



Integrating ChatGPT as a Learning Tool: Potential Benefits and Critical Considerations

Integrare ChatGPT come strumento di apprendimento: Potenziali benefici e considerazioni critiche

Danilo Petrassi

Department of Education, Cultural Heritage and Tourism, University of Macerata (Macerata, Italy) – d.petrassi@unimc.it
<https://orcid.org/0009-0003-4939-3757>

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ABSTRACT

This article examines the potential integration of OpenAI's ChatGPT into educational settings, with a particular focus on its capacity to enhance students' engagement in learning contexts. In order to investigate the potential of ChatGPT to deliver tailored educational content to diverse learning groups, structured interviews were conducted between different types of students and the chatbot. These interviews were designed to simulate hypothetical basic real-world educational interactions. While the outcomes indicate that ChatGPT is capable of adapting to a range of educational needs and styles, thereby facilitating more accessible and engaging learning experiences, however, a lot of limitations such as the lack of emotional intelligence and the potential to reduce critical thinking have been identified—underscoring the necessity for cautious integration and ongoing monitoring of AI technologies in education settings. The researcher proposes a balanced approach to AI integration, emphasizing the potential for synergy between AI tools and traditional learning methods.

Questo articolo esamina la potenziale integrazione di ChatGPT di OpenAI nei contesti educativi, con particolare attenzione alla sua capacità di migliorare l'impegno degli studenti nei contesti di apprendimento. Per indagare il potenziale di ChatGPT nel fornire contenuti formativi personalizzati a gruppi di apprendimento diversificati, sono state condotte interviste strutturate tra diversi tipi di studenti e il *chatbot*. Queste interviste sono state progettate per simulare interazioni educative ipotetiche di tipo elementare che rispecchino situazioni reali. Sebbene i risultati indichino che ChatGPT è capace di adattarsi a una gamma di esigenze e stili educativi, facilitando lo sviluppo di esperienze di apprendimento più accessibili e coinvolgenti, sono state identificate numerose limitazioni, quali la mancanza di intelligenza emotiva e il potenziale di diminuire il pensiero critico – sottolineando la necessità di un'integrazione cauta e di un monitoraggio continuo delle tecnologie IA nei contesti educativi. Il ricercatore propone un approccio equilibrato all'integrazione dell'IA, enfatizzando il potenziale di sinergia tra gli strumenti IA e i metodi di apprendimento tradizionali.

KEYWORDS

ChatGPT, Media education, Artificial intelligence, Engaging learning, Digital technologies
ChatGPT, Educazione ai media, Intelligenza Artificiale, Apprendimento coinvolgente, Tecnologie digitali

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1. Introduction

Since its release in November 2022, ChatGPT, the generative artificial intelligence chatbot developed by OpenAI, has immediately aroused great interest in the education fields, sparking debates, upheavals, and general reflection on how to adopt and use this specific technology (Holmes et al., 2019). The tool's capabilities extend across text generation, translation, personalized content creation, and data clustering, offering substantial benefits for research and education. However, there is concern that unchecked adoption might compromise human intellectual engagement (Floridi, 2023). As a sophisticated AI, ChatGPT facilitates personalized learning and supports students with specific needs by dynamically adjusting to user interactions, which promotes an adaptive learning environment. This research evaluates these functionalities, aiming to discuss strategic uses of ChatGPT in education to enhance inclusivity and accessibility, and aims to provide a comprehensive analysis of ChatGPT's capabilities and discuss strategic and critical approaches to harnessing its potential in learning settings (Grassini, 2023), thereby contributing to a more inclusive and adaptive education in the near future.

1.1 Brief history about ChatGPT

ChatGPT, as a derivative of OpenAI's Generative Pre-trained Transformer models, represents a significant evolution in the field of artificial intelligence, particularly within the domain of natural language processing (NLP) (Brown et al., 2020; Bommasani et al., 2021). This model leverages advanced deep learning techniques that mimic neural pathways in the human brain to process and generate text that closely resembles human communication (Vaswani et al., 2017; Devlin et al., 2018). The foundation of ChatGPT lies in the transformative developments in NLP and machine learning. The inception of NLP can be traced back to the early efforts in computational linguistics, where the focus was primarily on programming computers to process and analyze large sets of human language data. The shift from rule-based methods to machine learning algorithms marked a pivotal change, enabling more nuanced language comprehension and generation (LeCun et al., 2015). The specific architecture of GPT models is based on the transformer model which revolutionized the way machines understand textual data. The transformer uses self-attention mechanisms to process words in relation to all other words in a sentence, allowing for a dynamic understanding of language context. This approach is distinct from earlier models that processed text in sequential order, thus limiting the effectiveness of understanding longer context (Wolf et al., 2020). The acronym GPT stands for:

- *Generative*: GPT models are capable of generating responses by drawing upon and processing initial training data, leveraging both supervised and peer reinforcement training. They are pre-trained on vast quantities of text, which enables them to learn from a diverse range of language models, inclu-

ding those pertaining to grammar and semantics, as well as context;

- *Pretrained*: models are pre-trained on gigantic amounts of text. This implies that they are capable of learning from a multitude of language models, encompassing not only grammatical and semantic nuances but also contextual intricacies;
- *Transformer*: the transformer architecture employs self-attention and parallel processing mechanisms to effectively address large-scale linguistic tasks, resulting in the generation of contextually accurate text.

ChatGPT was trained using a variation of supervised and reinforcement learning techniques, where the model was fed a diverse corpus of text ranging from books and articles to websites, enabling it to learn a wide array of linguistic patterns, styles, and information. Its training involved adjusting the model's parameters to minimize the difference between its predictions and the actual outcomes, refining its ability to generate coherent and contextually relevant responses (Ziegler et al., 2019). Since its introduction, ChatGPT has been utilized in various applications beyond mere text generation. In education, it assists in creating personalized learning experiences; in customer service, it powers conversational agents; and in content creation, it aids in generating written material efficiently and creatively (Peters et al., 2018). The versatility of ChatGPT underscores its potential to not only enhance existing applications, but also innovate new ways for students to interact with AI systems.

1.2 Phenomenology of ChatGPT

The phenomenological study of ChatGPT allows for a deeper exploration in order to understand how students experience and perceive this advanced AI tool (van Manen, 2023). This approach focuses on understanding the subjective interactions between humans and ChatGPT, revealing the nuances of human-AI relationships (Floridi & Chiriatti, 2020). Phenomenology, the study of structures of consciousness as experienced from the first-person point of view, is crucial in order to gain an understanding of how to interact with and perceive AI such as ChatGPT. In these interactions, students—often—attribute human-like qualities to the AI, a phenomenon that can be understood through Husserl's concepts of intentionality and the *Lebenswelt* (Husserl, 1970). Students engage with ChatGPT, experiencing it not just as a tool but as a kind of conversational partner, which suggests a blending of technology and human-like interaction dynamics. The perception of AI as possessing intentionality, a fundamental concept in phenomenology, highlights the user's inclination to ascribe purpose and autonomy to ChatGPT's responses (Searle, 1980). Despite its non-conscious nature, ChatGPT often is treated as if it has its own desires and motivations, impacting how users interact with and respond to the technology (Suchman, 2007). This attribution mirrors the phenomenological idea that consciousness always involves an object (the intentional object) and is never empty. Merleau-Ponty's notions of corporeality and embodied perception provide a useful lens for examining

how users experience ChatGPT (Merleau-Ponty, 1962). Although lacking a physical body, ChatGPT's presence is felt through the digital medium, which becomes a form of "digital corporeality." Users interact with this digital entity through interfaces that allow for an illusion of physical presence, akin to how voice and personality can manifest through text alone (Turkle, 2011; Fuchs, 2018). Understanding the phenomenology of ChatGPT can significantly enhance learning applications by tailoring interactions that acknowledge and utilize these perceived attributes. By designing educational interactions that consider the perceived intentionality and presence of ChatGPT, students can create more engaging and effective learning environments. This involves recognizing and leveraging the way students personify ChatGPT to foster a more interactive and responsive educational tool.

2. Research design

This study adopts a descriptive research approach, which was selected due to its effectiveness in capturing detailed information about the interactions between hypothetical students and AI systems within a controlled setting. A descriptive approach is particularly useful in exploratory research where the primary goal is to observe, describe, and document phenomena as they occur, without manipulating the study environment (Creswell, 2014). This approach is well-suited for the current study, as it allows for an in-depth examination of ChatGPT's capabilities and limitations as an educational tool.

In selecting this method, I decided to consider alternatives such as experimental or quasi-experimental designs, which often involve controlled manipulation of variables to establish cause-and-effect relationships (Denzin & Lincoln, 2018). However, these approaches were deemed less appropriate for the current study's objectives, which focus on exploring and understanding the potential of ChatGPT to simulate real-world educational interactions. The descriptive approach enables to gather rich, qualitative data on the nature of AI-student interactions, which is essential for drawing nuanced conclusions about the utility and limitations of ChatGPT in educational settings.

Furthermore, the choice of a descriptive design aligns with best practices in educational research, where understanding complex, context-dependent phenomena is critical. By allowing to observe and analyse AI interactions in a structured manner, this approach provides a comprehensive foundation for subsequent research that might employ more experimental or longitudinal methods to further investigate the impacts of AI in education.

2.1 Participants

Given the focus on AI interactions, traditional human participants were not used directly in this study. Instead, the research centered on simulated interactions between the author and ChatGPT. These simulations were designed to represent typical learning scenarios, ranging from elementary to higher educational contexts, across various disciplines. This method follows

established protocols in educational research where simulated interactions are used to evaluate the pedagogical effectiveness of digital media tools. This approach ensures consistency in the interaction environment and eliminates the variability that human subjects might introduce, thus focusing on the capabilities and responses of the AI.

2.2 Simulation details

To ensure that the simulations accurately represented educational interactions, the research design incorporated several key elements designed to reflect typical learning scenarios. These simulations were not arbitrary; they were constructed based on established educational frameworks and the common challenges that students encounter at different educational levels. First, the scenarios were developed to include a range of academic subjects, from history to environmental science, ensuring that the interactions covered diverse content areas. This variety was intended to reflect the breadth of topics that students might engage with in real-world educational settings. Second, the simulated student inquiries were carefully crafted to represent typical questions and learning behaviours of students at various educational stages, from elementary to higher education. This approach draws on educational psychology literature, which emphasizes the importance of context and learner characteristics in shaping educational outcomes (Bransford, Brown, & Cocking, 2000). By aligning the simulations with these established principles, the research design aimed to create realistic and relevant interactions that would mirror actual classroom dynamics. Third, the choice of using structured interviews as the interaction medium was based on their ability to provide a controlled yet flexible environment for exploring AI capabilities. Structured interviews allow for consistency in the interaction process, while still enabling the AI to demonstrate its adaptability to different questions and contexts. This design choice ensures that the results are not merely anecdotal but are systematically obtained, contributing to the reliability of the findings.

To further enhance the realism of the simulations, I included iterative testing of the AI responses to refine the scenarios and ensure they were representative of genuine educational exchanges. By taking these steps, I sought to create a simulation environment that closely mimics the complexities and nuances of real-world educational settings.

2.3 Ethical considerations

Although the absence of human participants in this study reduces certain ethical concerns, there are still important ethical considerations related to the usage of AI in educational research. The research design took into account the ethical implications of using ChatGPT as a tool for simulating educational interactions, particularly concerning data privacy, informed consent, and the responsible use of AI-generated content. Firstly, it is essential to consider the ethical guidelines established by OpenAI for the use of GPT

models. According to OpenAI's usage policies, research involving their AI models must adhere to principles that ensure the responsible use of technology, including transparency, accountability, and fairness. Moreover, the study recognizes the potential for AI to introduce biases into educational content. To mitigate this, I took steps to critically assess the AI's responses for any signs of bias or inaccuracy. This involved an evaluation review of the AI's output against established educational standards and ethical considerations, ensuring that the content provided by ChatGPT was not only accurate but also aligned with educational values such as inclusivity and fairness. While the study did not involve direct human subjects, the ethical implications of AI's role in education extend to the potential impact on students who might use similar technologies in the future. The research design therefore included considerations of how AI tools could be integrated into educational settings in ways that support rather than undermine educational goals. This includes ensuring that AI is used as a supplementary tool that enhances human teaching rather than replacing it, thus safeguarding the role of educators in fostering critical thinking and emotional intelligence. Finally, the results and conclusions were presented with transparency about the limitations of the research design, acknowledging the need for further studies to explore the broader implications of AI in education.

3. Interviews

The following interviews were structured to simulate hypothetical real-world interactions to provide insights into developing effective questions and scenarios that reliably test the learning utility of AI technologies such as ChatGPT to investigate its potential as a learning tool. However, an evaluation analysis of the benefits and critical considerations regarding ChatGPT performance will be presented at the conclusion of each interview.

3.1 Interviews protocol

The structured interviews were designed as a series of three scenarios (Sections 3.2 – 3.3), each with its own assessment table (Tables 1 – 3), and each focusing on a distinct area: capability assessment, interaction quality, and adaptability to personalization. Each area was targeted with specific questions and scenarios that reflected common learning activities:

1. *Capability assessment*: questions in this area were designed to evaluate ChatGPT's ability to explain complex scientific concepts, like interpret historical events, and provide problem-solving strategies. This section aimed to assess the explanatory power and factual accuracy of ChatGPT.
2. *Interaction quality*: this segment tested the AI's responsiveness, clarity of communication, and ability to maintain a contextually relevant dialogue. Scenarios were crafted to observe how ChatGPT managed ongoing conversations, its ability to recall

previous exchange points, and its effectiveness in adjusting communication style as per the simulated students' needs.

3. *Adaptability and personalization*: the questions here were intended to examine ChatGPT's capacity to tailor responses based on different educational levels and learning styles. This involved modifying the complexity of language, the depth of content, and the method of explanation according to the needs of simulated users ranging from younger students to adult learners.

3.2 Capability assessment (scenario: discussing a historical event)

Student: Hi ChatGPT! I have a basic knowledge of history and today I'd like to learn about the fall of the Berlin Wall. Could you explain why it was built and the events leading up to its fall?

ChatGPT: Hi! Certainly, the Berlin Wall was a significant symbol during the Cold War, representing the division between East and West Berlin and, more broadly, between the communist and capitalist worlds. It was constructed in 1961 by the German Democratic Republic (East Germany) primarily to stop the mass emigration and defection that marked Germany and the communist Eastern Bloc during the post-World War II period.

The wall was built overnight on August 13, 1961. It cut off West Berlin from surrounding East Germany, including East Berlin. The construction was a response to the drain of labor and economic migration from the Eastern Bloc to the West through the open borders in Berlin. Life in West Berlin was seen as more attractive, and the East German government wanted to prevent this brain drain.

Leading up to the fall of the Berlin Wall, there were several significant events. By the late 1980s, the Soviet Union, under Mikhail Gorbachev, adopted policies of glasnost (openness) and perestroika (restructuring), which led to greater freedom of expression and economic reform. These policies spread to other Eastern Bloc countries, inciting movements that pushed for democratic reforms.

In East Germany, public unrest and demonstrations became more pronounced by 1989. The pressure from these protests coupled with the ongoing emigration crisis (where thousands of East Germans emigrated via other Eastern Bloc countries) forced the East German government to ease travel restrictions. The announcement was made somewhat prematurely on November 9, 1989, by a government spokesperson. Miscommunication about when the new regulations were to take effect led to crowds of East Germans gathering at the wall, demanding the gates be opened. Overwhelmed, the border guards eventually opened the gates, allowing people to cross freely. This event marked the beginning of the end for the Berlin Wall and, symbolically, the Cold War itself.

The wall officially fell in 1990, leading to German reunification, which was formally completed on October 3, 1990.

Student: That's very informative, thank you! How did the fall of the Berlin Wall impact Germany in the years that followed?

ChatGPT: The fall of the Berlin Wall had profound and lasting impacts on Germany. Economically, the reunification process involved large-scale efforts to integrate the socialist economy of East Germany with the capitalist West Germany. This was a challenging process, as the East German economy suffered from inefficiencies and outdated industries. The West German government invested heavily in infrastructure, social programs, and economic reform in the former East to bring it up to the level of the West, which required significant financial resources and led to economic strain.

Socially and politically, reunification marked a new era of freedom and democracy for East Germans, who had lived under a restrictive regime. The integration of East and West also brought challenges, including disparities in living standards and cultural differences between the two populations, which had developed distinct identities over the nearly 30

years of separation. However, over time, these differences have been addressed through continued political and social efforts to forge a unified German identity.

Internationally, the fall of the Berlin Wall signaled the end of the Cold War, leading to a new phase in global politics, including the expansion of the European Union and NATO. It also set a precedent for the peaceful resolution of political conflicts and inspired democratic movements worldwide.

Student: Thanks, ChatGPT!"

The simulated interaction where ChatGPT discussed a complex historical event—the fall of the Berlin Wall—showcases its capacity to serve as an effective learning tool by explaining events in a manner that is both detailed and accessible. This highlights the AI's strengths in delivering content that is not only factual but also enriched with contextual analysis, which can enhance students' understanding of the causes, consequences, and broader implications of historical events.

Benefits of ChatGPT's performance	Critical considerations:
<ul style="list-style-type: none"> <i>Detailed and accessible explanations:</i> ChatGPT effectively balances the depth and accessibility of its explanations. It provides a comprehensive overview while ensuring that the language and structure of the information are suitable for educational purposes. This capability is crucial for facilitating learning, especially for students who may be encountering complex historical content for the first time; <i>Contextual analysis:</i> beyond just recounting facts, ChatGPT provides a broader analysis that situates the historical event within its larger socio-political context. This kind of analysis is essential for developing a holistic understanding of history, as it connects individual events to larger historical narratives and themes, thereby enriching students' understanding of how past events shape current realities; <i>Utility as a learning tool:</i> this basic interaction underscores the potential of ChatGPT to augment traditional learning environments. By providing real-time responses that are both informative and engaging, ChatGPT can act as a supplementary educational resource, assisting students in exploring historical topics in greater depth. 	<ul style="list-style-type: none"> <i>Accuracy and completeness:</i> while ChatGPT aims to provide accurate information, the completeness of its responses is limited by the data it has been trained on. In history education, where multiple perspectives and interpretations are valuable, there's a risk that ChatGPT might not fully represent all viewpoints, especially those that are less documented or controversial. In this case teachers need to ensure that discussions include multiple perspectives to provide a balanced view of history; <i>Dependence on predefined data:</i> ChatGPT's knowledge is static, based on the information available up to its last update. This can be problematic for discussing recent historical developments or ongoing research that isn't yet part of its training data. Students and teachers should be aware of these limitations, particularly when using the tool for current events or the most recent historical scholarship; <i>Critical thinking skills:</i> there's a concern that the ease of obtaining detailed responses from an AI might discourage students from engaging in deeper research or developing their critical thinking skills. To mitigate this, teachers should use ChatGPT as a starting point for further discussion and exploration, encouraging students to question and critique the information provided by the AI.

Table 1. Capability assessment (scenario: discussing a historical event).

3.3 Interaction quality (scenario: quality of engagement and communication)

Student: I've heard a lot about the French Revolution but always found it confusing. Could you explain it in simpler terms?

ChatGPT: Absolutely, I'd be happy to help simplify the French Revolution for you. Essentially, the French Revolution, which started in 1789, was a period of significant upheaval in France that ultimately led to the overthrow of the monarchy and the establishment of a republic.

The revolution began due to widespread discontent with the French monarchy and the poor economic policies of King Louis XVI, which exacerbated the economic hardship faced by the peasants. The Estates-General was convened in 1789, which was the first

step toward a more democratic governance, but disagreements on representation led to the formation of the National Assembly by the third estate, representing the common people.

Key events include the storming of the Bastille, a fortress prison, symbolizing the fall of the monarchy's authority. This was followed by years of political turmoil and violence, known as the Reign of Terror, where thousands were executed for perceived enemies of the revolution.

Ultimately, the revolution led to the rise of Napoleon Bonaparte, who established himself as the leader of France and later declared himself emperor. The principles of the revolution—liberty, equality, fraternity—left a lasting impact on France and shaped modern nations by promoting democratic ideals and rights.

Student: Can you give me an example of how the revolution influenced modern democratic ideals?

ChatGPT: Certainly! One of the most significant influences of the French Revolution on modern democratic ideals is the Declaration of the Rights of Man and of the Citizen, which was passed in 1789. This document asserted that all men are born free and equal in rights, which are universal and should be preserved by the state. This was a radical idea at the time and laid the groundwork for modern human rights.

The principles enshrined in the declaration, such as freedom of speech, freedom of religion, and the right to a fair trial, have been integral to democratic constitutions around the world. Moreover, the emphasis on equality before the law and the sovereignty of the people influenced many democratic societies, promoting the idea that governments should be accountable to the people and must operate within a framework of justice and human rights.

Student: Thanks, that makes a lot more sense now. How did the citizens manage to maintain momentum during the revolution?

ChatGPT: The momentum of the French Revolution was maintained through various means. Initially, the palpable public outrage against the monarchy's inability to manage debt and provide relief during a time of famine and economic hardship fueled the movement. Political clubs and societies, like the Jacobins and the Cordeliers, played a crucial role in mobilizing the population, spreading revolutionary ideas, and organizing protests and assemblies.

Additionally, pamphlets and newspapers were instrumental in disseminating revolutionary ideas, critiquing the monarchy, and mobilizing public opinion. The use of symbols, such as the tricolor cockade, also helped to unify and identify supporters of the revolution.

As the revolution progressed, the continual political shifts and the emergence of strong leaders like Robespierre also helped sustain the revolutionary fervor by driving the legislative agenda and enforcing policies aligned with revolutionary ideals, albeit often through radical and violent means during the Reign of Terror."

Benefits of ChatGPT's performance	Critical considerations:
<ul style="list-style-type: none"> • <i>Clarity and engagement:</i> the response from ChatGPT was structured in a way that is both informative and easy to understand, using straightforward language and clear explanations to convey the details of a complex historical event. This approach is likely to enhance student engagement, as it transforms potentially dry historical facts into an interactive and appealing dialogue; • <i>Adaptive communication:</i> ChatGPT's ability to tailor its communication style to the student's level of understanding is a significant strength. By modulating its responses according to the perceived knowledge and engagement level of the student, ChatGPT facilitates a more personalized learning experience, which can lead to better educational outcomes; • <i>Contextual relevance:</i> the AI's responses remained relevant to the student's inquiries, suggesting a strong capacity for maintaining context within a conversation. This is crucial for educational dialogue, where the continuity and relevance of information are key to effective learning and comprehension. 	<ul style="list-style-type: none"> • <i>Risk of oversimplification:</i> in its attempt to make complex information accessible, there is a risk that ChatGPT might oversimplify historical events, potentially omitting crucial details or nuances. For the students this could lead to a superficial understanding of significant events, where the complexities that shape historical narratives are lost. Teachers must be vigilant in supplementing AI-generated content with critical discussions that explore these complexities more thoroughly; • <i>Potential data distortions:</i> ChatGPT's responses are as good as the data on which it was trained. If the training data is biased, outdated, or inaccurate, these flaws can be reflected in the responses generated by ChatGPT. This can lead to historical distortions or biased interpretations of events, inadvertently shaping learners' understanding based on skewed perspectives. Continuous monitoring and updating of the data used for training AI systems are imperative to mitigate these risks; • <i>Dependence on technology:</i> relying heavily on AI for learning content delivery risks diminishing the role of human teachers in fostering critical thinking and deep analytical skills. There is a concern that if students become too accustomed to receiving simplified explanations, their ability to tackle complex problems and think critically may be impaired. It's crucial that educational use of AI be integrated with traditional teaching methods that challenge students and encourage deeper engagement with the material.

Table 2. Assessment of the interaction quality (scenario: quality of engagement and communication).

3.4 Adaptability and personalization (comparative scenario: elementary school student vs. university student)

The third scenario is split into two parts, each dedicated to a different grade of schooling. The first part involves a simulated elementary school student:

"Student: I'm in elementary school and our teacher asked us to learn about the water cycle. Can you explain it in a way that's easy for me to understand?

ChatGPT: Of course! Imagine that the Earth has a big recycling system for water, called the water cycle. This cycle helps to move water all around our planet. Here's how it works:

- **Evaporation:** When the sun heats up water in rivers, lakes, or oceans, the water turns into vapor or steam and goes up into the air.
- **Condensation:** As the water vapor goes higher, it cools down and turns back into tiny droplets of water. This is what forms clouds in the sky.

- **Precipitation:** When those clouds get really full of water droplets, the water falls back down to Earth as rain, snow, sleet, or hail.
- **Collection:** Once the water falls, it collects in rivers, lakes, and oceans. And then, it starts all over again!

This cycle is important because it helps give us fresh water to drink and helps plants grow.
Student: Oh, I see! What happens if it doesn't rain for a long time?

ChatGPT: If it doesn't rain for a long time, it's called a drought. During a drought, lakes and rivers can dry up, and plants may not get enough water to grow well. This can be tough for farmers because they need water to help their crops grow. It can also mean less water for us to use at home. That's why it's important to save water whenever we can, especially when it hasn't rained much.

Student: Thanks for explaining! Can you tell me what sleet is?

ChatGPT: Sure! Sleet is a type of precipitation, just like rain and snow. It happens when raindrops fall from a cloud and pass through a cold layer of air as they come down to the ground. This cold air freezes the raindrops into ice pellets before they hit the ground. Sleet is smaller than hail and usually bounces when it lands. It can be slippery and icy when it builds up on roads and sidewalks.

Student: That makes sense! Thank you for helping me understand!"

The second part follows, which involves a university student:

Student: I'm a university student studying environmental science. Could you explain the significance of the water cycle in climate regulation?

ChatGPT: Absolutely! The water cycle plays a crucial role in regulating the Earth's climate. It does this in several key ways:

- **Temperature Regulation:** Water has a high heat capacity, which means it can absorb a lot of heat without getting very hot. This property helps regulate temperatures in the environment. For example, oceans absorb heat from the sun and release it slowly, which stabilizes temperatures and creates a more moderate climate, especially in coastal areas.
- **Transporting Heat:** The water cycle also moves heat across the planet. When

water evaporates, it takes heat from the environment, which cools the area. This water vapor can travel long distances in the atmosphere before it condenses and releases the heat as it forms precipitation. This process is a major component of global heat distribution.

- **Influencing Weather and Climate Patterns:** The distribution and movement of water vapor in the atmosphere affect weather patterns and climate. For instance, regions with high evaporation can lead to more cloud formation and precipitation, influencing local and regional climates.
- **Carbon Cycle Interaction:** The water cycle is also intertwined with the carbon cycle. Water bodies absorb CO₂, and water flow can transport carbon into and out of ecosystems, impacting the global carbon budget and, consequently, climate change.

Understanding the water cycle helps us grasp how changes in climate can affect water resources and vice versa, which is critical for managing water sustainably and addressing climate change.

Student: That's really insightful, thanks! How does deforestation affect the water cycle?

ChatGPT: Deforestation can have significant effects on the water cycle. Trees play a vital role in the cycle by absorbing groundwater through their roots and releasing water vapor into the atmosphere through a process called transpiration. When forests are cut down:

- **Reduction in Transpiration:** This leads to less moisture being released into the atmosphere, which can decrease local rainfall.
- **Soil Erosion:** Without tree roots to hold the soil in place, deforestation can lead to increased erosion. This not only degrades the soil but can also lead to more runoff and less water infiltration into the soil, affecting groundwater supplies.
- **Increased Temperature:** Forests help to cool the air through transpiration. Without this cooling, deforested areas can experience higher temperatures, further altering local climate patterns.

These changes disrupt the local water cycle, affecting water availability and climate conditions, which can have broader environmental impacts.

Student: Thank you, ChatGPT!"

Benefits of ChatGPT's performance	Critical considerations:
<ul style="list-style-type: none"> • <i>Adaptation to educational levels:</i> ChatGPT demonstrates a sophisticated understanding of how to modify its language and detail according to the student's age or educational stage. This is evident from its interactions with both an elementary school student discussing the water cycle and a university student exploring the complexities of the water cycle's role in climate regulation. Such flexibility is vital for engaging students effectively and ensuring that the information is appropriate and accessible to all learners; • <i>Personalized communication:</i> the AI's capability to personalize interactions contributes to a more engaging and supportive learning environment. This personalization helps maintain students' interest and motivation, key factors in effective learning outcomes. By responding in a way that is directly aligned with each student's needs, ChatGPT can enhance comprehension and retention of educational material; • <i>Facilitation of learning across subjects:</i> the interaction showcases ChatGPT's ability to handle a diverse range of subjects—from simple scientific concepts to more complex climate science—demonstrating its utility as a broad educational resource. This versatility makes it an invaluable tool in educational settings where subject matter can vary widely and teacher expertise may be limited in certain areas. 	<ul style="list-style-type: none"> • <i>Risk of over-reliance:</i> there is a potential risk that students might become overly reliant on ChatGPT for answers, possibly at the expense of developing their own research and problem-solving skills. Teachers must ensure that use of such AI tools complements, rather than replaces, traditional learning and critical thinking exercises; • <i>Accuracy and scope of content:</i> while ChatGPT can provide immediate answers, the accuracy and depth of these responses can sometimes be limited by the data on which it was trained. In subjects where new research or data is constantly emerging, ChatGPT's responses may not always reflect the most current information or understandings. Teachers need to be vigilant in updating and supplementing AI interactions with the latest scholarly content; • <i>Development of critical thinking:</i> ChatGPT can adapt responses to various educational levels, but there is still a need for fostering critical thinking and deeper analytical skills among students. AI interactions should be designed not just to provide information but to encourage students to think critically about the material, question its sources, and explore topics further on their own.

Table 3. Assessment of the adaptability and personalization (comparative scenario: elementary school student vs. university student).

4. Results

The simulated interviews conducted with ChatGPT reveal its substantial capabilities and limitations as a learning tool, highlighting both its strengths and areas requiring further improvement. The evaluation analysis presents a nuanced view of ChatGPT's capabilities as an adaptive learning tool (Gligorea et al., 2023), which can significantly contribute to educational engagement (Chan & Tsi, 2023). The following results are the primary findings that emerged from the responses obtained in the simulated interviews with ChatGPT and are summarized according to ChatGPT's syntax.

4.1 Positive outcomes

Adaptive personalization: ChatGPT demonstrated effective personalization of learning content by adjusting the complexity and presentation of information according to the learner's age, educational background, and subject comprehension. This was particularly evident in the interviews designed for different educational levels, where the AI tailored its responses to meet the specific needs of the elementary and university students. This functionality supports a wide range of learning styles and paces, which is particularly beneficial in inclusive education environments where students may have varied learning disabilities or requirements (Zawacki-Richter et al., 2019).

Improved accessibility: by providing real-time, tailored responses, ChatGPT enables students who require additional educational support to access information at a pace and level that suits them. This was demonstrated in the interviews where ChatGPT effectively communicated complex topics in simpler terms for younger students while also provi-

ding more detailed and sophisticated explanations for advanced learners. This can significantly improve learning outcomes for students with challenges such as dyslexia, ADHD, or those who are non-native speakers of the language of instruction.

Engagement and motivation enhancement: ChatGPT's ability to engage students through interactive and contextually relevant dialogue helps sustain their interest and motivation in the subject matter. The interviews highlighted this, as the AI maintained the flow of conversation, offered clear explanations, and provided additional relevant information based on follow-up questions from the simulated students. This engagement is critical in fostering a positive learning environment where students feel encouraged to explore topics in depth.

4.2 Identified limitations

Lack of emotional engagement: despite ChatGPT's strengths, one of its significant limitations is the lack of genuine emotional engagement. While the AI can simulate conversation and provide information, it cannot replicate the empathetic and motivational support that human teachers provide. This was evident in the interviews where ChatGPT provided factual and contextual analysis but lacked the emotional depth that could further engage students, particularly in scenarios that required motivational support or dealing with sensitive topics.

Data-driven biases: the interviews also revealed potential biases in ChatGPT's responses, reflecting the data on which it was trained. This is a critical concern, as the AI's outputs might inadvertently reflect historical inaccuracies or cultural biases, particularly in the way it handles sensitive topics such as histo-

rical events or social issues. For instance, while ChatGPT was able to provide a comprehensive overview of events like the fall of the Berlin Wall, it is important to consider that such explanations might not fully represent multiple perspectives, particularly those less documented or controversial.

Over-reliance and critical thinking: another limitation identified during the interviews was the risk of students becoming overly reliant on ChatGPT for answers, potentially at the expense of developing their own research and problem-solving skills. The AI's ability to provide immediate and detailed responses might discourage students from engaging in deeper research or critical thinking. This concern is particularly relevant in the context of complex subjects like history or science, where diverse viewpoints and analytical skills are crucial for a comprehensive understanding.

4.3 Educational considerations:

The interviews emphasized the importance of accuracy and completeness in AI-generated content. While ChatGPT generally provides accurate and relevant information, there is a need for caution, particularly in subjects where multiple interpretations or the latest research is essential. Teachers must supplement AI-generated content with additional materials to ensure students receive a well-rounded education. The results also indicate that while ChatGPT can be a valuable tool in educational settings, it is crucial to balance its use with traditional teaching methods. Human oversight is necessary to guide students, encourage critical thinking, and provide the emotional and contextual support that AI cannot offer. This balanced approach will help maximize the benefits of AI in education while addressing its limitations.

Given the strengths and limitations identified, educators should consider the following when integrating AI tools like ChatGPT into the classroom:

1. *Complementary use:* use AI just as a supplement to human teaching, particularly for reinforcing concepts, providing additional explanations, and catering to diverse learning needs.
2. *Critical engagement:* encourage students to critically engage with AI-generated content, questioning and verifying information through independent research and discussion.
3. *Continuous monitoring:* regularly update and monitor AI systems to ensure they provide accurate, unbiased, and relevant content, reflecting the latest educational standards and research.

5. Discussion

The integration of AI tools like ChatGPT into educational settings represents a transformative shift in how learning can be facilitated, personalized, and scaled. AI's ability to process vast amounts of data, adapt to individual learning styles, and provide real-time feedback offers unprecedented opportunities to enhance student engagement and accessibility. This study has highlighted the potential benefits of using ChatGPT

to create more inclusive and effective learning environments. However, these advantages come with significant considerations that must be carefully managed to ensure responsible and effective integration into educational practices.

One of the most critical aspects of integrating AI into education is the need for a balanced approach that combines the strengths of AI with the irreplaceable human elements of teaching. While AI can offer immediate, tailored responses and adapt to various learning needs, it cannot replicate the emotional intelligence, empathy, and nuanced understanding that human teachers bring to the classroom. Emotional intelligence, which involves recognizing and responding to students' emotional states, is crucial for creating a supportive learning environment (Goleman, 2005). AI lacks the capacity to genuinely perceive emotions or respond with the kind of empathy that can motivate and reassure students, making human teachers indispensable in this regard. Previous studies have similarly emphasized the complementary role of AI in education, highlighting that while AI can enhance personalized learning, it should not replace the critical role of human educators (Luckin, 2017; Selwyn, 2019). Moreover, the potential biases inherent in AI systems, which stem from the data they are trained on, pose a significant challenge: these biases can manifest in various forms, from skewed historical perspectives to cultural stereotypes, which may inadvertently be reinforced through AI-generated content. This concern has been raised in other research as well, which underscores the importance of curating diverse and representative datasets to train AI systems (Buolamwini & Geburu, 2018; Bender & Koller, 2020). For instance, Noble (2018) discusses how algorithms can perpetuate racial biases, leading to unequal educational opportunities if not carefully monitored and adjusted. To mitigate these risks, it is essential to implement continuous oversight and regularly update AI systems to ensure they reflect current, accurate, and diverse perspectives. Educational institutions should also develop algorithms that can detect and address these biases, ensuring that AI tools provide equitable and accurate information to all students. This includes incorporating checks and balances that allow educators to review and correct AI outputs, fostering a collaborative environment where AI serves as a supportive tool rather than an autonomous authority. Another critical consideration is the development of students' critical thinking skills. While AI can provide detailed and accurate information, there is a risk that students may become overly reliant on these tools, leading to a decline in their ability to engage in deep research and independent problem-solving. Research by Haider & Sundin (2019) points out the major need for educational practices that encourage students to critically engage with AI-generated content, fostering a more active and analytical approach to learning. Without these critical skills, students may accept AI-generated responses at face value without questioning their validity, accuracy, or the underlying assumptions. Therefore, it is crucial to design educational frameworks that integrate AI in ways that promote inquiry, skepticism, and deeper engagement with content, ensuring that students develop the ability to think independently and critically. Additionally,

there is the concern of digital literacy among both students and educators. As AI tools become more integrated into educational systems, the need for digital literacy becomes more pressing. Educators must be equipped with the knowledge and skills to effectively integrate AI into their teaching practices, including understanding its limitations and potential biases. Likewise, students must be taught to navigate and critically evaluate AI-generated content, understanding how these tools work and how to use them responsibly (Martin, 2018). This requires ongoing professional development for educators and curriculum updates that include AI literacy as a core component.

To effectively integrate AI into educational settings, a strategic and balanced approach is required. This involves combining the strengths of AI with traditional pedagogical methods to create a comprehensive and inclusive learning environment. For instance, AI can be used to provide personalized learning experiences and immediate feedback, while human teachers can focus on facilitating discussions, providing emotional support, and guiding students through complex problem-solving tasks (Zawacki-Richter et al., 2019). This hybrid model leverages the efficiency and scalability of AI while preserving the relational and interpretative aspects of teaching that are critical for student development.

In addition to this balanced approach, it is crucial to establish strong ethical frameworks and clear policies around the use of AI in education. These policies should address not only the potential biases and dependencies but also the privacy and security concerns associated with AI tools. The ethical use of student data is paramount, particularly in ensuring that AI systems do not infringe on student privacy or use data in ways that could harm students (Nissenbaum, 2011). Moreover, the security of AI systems must be robust to protect against potential breaches that could expose sensitive student information. Previous studies have highlighted the need for robust ethical guidelines to govern the use of AI in educational contexts, ensuring that these technologies are used responsibly and equitably (Edwards & Veale, 2017). For instance, frameworks like the General Data Protection Regulation (GDPR) in Europe offer a starting point for developing policies that protect student rights while allowing for innovative educational practices (Voigt & Von dem Bussche, 2017).

Ongoing research and evaluation are also necessary to understand the long-term impacts of AI in educational settings fully. This includes conducting longitudinal studies that assess how AI tools like ChatGPT influence learning outcomes, student engagement, and the development of critical life skills. Such research will be pivotal in shaping future educational strategies and ensuring that AI tools are used effectively and responsibly (Montenegro-Rueda et al., 2023). Moreover, comparative studies across different educational contexts—such as primary versus higher education or across different cultural settings—can provide valuable insights into how AI can be best tailored to meet diverse educational needs. This research should also explore the psychological impacts of AI on students, such as the potential for decreased motivation or increased anxiety due to the presence of AI in the learning environment (Lee, 2020). By un-

derstanding these effects, educators can make more informed decisions about how to integrate AI in ways that support positive educational outcomes and student well-being.

6. Conclusions

This study has underscored the significant potential of ChatGPT as a transformative learning tool, particularly in its ability to offer personalized, accessible, and engaging educational experiences. By adapting content to meet diverse learner needs and providing immediate feedback, AI tools like ChatGPT can play a crucial role in enhancing student engagement and supporting differentiated instruction. However, the integration of AI into education must be approached with caution, with a strong emphasis on preserving and enhancing the human elements of teaching. While AI has the capacity to augment traditional educational methods, it is not a substitute for the critical role that human teachers play in fostering emotional intelligence, empathy, and critical thinking skills—elements that are essential for holistic student development (Luckin, 2017; Selwyn, 2019).

To truly maximize the benefits of AI in education, it is essential to develop comprehensive frameworks that encourage the responsible and ethical use of these tools. Such frameworks should include rigorous protocols for the continuous evaluation and updating of AI systems to ensure that they remain aligned with educational objectives and societal values. This includes not only technical updates to improve accuracy and functionality but also updates to the underlying datasets to ensure they are inclusive and representative of diverse perspectives (Buolamwini & Gebru, 2018; Bender & Koller, 2020). Additionally, training teachers on how to effectively integrate AI into their teaching practices is critical. This involves not just technical training but also pedagogical strategies that leverage AI's strengths while mitigating its limitations. Nowadays teachers should be equipped to use AI as a tool to enhance their instruction, rather than as a replacement for their professional judgment and relational skills. Developing policies that balance technological innovation with the fundamental goals of education—such as promoting equity, fostering critical thinking, and supporting student well-being—will be crucial in this regard (Edwards & Veale, 2017). Moreover, the ethical implications of AI use in education cannot be overlooked. Ensuring data privacy, preventing bias, and safeguarding against the misuse of AI-generated content are essential considerations that must be addressed in any comprehensive AI integration strategy. Establishing clear guidelines and accountability mechanisms will help prevent potential harms and ensure that AI tools are used in ways that are ethical and beneficial to all students (Nissenbaum, 2011).

Future research should prioritize longitudinal studies that assess the long-term impacts of AI in educational settings. Such research is essential to understanding how AI tools influence learning outcomes, student development, and the broader educational ecosystem over time. Longitudinal studies can provide valuable insights into the cumulative effects

of AI integration, helping educators and policymakers make informed decisions about how to best incorporate these technologies into their classrooms (Montenegro-Rueda et al., 2023). Additionally, comparative studies across different educational contexts—such as varying age groups, subject areas, and cultural settings—will be important for identifying best practices and tailoring AI tools to meet specific educational needs.

This balanced and proactive approach will ensure that AI tools like ChatGPT serve as beneficial adjuncts within the educational landscape, enhancing learning while safeguarding the critical and essential role of human interaction. By embracing the potential of AI while remaining vigilant about its limitations, educators can create a more inclusive, engaging, and effective learning environment that prepares students for the challenges and opportunities of the future.

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