulsory education] (Martins et al., 2017)), suggesting a potential implementation gap between curricular aspirations and students' day-to-day practices with GenAI. Together, these elements situate our results as a baseline snapshot of perceptions in a context where formal critical AI literacy is still emerging.

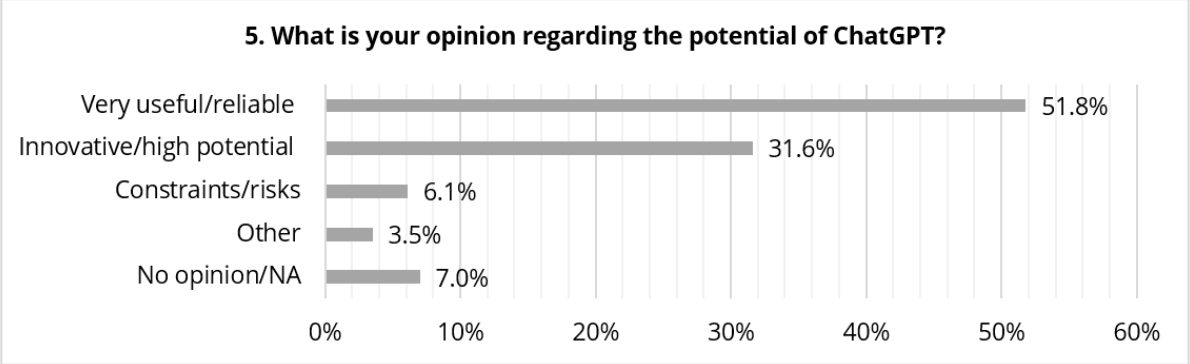

Figure 4. Students' responses to the question "5. What is your opinion regarding the potential of ChatGPT?" (Source: Authors' own elaboration)

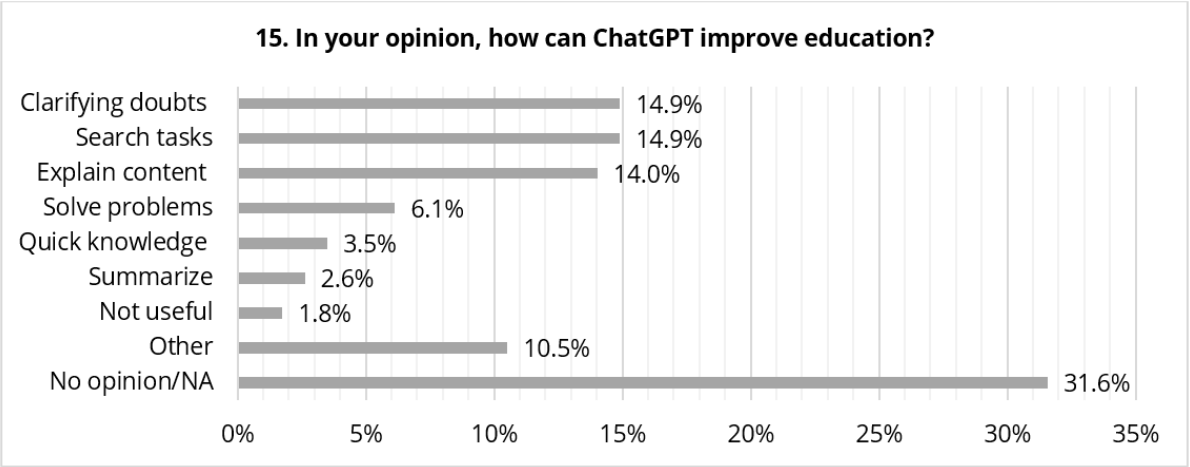

Figure 5. Students' responses to the question "15. In your opinion, how can ChatGPT improve education?" (Source: Authors' own elaboration)

Potential of ChatGPT (For Teaching)

Dimension D, potential of ChatGPT (for teaching), also encompasses two questions. The first (question 5) focused on the overall potential that students attribute to ChatGPT, while the second (question 15) aimed to understand how students perceive the tool's potential to improve teaching dynamics.

Accordingly, the students' responses to question 5 were grouped into five categories, as shown in **Figure 4**.

In this question, over half of the students (51.8%) stated that ChatGPT is a very useful and reliable source of information, including for "conducting research and academic work" or for "clarifying doubts related to subject content." Approximately one-third (31.6%) further indicated that this tool is innovative and holds great potential in educational settings. Only 6.1% of students mentioned that the use of ChatGPT presents some constraints (for example, concerning the reliability of its responses). Additionally, 3.5% of students cited other potential uses, while 7.0% either expressed no opinion or did not answer the question.

For question 15 (also an open-ended question), the students' responses (**Figure 5**) largely aligned with the tasks they reported typically performing with ChatGPT (responses to question 7). This suggests that students perceive the ease of completing tasks using ChatGPT as the tool's main contribution to improving the teaching and learning process.

In this question, students highlighted clarifying doubts (14.9%), conducting (re)search tasks (14.9%), and explaining content (14.0%) as the main areas where ChatGPT improves teaching dynamics. Students also mentioned the possibility of using the tool for solving exercises and mathematical problems (6.1%), for the rapid and effective acquisition of knowledge (3.5%), and for "summarizing information" (2.6%). Only two students (1.8% of respondents) reported that they did not consider ChatGPT a useful tool for improving the

quality of teaching. Additionally, 12 other distinct responses were categorized as "other" (10.5%), and 36 students (31.6% of responses) stated that they had not formed an opinion on this topic.

The students' responses to these questions indicate that the potential and opportunities they identified are closely related to school-related tasks. Similarly, the overlap between responses to question 15 and those to question 7 may suggest that students' use of ChatGPT predominantly occurs within the academic context, aimed at performing or facilitating academic tasks.

Ethics and Integrity

Ethical issues related to academic plagiarism are becoming increasingly pertinent as GenAI establishes its place in education. Plagiarism is one of the most serious forms of academic misconduct, as it violates ethical principles and compromises the acquisition and assessment of competencies (Elkhatat et al., 2023). Despite ChatGPT's considerable usefulness in supporting students in preparing texts for academic assessment, there is growing concern regarding the originality of the content generated by the system for academic purposes (Elkhatat et al., 2023).

Given that it is often difficult to distinguish text produced by AI, Cooper (2023) emphasizes that schools, when embracing the use of ChatGPT, must ensure its use is conducted ethically and responsibly. This includes developing appropriate policies and procedures for its use and providing adequate training on the subject for both students and teachers (in addition to using, for example, software capable of detecting AI-generated texts). By doing so, educational institutions can harness the opportunities offered by ChatGPT while safeguarding the integrity of assessments and the quality of learning.

To explore some of the ethical issues associated with the use of this AI tool (dimension E), the questionnaire included the items: "13. If you were completing an assessment task using ChatGPT, would you directly use the information provided by ChatGPT?" and "14. If you were completing an assessment task using ChatGPT, would you indicate in the references that you used ChatGPT?" Both questions were dichotomous ("yes"/"no") items.

For the first (question 13), the vast majority of students (82.5%) reported that they would directly use the information provided by ChatGPT. This response also suggests a lack of critical and reflective analysis by students regarding the outputs generated by this tool, as previously discussed. Regarding the acknowledgment of using ChatGPT for assessment tasks (for example, research papers, reports, among others), student responses were almost evenly split, with 55 students indicating that they would credit ChatGPT as the author or co-author of the work, and the remaining 59 students responding negatively.

Taken together, these two results highlight a potential lack of student awareness regarding plagiarism or even a lack of academic integrity, as pointed out by Balalle and Pannilage (2025).

To render our ethical discussion actionable for secondary settings, we propose a concise institutional approach that

(1) codifies permitted, restricted, and prohibited uses of AI by task type,

(2) requires transparent disclosure of AI assistance–identifying tools used, salient prompts, and substantive edits–together with clear citation guidance, and

(3) safeguards personal data through the exclusive use of approved platforms.

Assessment practices should be designed to capture process (e.g., staged drafting, brief oral defenses, and version histories), enabling proportionate verification. In line with due process standards, similarity checking may be employed as a screening aid, but we do not recommend reliance on AI-generated text "detectors" for sanctions given their limited validity; concerns should instead be adjudicated through evidence triangulation and instructor review. To build capacity, schools should embed short AI literacy modules for students (verification routines, biases and hallucinations, ethical reuse and disclosure) and provide subject-specific professional learning for teachers with ready-to-use routines (disclosure statements, verification checklists). Finally, we recommend piloting these measures, communicating the policy to parents/guardians, and instituting an annual review cycle to update guidance as tools and classroom practices evolve.

Although these findings cannot be generalized due to the size and characteristics of the sample, they provide relevant insights into students' perceptions of GenAI, particularly ChatGPT. They underscore the

urgent need to invest in teacher training so that educators are equipped to explore and integrate the potential of AI into their teaching practices, fostering the development of students' critical thinking skills. This, in turn, would help students to identify the limitations that may arise from using such tools and, importantly, would raise their awareness of academic integrity issues that must be safeguarded in this rapidly changing AI-driven world.

In sum, the evidence in this dimension reveals a tension between students' high confidence in ChatGPT's adequacy and correctness and their declared practices in assessment. These patterns underscore the need for explicit verification routines and clear integrity policies. To contextualize these findings and strengthen the study's contribution, the next subsection–"International comparisons of secondary students' perceptions of ChatGPT"–situates the Portuguese results alongside evidence from other countries, highlighting both commonalities and divergences.

International Comparisons of Secondary Students' Perceptions of ChatGPT

Recent international evidence suggests that secondary students' awareness and uptake of GenAI tools are high but uneven across contexts. In the UK, large-scale survey data show that the share of 13-18-year-olds who have used GenAI rose from 37% in 2023 to 77% in 2024 (Picton & Clark, 2024). USA data indicate that 26% of teens used ChatGPT for schoolwork in 2024, up from 13% the previous year (Sidoti et al., 2025). These adoption indicators frame our Portuguese sample as part of a broader wave of experimentation with GenAI in secondary education, while reminding us of that national metrics and measures vary.

Across countries, reported use cases converge on information seeking, idea generation, and drafting support. For example, Indonesian high school students report that ChatGPT helps to clarify physics concepts and correct misconceptions, with overall positive perceptions of usefulness (Fadillah et al., 2024). Nigerian secondary students likewise describe benefits for mathematics learning, but they also voice persistent concerns regarding accuracy and overreliance (Egara et al., 2025). These patterns mirror our respondents' emphasis on homework help and conceptual explanation, as well as their high trust in outputs.

Cross-national contrasts emerge more sharply around acceptability for assessed work and verification habits. In our sample, 82.5% said they would directly reuse ChatGPT content on assessments. By contrast, only 18% of U.S. teens say it is acceptable to use ChatGPT to write essays, while 42% judge it unacceptable (Sidoti et al., 2025). In the UK, while many teens report adding their own thinking, only about 40% say they check AI outputs and roughly 21% state they usually just copy what AI tells them (Picton & Clark, 2024). Taken together, these comparisons position the Portuguese context as one where instrumental acceptance may be comparatively high and verification practices comparatively weak–implications we develop below for critical-AI literacy and academic integrity (note that cross-study differences in sampling frames, instruments, and definitions [e.g., "use" of GenAI vs. "use of ChatGPT for schoolwork"] limit direct comparability). We therefore interpret international contrasts as directional rather than strictly causal.

The ethics items reinforce this interpretation. The fact that 82.5% of respondents would directly reuse ChatGPT content on assessments, together with a nearly even split on whether to acknowledge its use, points to insufficiently consolidated norms around attribution, verification, and appropriate reuse. In light of our earlier framing with DigComp 2.2 (Vuorikari et al., 2022), DigCompEdu (Redecker, 2017), or AI4K12 (Touretzky et al., 2022), these results suggest that students' ethical awareness is tightly coupled to digital and AI literacy and to the explicit teaching of analysis, evaluation, and inference as applied to AI-generated outputs. Concretely, this argues for school-level measures–teacher professional development, task designs that require disclosure and checking, and routine source appraisal–to translate curricular intentions into everyday classroom practice.

Subject-specific classroom studies in the sciences and mathematics also add nuance to the international picture. In high school physics, a quasi-experimental study in the UAE reports significant post-test gains and higher engagement when ChatGPT supports conceptual learning on Newton's second law (Alarbi et al., 2024). In mathematics, mixed-methods evidence from Nigerian secondary schools documents perceived benefits for understanding and problem solving alongside persistent concerns about accuracy and overreliance (Egara et al., 2025). Taken together, these studies align with our respondents' emphasis on explanation-seeking uses while reinforcing the need for explicit verification routines in classroom practice. Complementing these

perceptual findings, experimental work in physics education cautions that unreflective chatbot assistance can boost practice success while undermining unaided performance–underscoring the need for structured guidance rather than laissez-faire adoption (Krupp et al., 2024). These insights reinforce our recommendation that schools pair access to GenAI with pedagogy-first integration, explicit verification routines, and clear integrity policies.

FINAL CONSIDERATIONS

The present study examined the perceptions of 114 Portuguese secondary school students regarding the use of ChatGPT, whose relevance in contemporary society, and particularly in education, has been growing exponentially.

The findings reveal that although most students have prior contact with AI and ChatGPT, their knowledge of these technologies often remains superficial and focused on basic applications, mainly within the educational context, such as information searching, clarifying doubts, and preparing assignments. This trend confirms that ChatGPT is gradually becoming a resource employed in the teaching and learning process, even in the absence of formal guidance.

However, a pattern of uncritical use was also identified, as evidenced by the high level of trust students place in the accuracy and appropriateness of the outputs generated by the tool. This behavior is concerning, given some of the known limitations of GenAI systems, including the potential to produce incorrect information. It highlights the need to train both teachers and students so that these key actors in the educational process can better understand the tool and the implications of its use.

In terms of ethical considerations, it is noteworthy that a significant proportion of students reported directly using content generated by ChatGPT in assessment tasks, without proper attribution or awareness of possible plagiarism implications. This underscores the urgent need to promote digital literacy and academic integrity education among students.

The future of education will inevitably involve learning to integrate GenAI tools reflectively and ethically, ensuring that they serve not only as an additional resource but also as an opportunity to foster students' critical thinking, autonomy, and even digital citizenship.

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Ethics declaration: This study adhered to the ethical principles of educational research and was carried out within the scope of the supervised teaching practicum of the initial teacher education program, under the protocol established between the higher education institution and the partner school. Approval to conduct the study was granted by the school board. Given that the participants were minors, informed consent was obtained from their parents or legal guardians clearly explaining the purpose of the study and authorizing their participation. Students were assured that participation was entirely voluntary, that confidentiality would be maintained, and that they had the right to withdraw from the study at any time without negative consequences. It was also guaranteed that all data collected would be used exclusively for research purposes. No sensitive or personally identifiable information was collected, and all responses were anonymized in full compliance with the general data protection regulation, thereby safeguarding the autonomy, rights, and privacy of all participants.

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Data availability: Data generated or analyzed during this study are available from the authors on request.

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