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Understanding the impact of ChatGPT in education: Exploratory study on students' attitudes, perception and ethics

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With the advent of Artificial Intelligence (AI) in educational settings, particularly the integration of tools like ChatGPT, research on the impact of ChatGPT in education becomes a critical and timely endeavor, especially when it includes insights from students rather than just teachers. This exploratory study aims to examine students' attitudes, perceptions, and ethical concerns towards AI integration in learning environments by directly engaging 60 students from diverse geographical regions and educational background. The sample includes students from urban higher education and suburban high school. The study is founded on a quantitative research design and cross-sectional survey methodology. The findings reveal a clear digital divide in AI usage, with urban students demonstrating more engagement with ChatGPT for educational purposes than their suburban counterparts, thereby unveiling an underlying disparity in technological access. Ambiguity prevails among students about distinct functionalities and benefits of AI language models like ChatGPT, hinting at the need for clearer elucidation of AI's unique capabilities. Ethical concerns also emerge, especially regarding AI accuracy and the potential for misuse leading to a decline in critical thinking skills. However, despite these challenges, students generally express optimism about the future refinement and widespread application of ChatGPT. In conclusion, this study underscores the importance of promoting digital inclusivity, establishing clear ethical guidelines, and striving for continuous improvements in AI accuracy, all while maintaining student-centric approach. Future direction suggests a focus on enhancing digital inclusivity, ethical considerations, AI accuracy and educational strategies around unique functionalities of AI tools.

Keywords: AI tool, ChatGPT, higher education, high school, Generative AI

Introduction

Since the introduction of computers in the 1960s, they have had a significant impact on the educational landscape. The use of computers in education has continued to grow at all levels, including secondary and higher education throughout these years. The evolution in technology, including the incorporation of AI, has raised questions about the potential to significantly enhance educational experience, offering students new and innovative ways to learn and interact with information. The benefits of employing AI tools are obvious as AI-powered educational tools can provide personalized learning experiences, adapting to the needs and abilities of individual students (Cherukuri et al., 2021). AI-based learning platforms and tools can assist students in automating writing tasks, enabling students to focus more on critical thinking and problem-solving. According to Cherukuri et al. (2021), AI technology enables educators to develop and select digital materials that allow high school and higher education students to engage in personalized learning experiences through skill mapping and microlearning. They also highlighted the great impact of AI in education, which not only benefits students but also positively affects teachers, educational institutions, and business professionals. The positive effects manifest in several ways, including students being able to receive personalized lessons that help them understand complex concepts; teachers are able to automate assessments; educators are able to analyze student performance and knowledge gaps; educational institutions are able to offer higher quality education through online education; and business professionals are able to improve their skills and search for new knowledge areas.

The capacity of AI tools, including ChatGPT, to support individualized learning and enhance student engagement has been a focal point in recent educational research (Tiwari, 2023). There are numerous AI-powered educational platforms used to perform various tasks such as adaptive and personalized learning, content preparation, proctoring and assessment, online learning, language learning, coding and robotics, tutoring and mentoring, management, and scheduling. Each platform and tool possesses its own distinct features. For example, ALEKS (Assessment and Learning in Knowledge Spaces) is an AI-based learning and assessment

system (under adaptive and personalized platform) which is used to assess knowledge and suggest learning paths to students (<https://www.aleks.com>); Rev is an AI tool (under the content preparation platform) used in transcription using automated audio-to-text and it is able to transcribe lecture transcripts into study materials (<https://www.rev.com>); Neo Exam is an AI-driven assessment platform (under proctoring and assessment platform) which is used to conduct online examination securely without human interaction and automatically grade students. Neo Collab (iamneo.ai) is an AI and analytics-driven programming platform (under coding and robotics platform) that facilitates learning of programming languages for students' for better clarity (<https://iamneo.ai>). However, a critical evaluation of the current literature reveals an evident gap concerning the empirical understanding of students' perceptions and the usage of AI chatbots like ChatGPT, particularly among high school and Institutes of Higher Learning (IHL) students. Previous studies have largely centred on the potential and implementation of AI tools, neglecting the users' perspectives, an aspect crucial for the tools' successful adoption and efficacy (Kokku et al., 2018; Hashim et al., 2022). This limitation underscores the need for more nuanced and comprehensive research in this field, spotlighting a research niche that the present study aims to address.

Literature review

Generative AI: A paradigm shift

The rapid advent of AI and its subfield, Generative AI (GAI), has brought about significant transformations across various sectors, not least in education. As the tools of AI become increasingly sophisticated, they have presented a plethora of opportunities for fundamentally reshaping educational landscapes. Unlike traditional AI, which is primarily used to recognize patterns and make predictions. GAI is capable of generating new content rapidly in response to user input (Murugesan and Cherukuri, 2023). One notable example of GAI tools in education is ChatGPT, a conversational AI developed by OpenAI, which demonstrates remarkable capabilities in enhancing efficiency, improving accuracy, and offering potential cost savings (Deng and Lin, 2022).

The integration of chatbots like ChatGPT into teaching and learning contexts has gained significant attention in the education sector. So far, technology has primarily driven chatbot development, rather than a focused pedagogical approach aimed at supporting student outcomes (Wollny et al., 2021). The technology behind ChatGPT is a deep learning-based natural language processing (NLP) model that uses a transformer architecture. It is specifically based on the GPT (Generative Pre-trained Transformer) family of models, developed by OpenAI. The GPT models use a generative approach to NLP, where the model is trained on a large corpus of text data to predict the next word or sequence of words in a sentence. This training enables the model to generate coherent and contextually appropriate text, given a prompt or starting sentence.

Chatbots translate human languages into digital information by using machine learning and NLP. There are two common methods in developing a chatbot – retrieval and generative methods. Retrieval-based systems are limited to pre-defined responses, whereas generative-based methods can generate new dialogue based on extensive conversational training data. Many industries are using chatbots to provide more efficient or personalized services to their customers. For example, hospitals employ chatbots to offer personalized answers to patients. Medical staff also use chatbots for patient check-in, aiming to reduce human error. Marketing agencies leverage chatbots to tailor offers more effectively to customers based on their profile data and life events captured via social media. In the banking industry, chatbots are employed to address FAQ queries from customers, covering topics like bank fund transfers and credit card balances. Additionally, the travel industry utilizes chatbots, such as AVA to answer FAQs and provide flight status updates, including flight cancellations. These chatbots can also offer recommendations for new travel routes based on travelers' travel history and preferences. Most of the chatbots are using retrieval-based methods. However, ChatGPT employs generative-based methods and is currently under research.

An example of retrieval-based chatbot is Mitsuku. Mitsuku is a chatbot that acts like a virtual friend you can talk to at any time. It contains over 300,000 predefined response patterns and a knowledge base of over 3000 objects. Mitsuku can construct songs and poems based on its knowledge base (<https://chat.kuki.ai/createaccount>). A limitation of retrieval-based systems is their inability to generate new responses, being constrained to pre-defined ones. However, ChatGPT is a GAI using generative methods to generate new dialogue based on large amounts of conversational training data. Generative chatbots use combination of supervised learning, unsupervised learning, reinforcement learning and adversarial learning of multi-step training. Researchers use ChatGPT to search for relevant journals and perform systematic review automation (Wang et al., 2023). Wang

et al. (2023) used ChatGPT in generating effective Boolean queries for systematic review search. Boolean queries provide reproducibility, explainability and the benefits of filtering articles not relevant to the research topic (MacFarlane et al., 2022). According to the study conducted by Wang et al. (2023), ChatGPT has proven to be a valuable tool for researchers, especially when conducting quick systematic reviews.

However, while these advances are promising, the integration of AI and GAI tools into education also poses various problems. From concerns about overreliance on technology to questions about the ability of these tools to meet diverse learning needs, these issues highlight the need to integrate AI cautiously and carefully into the educational environment (Bostrom 2014). Bostrom (2014) primarily focuses on the potential uses and challenges associated with the development of superintelligent AI systems. Although Bostrom (2014) primarily discusses the broader ethical implications of AI, some of his concerns are relevant when considering the use of AI to meet diverse learning needs. There are ethical questions (such as bias or exclusion) about how AI systems are programmed to address diverse learning needs. Ensuring fairness, avoiding bias and respecting cultural and individual differences are vital considerations in AI integration in education. In addition, other ethical considerations such as privacy, potential bias in AI algorithms, and a lack of transparency also pose significant challenges to the widespread adoption of such tools (AlAfnan et al., 2023).

Emergence and Impact of AI in Education

The infusion of AI into education began as a response to the growing need for efficiency and personalization in educational contexts (Holstein et al., 2019). Over time, these technologies have developed, enhancing the quality of education by facilitating more personalized and adaptive learning environments (Cherukuri et al., 2021). For instance, platforms like ALEKS use AI to assess students' knowledge levels and suggest learning paths tailored to their specific needs by leveraging advanced algorithms and machine learning techniques (Falmagne et al., 2013; www.aleks.com). Similar platforms have also been developed for diverse areas like language learning, coding, and robotics.

Given these developments, it is evident that AI will have a lasting impact on education. The continuous advancements in this field promise more refined, innovative, and impactful applications in the coming years. The influence of AI in education will likely extend beyond improving existing systems to creating new pedagogical approaches and learning environments. As more sophisticated AI models emerge, they are expected to enhance the personalization of education, making learning more adaptive to individual needs and capabilities. More accurate assessment tools, advanced content creation aids, and efficient administrative tools are anticipated (Luckin et al., 2016). Additionally, the advent of GAI is expected to revolutionize interaction models between students and digital learning platforms, potentially transforming the education landscape. The following sections will further explore the shifts in educational paradigms, particularly those instigated by GAI and platforms like ChatGPT.

The Importance of Student Perceptions

The success of AI applications in education significantly relies on how students perceive and interact with these technologies. Students' attitudes towards AI can influence their engagement with AI-powered tools and, consequently, the effectiveness of these tools in enhancing learning outcomes (Davis, 1989). Moreover, students' perceptions can provide valuable feedback to us as educators, guiding how we promote and support the use of AI tools. For instance, the application of AI tools in areas such as research, data analysis, and writing can influence institutional policies. Additionally, students' views on data privacy issues associated with AI use are crucial in shaping practices that safeguard student data. Similarly, students' experiences can provide insights into whether AI tools are being used equitably and inclusively, addressing concerns about potential biases in AI-powered educational tools (Eynon, 2020). Therefore, taking into account students' perspectives in the adoption and application of AI in education forms a critical part of the sociotechnical narrative. Taking students' perspectives into account ensures that the design and use of AI tools are student-centric, ethically sound, and educationally effective. Hence, understanding and responding to these perceptions is instrumental in realizing the full potential of AI in education, while also mitigating its associated challenges

Methodology

A quantitative research design is employed to investigate high school and IHL students' perceptions, attitudes, and ethical concerns towards the AI chatbot, ChatGPT, in academic environments. Employing a cross-sectional

survey provides a snapshot of diverse perceptions across a population sample, aligning with the study's objectives (Creswell, 2014). To accomplish the research objectives, which involve exploring students' attitudes, perceptions and ethical concerns regarding AI integration in learning environments, this study employs a cross-sectional survey methodology. Purposive sampling informed the selection of participants, specifically targeting students with direct experience interacting with ChatGPT in their academic settings. The sample comprised 60 students drawn from diverse geographical regions and educational backgrounds, ensuring broad representation of perspectives. The rationale for the sample size stems from the need for statistical power in quantitative research, facilitating the capture of various viewpoints and the uncovering of nuanced insights (Bryman, 2016).

Data was collected through an anonymous online survey designed by the research team. The survey encompassed both closed-ended questions, which allowed for straightforward binary data collection, and open-ended questions, comprising three open-ended questions. The survey underwent validation by two experts with experience in higher education. The survey questions were organized into four distinct sections:

1. **Demographics:** this section aimed to gather information about participants' age, gender, educational level and geographical location.
2. **Perceptions and Usage of ChatGPT:** In this part, the researchers delved into students' attitudes, perceived benefits and limitations, and specific application scenarios of ChatGPT in their educational settings.
3. **Ethical Implications:** This section examines considerations related to AI chatbots. Special attention was given to concerns about data privacy, potential biases in AI algorithms and the need for transparency in AI systems.
4. **Open-ended questions:** To invite participants to share additional insights and recount their unique experiences with ChatGPT. This section is intended for respondents to provide open-ended or qualitative responses. The three questions are: (i) Please share your experience/attitude towards ChatGPT for learning (in terms of usefulness, ease of use, ease of learning and satisfaction); (ii) List the most negative aspect(s) or reaction (s) to the use of ChatGPT; and (iii) List the most positive aspect(s) or reaction (s) to the use of ChatGPT.

Data analysis encompasses descriptive and inferential statistics to provide a deep analysis of the collected data. Responses to open-ended questions are subjected to thematic analysis, aligning with recognized qualitative analysis methods (Braun & Clarke, 2006). The study strictly adheres to ethical guidelines for research involving human participants, including informed consent, confidentiality, and secure data storage. In this study, subjects participated voluntarily, providing oral consent. Once consent was obtained, participants were provided with an online survey link or QR code. The study also considers potential biases, such as selection bias from the purposive sampling method and social desirability bias in responses. To mitigate potential biases, the study presents its purpose without influencing participant responses. It also ensures anonymity to encourage honest feedback (Resnik, 2015). To address potential purposive sampling bias in this study, participants from various geographical locations are included, thus enhancing the diversity of the selection criteria. In summary, this methodology focuses on understanding students' experiences with ChatGPT. It aims to offer valuable insights for future AI integration in education, specifically in areas of user engagement and ethics.

Survey results and findings

The study sample comprised 60 students who had previous experience using ChatGPT with 23% being female and 77% being male. Participants were selected from a private university in Kuala Lumpur, Malaysia and a high school in Perak, Malaysia. The age range of the participants was between 18 to 29 years of age. Of the participants, 68% were from urban areas, and 32% were from suburban areas. Most participants (58%) were pre-university or A-Level holders, and 20% were O Level equivalent holders. As shown in Figure 1, the usage of ChatGPT is presented by location. Among students living in cities, 58.3% of them had used ChatGPT to seek answers to theory-based questions, while only 8.3% of students from suburban areas had done so. In comparison, among participants who had not used ChatGPT for theory-based queries, 23.3% hailed from suburban areas, while 10% came from cities. These results suggest that suburban participants had less exposure to the latest AI technology than those from cities.

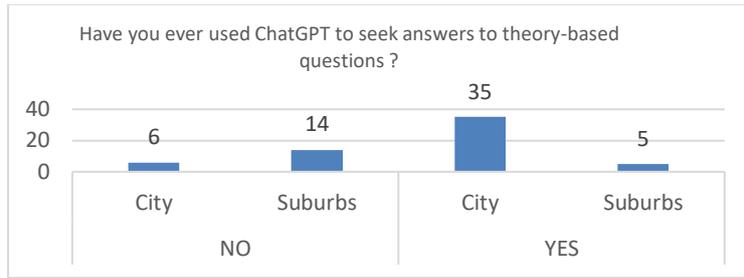


Figure 1. Usage of ChatGPT by location

Google’s search engine is a widely used tool for finding information on the internet through keyword searches. In contrast, ChatGPT is a language model that generates text based on a given prompts or questions. Although both tools serve different purposes and functionalities, some students perceive ChatGPT as a potential replacement for Google’s search engine in the future. The results indicate that 28.3% of participants aged 20-25 think that ChatGPT may replace Google’s search engine, while the majority of participants, particularly those aged 15-19 and 20-24, are uncertain (answering “may be”). Participants who are certain that ChatGPT will not replace Google search engine are in the minority (< 7%). This suggests that participants may not fully understand the differences between ChatGPT and search engines in terms of their purposes and functionalities regardless of their age group. However, AlAfnan et al. (2022) argue that search engines provide billions of results at a time, which lack accuracy and/or relevance. But ChatGPT provides responses within a user-defined word limit. Refer to Figure 2 for the breakdown of participants’ perceptions of ChatGPT replacing Google search engine by age.

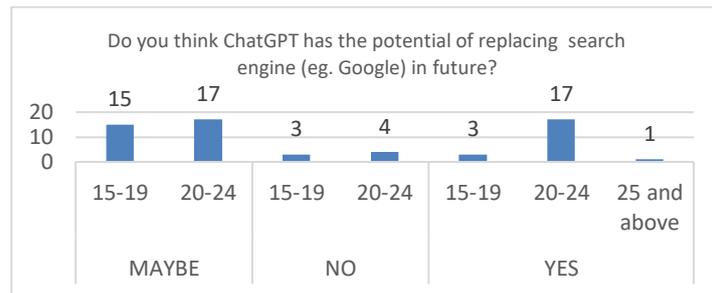


Figure 2. Perception of ChatGPT as a replacement for Google search engine, categorised by age.

However, it appears that the participants are more aware of the potential impact of AI tools like ChatGPT in various industries, particularly those respondents from cities. This may also be due to the fact that many of the participants belong to Generation Y or Z, who have learned about AI tools are changing the education landscape through various channels including social media. This is supported by the responses given in the open-ended questions, where 53.3% of the respondents from cities agreed that ChatGPT has the potential to revolutionize many industries, including research and academics, as well as 20% from the suburbs. In contrast, less than 5% of the respondents in cities disagreed. The majority of the respondents were uncertain about ChatGPT’s potential regardless of their location. However, it’s important to note that the results do not provide conclusive evidence for this. Further research is needed to substantiate this observation. Refer to Figure 3 for perception of ChatGPT as revolutionary tool by location.

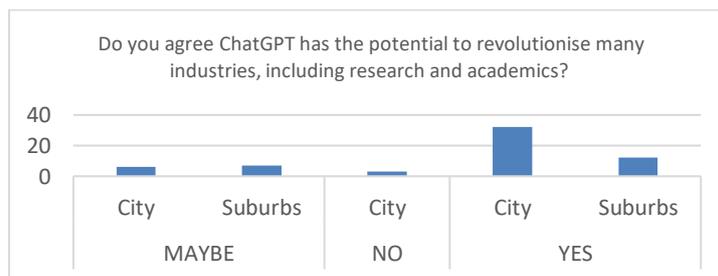


Figure 3. Perception of ChatGPT as revolutionary tool by location

In addition to the benefits demonstrated in Figure 1, Figure 2 and Figure 3, the drawbacks of ChatGPT regarding its impact on student learning, specifically accuracy, unlearning and declining interest in class are outlined in this section. Figure 4 illustrates the perception of accuracy of ChatGPT, revealing that 36% of respondents aged 20-24 and 23.3% of respondents aged 15-19 are uncertain about the accuracy of ChatGPT's input provided to students. Despite ChatGPT being trained on a vast dataset of conversations and incorporating the ChatGPT improved Accuracy (CGA) model (Deng and Lin, 2022), as well as leveraging the powerful pre-trained NLP model by OpenAI, over 50% of respondents expressed uncertainty about its ability to generate appropriate responses.

ChatGPT is an AI chat tool or chatbot that allows users to ask questions after creating an account on OpenAI. According to AlAfnan et al. (2022), if students need direct answers on specific points, they can consider ChatGPT as a reliable option. However, users should exercise caution in relying excessive on ChatGPT's responses for official assessment submissions. In Figure 5, the perception of ChatGPT leading to unlearning is presented. It reveals that 40% of respondents from cities and suburbs agreed that unethical use of ChatGPT, such as copying its responses for assignments or reports, leads to unlearning. This unethical usage is believed to contribute to a decline in critical thinking skills, serving as a drawback of ChatGPT. However, it's important to note that 10% of respondents disagreed with this statement. Instructors encouraged students to use ChatGPT for formal and informal learning, such as defining a concept or gathering insights. However, its use should be discouraged for writing assessments or official submissions (AlAfnan et al., 2022). It is tempting for students to avoid working diligently on their assessments, seeking last-minute assistance from ChatGPT instead. AlAfnan et al. (2022) discovered that reliance on AI tools for academic submissions contributes to a decrease in cognitive skills, academic engagement, and professional development among students.

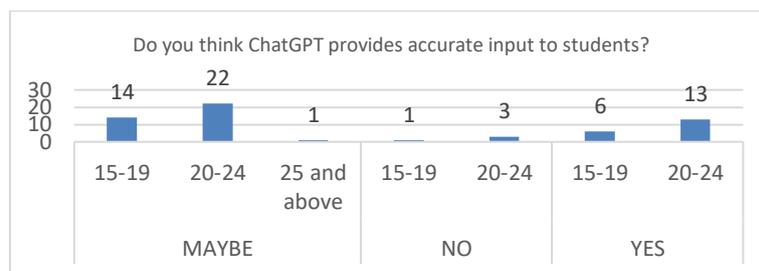


Figure 4. Perception of ChatGPT accuracy to students by age

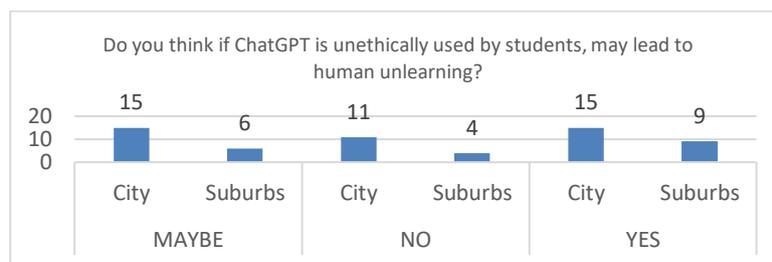


Figure 5. Perception of ChatGPT leading to unlearning by location

Among the respondents, 38.3% from urban areas and 11.7% from suburban areas agreed that using ChatGPT to generate assignments could lead to a decrease in their interest in classes as they become dependent on AI. On the other hand, 20% of the respondents disagreed with this statement, while 30% were uncertain. This indicates a stronger dependency on AI tools for assignment completion among urban students, which may consequently diminish their overall class engagement. This group of respondents is mainly studying at a university. This is also shown in Figure 7 that approximately 50% of the respondents in age group 20-24 tempted to use ChatGPT in generating assignments. However, a minority, approximately 1% from both cities and suburbs, are not tempted to use it for generating assignments, whereas 23% expressed uncertainty.

There are ethical implications surrounding concerns about academic integrity and the potential misuse of technologies, as well as the issues of over-reliance on AI, which can have an impact on students' ability to develop critical thinking and problem-solving skills. Figure 8 presents the perception of using ChatGPT as unethical, categorized by age. It is notable that a third of participants aged 20-24, and a negligible percentage

from other age groups, do not consider the use of ChatGPT for academic submissions to be unethical. Furthermore, 47% of participants expressed uncertainty regarding the ethical implications of using ChatGPT.

The fourth section of the questionnaire allocated space for participants to share their thoughts and experiences with ChatGPT in an open-ended format, which allowed for a richer exploration of their perspectives. Overall, the participants emphasize the usefulness, versatility, and benefits of ChatGPT particularly in terms of gaining insights, improving understanding, generating ideas, and saving time in various academic and non-academic contexts. The respondents also raised cautionary points regarding ChatGPT’s accuracy, potential limitations in answering certain types of questions, server accessibility, narrowing knowledge range, margin of error in research, and the need to formulate questions effectively. There are also concerns about overdependence on ChatGPT and its coverage of less trendy topics. Furthermore, the respondents emphasize the user-friendly nature of ChatGPT, its ability to provide clear explanations, and aid in understanding, assistance in grammar and sentence construction, and its convenient accessibility for students, including the availability of a free version without the need for payment. Finally, the respondents highlight the belief in the potential of ChatGPT to improve through refinement and development, its impact on work and industries, the importance of user feedback and continuous learning in its development process, and the potential for deployment across industries in the near future.

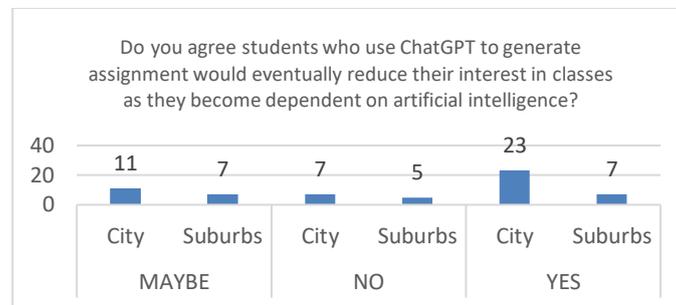


Figure 6. Perception of declining interest in class due to using ChatGPT as by location

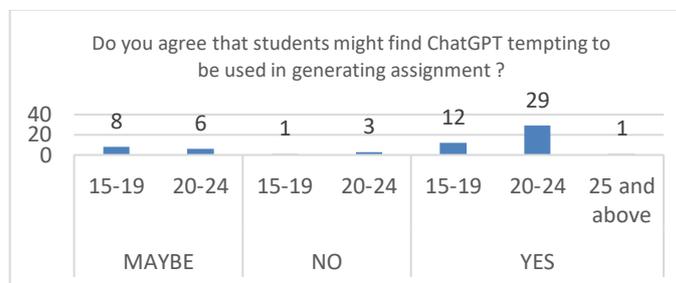


Figure 7. Perception of using ChatGPT for assignment by age

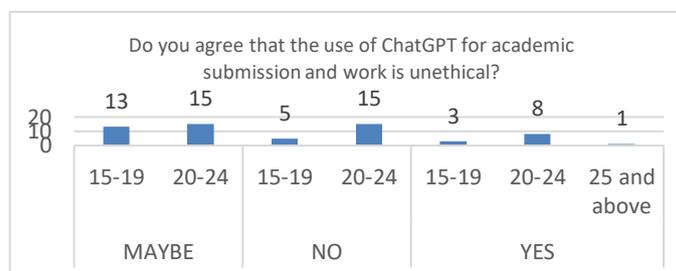


Figure 8. Perception of using ChatGPT as unethical by age

A key insight derived from the study was the pronounced digital divide between urban and suburban students. This finding aligns with the discourse on digital inequalities in educational settings (Seale, 2013) and underscores the need for further research into potential interventions to enhance digital inclusivity. Another significant finding concerned students' uncertainty about the potential of AI tools like ChatGPT to replace

conventional search engines such as Google. It points to a potential need for better education and clarification about the differences between AI tools and traditional search engines (Guzman and Lewis, 2020). A critical issue revealed by the study is the uncertainty among participants about ChatGPT's reliability and accuracy. More than half of the respondents expressed doubt about whether ChatGPT provides accurate and reliable input, which indicates a need for continued improvements in AI accuracy. Furthermore, ethical considerations around the misuse of AI tools were prominent in the study findings. Additionally, the study findings revealed mixed views about the paraphrasing capabilities of ChatGPT and its implications for academic integrity. Although no specific data was provided about the level of agreement or disagreement with this claim, it is nonetheless a critical area for further exploration. The findings show the transformative potential of ChatGPT was another area where perceptions diverged. This finding suggests possible knowledge gaps among students about the transformative capabilities of AI (Nelles and Vorley, 2021). Finally, on the question of using ChatGPT for academic submissions, the study findings were again mixed. This finding, along with the acknowledgement that students might be tempted to use ChatGPT for assignments, underscores the need for clear and definitive ethical guidelines governing the use of AI in academic contexts (Kolb, 2020).

The open-ended responses offered further depth and richness to the study findings. Many students acknowledged the versatility and benefits of ChatGPT across a range of academic and non-academic contexts. However, they also expressed concerns about the accuracy, potential over-reliance, and limitations of ChatGPT. Despite these concerns, the overall sentiment towards ChatGPT was positive, with many students expressing optimism about its future refinement and widespread application (Xu, 2020).

Conclusion

In conclusion, this investigation provides crucial data on how students perceive and interact with ChatGPT in an educational context. This study goes beyond simply assessing attitudes, additionally highlighting the essential elements of digital inclusivity, ethical standards, and the need for ongoing enhancements in the precision of AI tools like ChatGPT. Students generally expressed an optimistic view towards ChatGPT, but the findings simultaneously bring to the fore potential challenges. These include the misuse of AI tools, over-reliance on technology for educational tasks, and gaps in understanding concerning the limitations and capabilities of AI in educational settings. Given these discoveries, future research could constructively aim to develop robust strategies focused on improving digital inclusivity. The goal is to make sure that the benefits of AI advancements are not limited to specific student groups but are equitably distributed across the entire student body. Such inclusivity could manifest in varied educational settings, from primary schools to Institutes of Higher Learning. Furthermore, the integration of AI technologies like ChatGPT into education raises important questions about ethical standards and protocols. These ethical considerations are not just theoretical but have immediate practical implications. For instance, future research could explore the establishment of guidelines and protocols for the academic application of AI tools like ChatGPT, which would serve to govern their usage effectively. The findings underscore the need for ongoing, systematic assessments of the reliability of AI tools in educational contexts. This scrutiny isn't a one-off task but should be ongoing, adapting to technological changes and improvements. The refinement of developmental techniques in creating and maintaining these tools should take precedence in future studies and developments.

In summary, this study offers invaluable directional insights for subsequent investigations. These could focus on exploiting the beneficial aspects of AI in education, while also ensuring that ethical considerations and potential pitfalls are not overlooked. Thus, the research sets the stage for more nuanced, comprehensive work in the field, addressing the multi-faceted implications of AI in education. The potential for AI to enhance education is considerable; however, actualising this requires a focus on ethical considerations and inclusive approaches.

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Note: All published papers are refereed, having undergone a double-blind peer-review process.

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