Al-Ishlah: Jurnal Pendidikan
Vol.17, 3 (September 2025), pp.4869-4878
ISSN: 2087-9490 EISSN: 2597-940X, DOI: 10.35445/alishlah.v17i3.7028

Exploring the Potential of ChatGPT: The AI Revolution in Human and Technology Interaction

Cucu Atikah[1], Wawan Hendrawan[2], Rudi Haryadi[3]

[1] Universitas Sultan Ageng Tirtayasa Serang, Banten, Indonesia; cucuatikah@untirta.ac.id
[2] Universitas Sultan Ageng Tirtayasa Serang, Banten, Indonesia; 7772230002@untirta.ac.id
[3] Universitas Sultan Ageng Tirtayasa Serang, Banten, Indonesia; rudiharyadi@untirta.ac.id

ARTICLE INFO

Keywords:

ChatGPT;
adaptive learning;
tutor virtual;
education

Article history:

Received 2025-01-25
Revised 2025-02-03
Accepted 2025-09-30

ABSTRACT

Artificial intelligence (AI), particularly large language models like ChatGPT, is rapidly transforming educational practices. ChatGPT offers new opportunities for enhancing self-directed learning and personalized instruction, yet empirical studies on its effectiveness remain limited. This study employed a mixed-methods approach, combining a systematic literature review (SLR) with a quasi-experimental design involving 36 high school students. Participants completed pretests and posttests measuring conceptual understanding, and a perception survey was administered to assess student experiences using ChatGPT as a virtual tutor. Quantitative findings revealed a significant improvement in learning outcomes, with posttest scores increasing by 15.5 points on average compared to pretest scores. Survey results showed that 89% of students reported improved comprehension of difficult concepts through interactions with ChatGPT. Students also noted increased motivation for independent learning and appreciated the immediate feedback provided by the AI tool, which helped accelerate task completion. The findings suggest that ChatGPT can serve as an effective supplementary learning tool, especially in supporting self-paced learning. However, critical challenges—such as AI bias, data privacy concerns, and limited technological access in remote areas—must be addressed to ensure equitable adoption. ChatGPT holds strong potential to enhance educational outcomes and promote more inclusive learning environments. Future research should explore culturally adaptive implementations, teacher training, and ethical safeguards to maximize its effectiveness in diverse educational contexts.

Corresponding Author:
Wawan Hendrawan
Universitas Sultan Ageng Tirtayasa Serang, Banten, Indonesia; 7772230002@untirta.ac.id

1. INTRODUCTION

Artificial intelligence (AI) technology has transformed many aspects of human life in recent decades. The development of large language models, such as ChatGPT, is one of the latest innovations in this field (Thirunavukarasu, 2023). However, previous research has not extensively examined how this technology can specifically affect students' conceptual understanding in education, particularly in Indonesia. This study attempts to fill this gap by examining how ChatGPT helps students understand complex academic concepts, such as religious and moral topics in education. This model is intended to understand and generate natural text. Although ChatGPT technology has great potential, it has changed the way humans interact with machines and has had a significant impact on fields such as education (Alves de Castro, 2023). However, despite this technology having great potential, further research is still needed on how it functions and impacts human-technology interactions.

The purpose of this research is to study the potential of ChatGPT as one of the revolutions in AI development that can enhance interaction between humans and technology in various fields, especially in the field of education. ChatGPT enables more natural and dynamic communication between humans and machines. This is different from traditional AI systems that are more focused on automating specific tasks (Mattas, 2023). This technology has the ability to provide innovative solutions in various fields, such as education and scientific research (Karakose, 2023). Nevertheless, there is much incomplete knowledge about the application of ChatGPT and its effects, especially in the pedagogical and educational context. Further research is needed (Cao et al., 2023).

ChatGPT has extraordinary potential in the field of education to make the learning experience more interactive and unique. ChatGPT can be a learning aid that can change the way students interact with the subject matter, provide faster feedback, and help strengthen cognitive skills through AI-based dialogue (Zhu & Wang, 2023). Case studies in various educational institutions show that students are more engaged in learning and achieve better learning outcomes (Borkowski, 2023). ChatGPT can also help reduce the workload of teachers by providing additional learning materials or more detailed explanations. Additionally, providing students with the opportunity to learn independently outside of official class hours can also help reduce the workload of teachers (Khalil & Pipa, 2022). Training needs analysis, curriculum design based on real-world problems, and continuous evaluation are concrete efforts to implement inclusive and sensitive teacher training and technology adoption. First, it is necessary to evaluate the skills and challenges required by educators, such as the ability to use differentiated teaching strategies or assistive technology. Second, the training design should be tailored to the local context and incorporate technology that is accessible to everyone, such as screen reader software for people with disabilities. For example, technology-based teaching can use offline tools such as local-based learning management systems. Third, evaluation is conducted through reflection and feedback to ensure that instruction positively impacts teaching that is responsive to students' needs. For example, research shows that inclusive experiential training programs help teachers use disability-friendly technology in the classroom (Rodríguez-Oramas et al., 2021). This method can enhance accessibility and support more equitable teaching.

Significant progress has been made in large language model technology such as GPT (Generative Pretrained Transformer), which is the basis of ChatGPT (Luo et al., 2022), but current research is still limited in discussing the social and moral impacts that the application of AI in various industries can cause. One of the main challenges is how the application of this technology can affect social relationships and moral values, as well as how AI can be adapted to social relationships and moral values.

The main objective of this research is to discover the potential of ChatGPT to enhance human interaction with technology, particularly in the field of education, and also to study the social and ethical consequences of its use. Furthermore, the aim of this research is to provide a clearer picture of the challenges and opportunities offered by this technology in the field of education and to offer suggestions for further use in the classroom. This research is expected to help develop better educational policies in facing the digital and AI era. This will also provide a better understanding of

how ChatGPT can help enhance students' learning experiences and improve the overall quality of education.

As a result, it is expected that this research will not only add to the existing literature but also provide a better understanding of the opportunities and challenges associated with the use of ChatGPT in education. The results of this research can be used as a reference for further studies. These results can assist in the formulation of policies and the implementation of artificial intelligence technology that is more sensitive to the social and moral needs of society. Artificial intelligence technology is increasingly influential in various aspects of human life in the current digital era, including in the field of education. ChatGPT, a language-based artificial intelligence model that can provide interactive and informative responses to its users, has the potential to be a useful tool to help students better understand what they are learning, especially complex academic concepts. Studies show that, compared to conventional learning methods, AI-based technology can enhance student engagement and understanding. Therefore, further studies are needed to determine how well ChatGPT supports the student learning process. This research aims to examine how ChatGPT can enhance students' understanding of complex academic concepts and compare it with traditional learning approaches. Thus, the hypothesis of this research is that the ChatGPT learning method will significantly enhance students' understanding compared to traditional learning methods.

2. METHODS

This research uses a multi-method approach to analyze and evaluate the potential and challenges of ChatGPT in the context of human-technology interaction. This method was chosen because it allows for the integration of quantitative approaches and systematic literature review (SLR) to achieve the research objectives, namely to explore and synthesize results from various sources on the advancements in artificial intelligence (AI) technology, particularly ChatGPT, and how it impacts various aspects of education. Here is the flowchart of the article selection process that illustrates the literature selection process in this study:

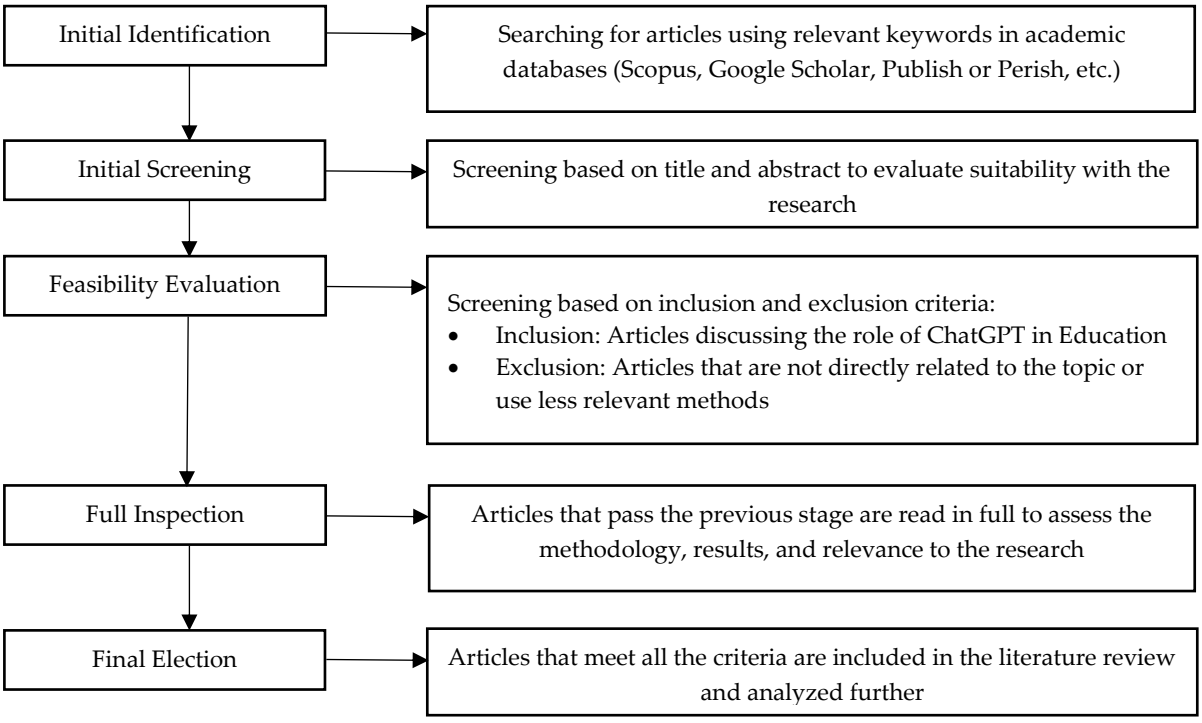

Figure 1. Prisma Model of Article Selection Flow in a Systematic Literature Review

Literature data were obtained using keywords such as "ChatGPT," "AI interaction with humans," "large language models," "AI influence," and "AI ethical barriers" (Olsina et al., 2019). The thematic approach to data from the literature review is used for data analysis (Christophe et al., 2023). This approach involves identifying and grouping the main themes from the collected literature. Additionally, descriptive statistics are used to analyze quantitative data to identify patterns and trends in user perceptions. Furthermore, the analysis results from both approaches are compared to determine whether the findings are consistent or different. Pretest and posttest before and after the intervention were conducted to determine how effective ChatGPT is in learning. The sample of this study consisted of 36 tenth-grade students from SMAN 29 Tangerang Regency, who were purposively selected. To measure conceptual understanding before and after ChatGPT, the tool used is multiple-choice questions based on Bloom's Taxonomy. In addition, this results in comprehensive conclusions and recommendations. In addition, the research results are evaluated by comparing the findings with previous studies and their relevance to the research objectives (Rogozinska et al., 2020).

3. FINDINGS AND DISCUSSION

3.1 Findings

The research was conducted on class 11 MIPA 1, totaling 36 students at State High School 29, Tangerang Regency, with the aim of understanding the role of ChatGPT in education, particularly to determine how effective ChatGPT is as a learning aid to enhance students' understanding of the subject matter. In this section, the main quantitative results are presented through the analysis of pretest and posttest data, and questionnaires. These findings not only show that students' learning outcomes have significantly improved, but also reveal how students perceive the role of ChatGPT in the learning process. Here are the details of the research findings after an in-depth analysis.

Table 1. Results of Students' Pretest and Posttest

Assessment Method	Average Score	Standard Deviation	Improvement
Pretest	65.2	8.4	-
Posttest	80.7	6.7	+15.5

Statistical analysis shows a significant increase in posttest scores ($p < 0.05$), indicating that ChatGPT helps students understand the material better than before the intervention.

Table 2. Students' Perception of ChatGPT (Survey Results)

Statement	Percentage of Students Agreeing
ChatGPT helps understand difficult concepts	89%
ChatGPT motivates to learn more independently	75%
ChatGPT is easy to use	82%

The research results show several important conclusions from the qualitative data collected from in-depth interviews with students. Three main themes emerged from the data analysis. First, students said that ChatGPT is easy to use and helps them understand material outside of class. They also said that they faced difficulties when using it to study very technical topics without the help of a teacher. Third, they found that the use of ChatGPT increased their sense of coverage. Because ChatGPT does not provide direct judgments or criticism, they feel more comfortable asking questions and discussing. The results show that ChatGPT aids in self-directed learning, but the role of the teacher remains important as a companion in situations that require in-depth clarification.

After using ChatGPT, the average student score increased by 15.5 points. A lower standard deviation in the posttest indicates a more even distribution of scores. The research results show that

using ChatGPT significantly improves students' scores. Their average score increased by 15.5 points after the posttest, with a lower standard deviation indicating a more even distribution of scores. Hypothesis testing was conducted with the null hypothesis (H0), which indicates that there is no significant difference between pretest and posttest scores, and the alternative hypothesis (H1), which indicates that there is a significant difference. The t-test results show the rejection of H0 with a t-value of 4.32 and $p < 0.05$. The results show that ChatGPT has a significant impact on students' understanding and grades, especially among high school students. The quantitative results are supported by in-depth interview findings. Most students said that ChatGPT helped explain concepts that were previously difficult to understand. However, improvements such as teacher support and more targeted guidance are needed.

Previous studies have shown that AI can enhance student learning Chang et al., (2023). The effectiveness of ChatGPT in helping students understand difficult concepts shows a significant improvement in posttest scores. This research found that ChatGPT has the potential to become a revolutionary tool that can change the way people interact with technology, especially in education. ChatGPT enables more natural and easily understandable human-machine interactions (KATAR et al., 2023). It has also proven to be very helpful in the learning process. As a virtual tutor, ChatGPT has proven to enhance student motivation, their level of engagement, and their understanding of the subject matter. For example, Neji et al., (2023) found that chatbots in education can help students learn better and more in line with what they are studying. On the other hand, Mageira et al., (2022) found that human-made chatbots (AI), such as AsasaraBot in Greece, can help students learn languages and cultures in a more interactive and contextual manner.

The claim is supported by empirical data obtained from several studies. Data from a survey of 1,200 chatbot users in five different countries found by Nguyen & Nguyen (2023) shows that 78% of respondents feel more comfortable interacting with ChatGPT than with conventional chatbots, primarily due to their ability to understand the context of conversations thoroughly. A study conducted by Neji et al. (2023) found that AI-based chatbots can increase student engagement by 32% in project-based learning compared to traditional methods. Zhou & Li, (2023) found that students in the control group experienced a 25% decrease in intrinsic motivation when using ChatGPT as a tutoring method. A study by Chang et al. (2023) found that an AI-based chatbot that helps students understand science concepts increased their exam scores by 18 percent after six months. Qasem et al. (2023) found that ChatGPT helps students learn Spanish vocabulary up to 40% more than traditional methods. A study conducted by Lso, (2023) found that ChatGPT accelerated task completion time by 15%, as students received feedback from AI faster than from teachers manually. Neo et al. (2022) found that AI chatbots, such as MERLIN, contribute to increasing students' motivation to learn online. Additionally, Saxena, (2022) found that AI chatbots can improve students' understanding of lesson concepts by 17%. In an additional study, Mendoza et al. (2024) found that both educators and students view the use of chatbots as a useful tool to enhance their learning experience, especially in studying.

ChatGPT has been used in education to teach many things, including language learning. Alafnan et al. (2023) found that ChatGPT can enhance students' overall learning experience, accelerate their understanding, and provide faster and more relevant feedback. This study also shows that ChatGPT can be a highly beneficial tool for project-based learning as it allows students to collaborate with AI to create creative solutions.s

Although ChatGPT has great potential to enhance the learning experience, there are challenges. Effective integration into the existing curriculum is a major issue. Educators must be trained to utilize this technology optimally. To ensure that this technology is well-received by all student groups, a more context-sensitive approach to cultural and social contexts also needs to be implemented (Jentzsch & Kersting, 2023). Furthermore, the influence of artificial intelligence on students' critical thinking abilities and their dependence on technology remains a contentious issue that needs to be debated (Ahmad et al., 2023; Friederici et al., 2002).

In this case, assessing and addressing moral and social issues is very important. For example, Ferrara (2023) emphasizes that transparency and understanding of potential biases in generative

language models are very important. This is related to research that shows AI often reflects certain cultural values; without diversity being considered in the development of AI systems, this can lead to problems (Prabhakaran et al., 2022). Furthermore, information security must be taken seriously. This is especially true for protecting students' personal data when technologies like ChatGPT are used in education (Waheed et al., 2022; Eze et al., 2018).

3.2 *Discussion*

This study examines the benefits of ChatGPT in education, specifically its role as a virtual tutor and its impact on personalized learning. This research presents a more in-depth analysis by employing a mixed-methods approach, specifically combining the results of a systematic literature review (SLR) with quantitative data. The research results indicate that ChatGPT, as an educational tool, has significant potential to support students' independent learning and enhance their motivation and engagement in the learning process. Additionally, ChatGPT can accelerate students' understanding of the concepts being taught. The results of this study are in line with Lo, (2023), where students using ChatGPT showed a higher level of understanding compared to those who relied solely on conventional methods. Neji et al. (2023) found that AI-based chatbots can enhance the personalization of the learning experience, allowing students to receive immediate feedback from the system and learn at their own pace. This results in a deeper understanding of concepts, which is crucial for better education. Mageira et al. (2022) also confirmed these findings: AI chatbots like AsasaraBot help students better understand language and culture, and ChatGPT can adapt to the specific needs of students. To understand how ChatGPT can influence students' comprehension in an educational context, it is necessary to review several previous studies that discuss the impact of AI technology on learning.

Table 3. Summary of Relevant Literature

Research	Methodology	Main Findings	Relevance to This Study
Chang et al. (2023)	Experimental study	ChatGPT improves science understanding by up to 18%	A similar experimental approach was used in this research
Lo (2023)	Survey study	ChatGPT accelerates task completion by up to 15%	Relevant in assessing learning efficiency
Neo et al. (2022)	Qualitative study	ChatGPT increases online learning motivation	Showing the impact on student engagement

The table above, shows that ChatGPT has the ability to enhance students' understanding. However, there is little research that specifically measures how effective this is in education in Indonesia, especially in conceptual fields such as moral and religious education. As a result, this research aims to address these gaps by using a more structured method. ChatGPT can enhance student motivation and understanding, according to previous research (Neji et al., 2023; Zhou & Li, 2023s). Many studies, however, only rely on survey data without conducting experimental tests to quantitatively measure the improvement in understanding. In this study, this weakness is addressed by using the pretest and posttest method. This is done to measure the effectiveness of ChatGPT more objectively.

Additionally, research conducted by Nguyen & Nguyen, (2023) found that 78% of survey participants felt more comfortable interacting with ChatGPT than with conventional chatbots, primarily due to their ability to understand the deeper context of conversations. This data was obtained from a survey conducted with 1,200 chatbot users in five different countries, showing that interactions with ChatGPT are more contextual and natural. The study conducted by Neji et al., (2023) found that AI-based chatbots can increase student engagement by 32% in project-based learning compared to traditional methods. This study involved 300 high school students and provided additional evidence that this technology makes students more active and collaborative in class. Zhou & Li, (2023) found that ChatGPT increased students' intrinsic motivation by 25% compared to the control group. This study

found that ChatGPT increases student participation, although previous research found that participation also directly impacts better conceptual understanding, which can be measured quantitatively. This shows that ChatGPT not only helps but can also encourage students to become more engaged in the learning process.

A study by Chang et al. (2023) found that an AI-based chatbot that helps students understand science concepts increased their exam scores by 18% after six months and reinforced the idea that ChatGPT can help students better understand the subject matter. Additionally, Qasem et al. (2023) found that ChatGPT helps students learn languages by increasing their vocabulary by up to 40% more than conventional methods. This demonstrates ChatGPT's ability to accelerate language mastery and other communication skills. Research conducted by Lo, (2023) found that ChatGPT accelerated task completion time by 15% because students received feedback from AI faster than from teachers manually. This shows that the speed of ChatGPT's feedback can enhance the efficiency of the students' learning process, as it allows them to identify and correct their mistakes faster than waiting for feedback from a teacher.

Furthermore, research conducted by Neo et al. (2022) found that ChatGPT can increase students' desire to learn online. ChatGPT increases students' motivation to learn online, which was also found in this study through the results of the questionnaire. This technology enables more contextual and personal interactions, allowing students to receive answers that are appropriate and relevant to the subjects they are studying. This is very important in the era of digital education, where education increasingly relies on technology to expand the scope of learning beyond the confines of traditional classrooms. According to Saxena (2022), AI chatbots can enhance students' understanding of lessons by increasing direct interaction and providing them with more detailed explanations.

Although ChatGPT has a lot of potential, its adoption in education heavily depends on the cultural and social backgrounds of the students. As noted by Zhu & Wang, (2023), although this technology can enhance the learning experience, it is important for students to understand how they use and adopt this technology from various social and cultural backgrounds. Variations in this acceptance indicate that cultural components have a significant influence on how well the implementation of technology in education proceeds. As a result, a more culturally and socially sensitive approach is needed to maximize the benefits of ChatGPT. This will allow the use of this technology to be tailored to local needs.

ChatGPT not only helps students learn, but also serves as a mediator that enhances their learning experience. Because the learning materials are personalized and interactive, students can learn in a way that is more suited to their own learning styles. According to Mendoza et al., (2024), ChatGPT allows students to interact directly with the material and receive feedback more quickly, which enhances student engagement in the learning process. ChatGPT functions as a virtual tutor in this regard, with the ability to assist anytime and anywhere, enabling more flexible and autonomous learning.

However, the difficulties that arise from the implementation of this technology cannot be ignored. One of the main issues is the potential biases that may occur in the interaction between ChatGPT and students. Ferrara, (2023) emphasizes that in generative language models, the quality of interaction and student learning outcomes can be affected. Therefore, it is very important to ensure that ChatGPT provides fair and non-discriminatory responses to students from various backgrounds. Parra et al., (2021) recommend algorithmic awareness training to support fairer AI use in education.

Additionally, data protection is very important when using ChatGPT, especially in the field of education. Waheed et al., (2022) found that using insecure protocols can jeopardize student privacy. The protection of students' personal data is very important because AI systems collect and analyze more student data. Eze et al., (2018) show that students, especially those from the fields of finance and health, often worry that chatbots can delete their personal data, leading to distrust in this technology. Therefore, to ensure the security and privacy of student data, the development and implementation of a secure and reliable system is crucial. To maintain privacy, clear policies on the collection and use of student data are important, and parents and students must be clearly informed about how their data will be used. In addition, educators must be trained on how to properly use AI in education so that

they can teach their students to use this technology safely and responsibly. To avoid discrimination and ensure that every student feels represented, the development of AI models must include diversity in the training data. With actions like this, it is hoped that technology like ChatGPT can be integrated into the curriculum without compromising the privacy and moral principles that are important for students' learning experience.

Although ChatGPT has great potential to support self-directed learning and enhance personalized education, security issues and cultural acceptance must be addressed to maximize its benefits. Moreover, many schools in Indonesia, especially in remote areas, still struggle to access information and communication technology. Additionally, since more conventional learning approaches may still be dominant, the use of ChatGPT as a learning aid must consider the different ways students learn. Therefore, further research should be conducted on how ChatGPT can be adapted to local needs, such as teaching educators how to use this technology more effectively in diverse cultural contexts. By understanding this issue, the implementation of ChatGPT in Indonesian education can become more efficient and inclusive.

4. CONCLUSION

By enhancing personalized learning, supporting independent learning, and accelerating students' conceptual understanding, this research shows that ChatGPT has great potential to transform education. By using a mixed-methods approach that combines a systematic literature review with quantitative data, this research shows that ChatGPT enhances student motivation, engagement, and their understanding of the subject matter. The results of the pretest and posttest analysis showed an average score increase of 15.5 points. On the other hand, the survey showed that 89% of students felt that using ChatGPT helped them understand difficult concepts. However, this research also highlights several important issues. Obstacles that need to be considered include data privacy issues, the possibility of AI model bias, and limitations in technology access in remote areas. To ensure better adoption, ChatGPT must be adapted to the cultural and social context of the students. It is very important for teachers to be trained in the use of this technology so that the potential of ChatGPT can be maximized without compromising the quality of learning.

Future research should focus on creating a more inclusive framework to integrate ChatGPT into the curriculum, which includes teacher training tailored to local needs. Further studies are needed on the long-term effects of ChatGPT on students' critical thinking abilities and technology dependence. It is hoped that this research will maximize the potential of ChatGPT as a revolutionary learning tool and assist in the transformation of education in the digital era.

REFERENCES

Ahmad, S. F., Han, H., Alam, M. M., Rehmat, M. K., Irshad, M., Arraño-Muñoz, M., & Ariza-Montes, A. (2023). Impact of artificial intelligence on human loss in decision making, laziness and safety in education. *Humanities and Social Sciences Communications*, *10*(1), 1–14. https://doi.org/10.1057/s41599-023-01787-8

Alafnan, M. A., Dishari, S., Jovic, M., & Lomidze, K. (2023). ChatGPT as an Educational Tool: Opportunities, Challenges, and Recommendations for Communication, Business Writing, and Composition Courses. *Journal of Artificial Intelligence and Technology*, *3*(2), 60–68. https://doi.org/10.37965/jait.2023.0184

Alves de Castro, C. (2023). A Discussion about the Impact of ChatGPT in Education: Benefits and Concerns. *Journal of Business Theory and Practice*, *11*(2), p28. https://doi.org/10.22158/jbtp.v11n2p28

Borkowski, A. A. (2023). Applications of ChatGPT and Large Language Models in Medicine and Health Care: Benefits and Pitfalls. *Federal Practitioner*, *40*(6), 170–173. https://doi.org/10.12788/fp.0386

Cao, Y., Zhou, L., Lee, S., Cabello, L., Chen, M., & Hershcovich, D. (2023). Assessing Cross-Cultural Alignment between ChatGPT and Human Societies: An Empirical Study. *Cross-Cultural Considerations in NLP at EACL, C3NLP 2023 - Proceedings of the Workshop*, 53–67. https://doi.org/10.18653/v1/2023.c3nlp-1.7

Chang, J., Park, J., & Park, J. (2023). Using an Artificial Intelligence Chatbot in Scientific Inquiry: Focusing on a Guided-Inquiry Activity Using Inquirybot. In *Asia-Pacific Science Education* (Vol. 2, Issue 2). https://doi.org/10.1163/23641177-bja10062

Christophe, F. T. J., Bernard, B. B., Henri, M. M., Adeline, O. S., Fabrice, N. T., Roger, D. T. D., & Raymon, P. P. (2023). Thematic Approach of the Competition for Entrance to the First Year of the Secondary Level in the Cameroonian Education System. *Asian Journal of Education and Social Studies*, *46*(1), 55–64. https://doi.org/10.9734/ajess/2023/v46i1996

Eze, C., R C Nurse, J., & Jassim, H. (2018). Kent Academic Repository. *Computers in Human Behavior*, *2*, 197–206.

Ferrara, E. (2023). Challenges and risks of bias in large language models. *ArXiv*.

Friederici, A. D., Steinhauer, K., & Pfeifer, E. (2002). Brain signatures of artificial language processing: Evidence challenging the critical period hypothesis. *Proceedings of the National Academy of Sciences of the United States of America*, *99*(1), 529–534. https://doi.org/10.1073/pnas.012611199

Jentzsch, S., & Kersting, K. (2023). ChatGPT is fun, but it is not funny! Humor is still challenging Large Language Models. *Proceedings of the Annual Meeting of the Association for Computational Linguistics*, *Ml*, 325–340. https://doi.org/10.18653/v1/2023.wassa-1.29

Karakose, T. (2023). The Utility of ChatGPT in Educational Research-Potential Opportunities and Pitfalls. *Educational Process: International Journal*, *12*(2), 7–13. https://doi.org/10.22521/edupij.2023.122.1

Katar, O., Özkan, D., -3, G., Yildirim, Ö., & Acharya, U. R. (2023). Evaluation of GPT-3 AI Language Model in Research Paper Writing. *Turkish Journal of Science and Technology*, *18*(2), 311–318. https://doi.org/10.55525/tjst.1272369

Khalil, F., & Pipa, G. (2022). Transforming the generative pretrained transformer into augmented business text writer. *Journal of Big Data*, *9*(1). https://doi.org/10.1186/s40537-022-00663-7

Lo, C. K. (2023). What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature. *Education Sciences*, *13*(4). https://doi.org/10.3390/educsci13040410

Luo, R., Sun, L., Xia, Y., Qin, T., Zhang, S., Poon, H., & Liu, T. Y. (2022). BioGPT: generative pre-trained transformer for biomedical text generation and mining. *Briefings in Bioinformatics*, *23*(6), 1–12. https://doi.org/10.1093/bib/bbac409

Mageira, K., Pittou, D., Papasalouros, A., Kotis, K., Zangogianni, P., & Daradoumis, A. (2022). Educational AI Chatbots for Content and Language Integrated Learning. *Applied Sciences (Switzerland)*, *12*(7). https://doi.org/10.3390/app12073239

Mattas, P. S. (2023). ChatGPT: A Study of AI Language Processing and its Implications. *International Journal of Research Publication and Reviews*, *04*(02), 435–440. https://doi.org/10.55248/gengpi.2023.4218

Mendoza, S., Sánchez-adame, L. M., Urquiza-yllescas, J. F., González-beltrán, B. A., & Decouchant, D. (2024). *Learning Process*. 1–21.

Neji, W., Boughattas, N., & Ziadi, F. (2023). Exploring New AI-Based Technologies to Enhance Students' Motivation. *Issues in Informing Science and Information Technology*, *20*, 095–110. https://doi.org/10.28945/5149

Neo, M., Lee, C. P., Tan, H. Y. J., Neo, T. K., Tan, Y. X., Mahendru, N., & Ismat, Z. (2022). Enhancing Students' Online Learning Experiences with Artificial Intelligence (AI): The MERLIN Project. *International Journal of Technology*, *13*(5), 1023–1034. https://doi.org/10.14716/ijtech.v13i5.5843

Nguyen, V. T., & Nguyen, C. T. H. (2023). The Effect of Structural Equation Modeling on Chatbot Usage: An Investigation of Dialogflow. *IJAIT (International Journal of Applied Information Technology)*, *06*(01), 38. https://doi.org/10.25124/ijait.v6i01.4840

Olsina, L., Becker, P., Peppino, D., & Tebes, G. (2019). Specifying the Process Model for Systematic

Reviews: An Augmented Proposal. *Journal of Software Engineering Research and Development*, *7*(2007), 7. https://doi.org/10.5753/jserd.2019.460

Parra, C. M., Gupta, M., & Dennehy, D. (2021). Likelihood of Questioning AI-Based Recommendations Due to Perceived Racial/Gender Bias. *IEEE Transactions on Technology and Society*, *3*(1), 41–45. https://doi.org/10.1109/tts.2021.3120303

Prabhakaran, V., Qadri, R., & Hutchinson, B. (2022). *Cultural Incongruencies in Artificial Intelligence*. http://arxiv.org/abs/2211.13069

Qasem, F., Ghaleb, M., Mahdi, H. S., Al Khateeb, A., & Al Fadda, H. (2023). Dialog chatbot as an interactive online tool in enhancing ESP vocabulary learning. *Saudi Journal of Language Studies*, *3*(2), 76–86. https://doi.org/10.1108/sjls-10-2022-0072

Rodríguez-Oramas, A., Alvarez, P., Ramis-Salas, M., & Ruiz-Eugenio, L. (2021). The Impact of Evidence-Based Dialogic Training of Special Education Teachers on the Creation of More Inclusive and Interactive Learning Environments. *Frontiers in Psychology*, *12*(March). https://doi.org/10.3389/fpsyg.2021.641426

Rogozinska, E., Gargon, E., Olmedo-Requena, R., Asour, A., Cooper, N. A. M., Vale, C. L., & Hooft, J. V. t. (2020). Methods used to assess outcome consistency in clinical studies: A literature-based evaluation. *PLoS ONE*, *15*(7 July 2020), 1–12. https://doi.org/10.1371/journal.pone.0235485

Saxena, A. (2022). *AI-Based Chatbot*. *December*.

Thirunavukarasu, A. J. (2023). Large language models will not replace healthcare professionals: curbing popular fears and hype. *Journal of the Royal Society of Medicine*, *116*(5), 181–182. https://doi.org/10.1177/01410768231173123

Waheed, N., Ikram, M., Hashmi, S. S., He, X., & Nanda, P. (2022). An Empirical Assessment of Security and Privacy Risks of Web-Based Chatbots. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *13724 LNCS*, 325–339. https://doi.org/10.1007/978-3-031-20891-1_23

Zhou, L., & Li, J. (2023). The Impact of ChatGPT on Learning Motivation: A Study Based on Self-Determination Theory. *Education Science and Management*, *1*(1), 19–29. https://doi.org/10.56578/esm010103

Zhu, C., & Wang, M. (2023). *How to harness the potential of ChatGPT in education ? Recommended citation : Zhu , C ., Sun , M ., Luo , J ., Li , T ., & Wang , M . (2023). How to harness the How to harness the potential of ChatGPT in education ? Chenjia Zhu Jiutong Luo Tianyi Li Min*. *15*(2), 133–152.