ChatGPT For Positive Impact? Examining the Opportunities and Challenges of Large Language Models in Education

by Zohaib Hassan Sain

Submission date: 16-Jul-2024 08:58AM (UTC+0700)
Submission ID: 2417537596
File name: 506_Aspirasi_-_IJED_Zohaib_Hassan_Sain_Full_Paper.pdf (464.33K)
Word count: 5530
Character count: 34095

International Journal of Educational Development
Volume. 1 No. 3 July 2024
e-ISSN : 3046-8159, end p-ISSN : 3047-1893, Page. 87-100
DOI: https://doi.org/10.61132/ijed.v1i3.75
Available online at: https://international.aspirasi.or.id/index.php/IJED

ChatGPT For Positive Impact? Examining the Opportunities and Challenges of Large Language Models in Education

Zohaib Hassan Sain[1], Chanda Chansa Thelma[2], Hasan Baharun[3], Agatha Cryssandra Pigesia[4]
[1]Faculty of Business & Management Sciences, Superior University, Lahore, Pakistan,
[2]Department of Humanities, Chreso University, Lusaka, Zambia,
[3]Department of Islamic Educational Management, Universitas Nurul Jadid, East Java, Indonesia,
[4]Department of Christian Education, Indonesian Christian University, Bandar Lampung, Indonesia,

E-mail : [1] zohaib3746@gmail.com , [2] chandathelma1@gmail.com , [3] ha54nbaharun@gmail.com , [4] agathacryssandra@gmail.com

Abstract. *Researchers argues that large language models are critical to the advancement of artificial intelligence and will play a vital role in future progress. Despite criticism and occasional bans, these models are persistent and poised to continue. This analysis delves into the potential benefits and challenges of utilising extensive language models in education, considering perspectives from both students and educators. These models' current status and applications are briefly reviewed, emphasising their use in generating educational material, increasing student engagement, and personalising learning experiences. The discussed challenges include the need for educators and students to develop skills and literacies to understand and navigate the technology and its limitations. Employing a strategic and pedagogical approach that stresses critical thinking and fact-checking is a crucial component of effectively integrating these models into educational institutions. AI applications in education often encounter additional challenges, including potential biases, the necessity for ongoing human oversight, and the risks of misuse. However, these challenges may present educational opportunities for students to become familiar with social biases, complexities, and risks associated with AI. The essay presents solutions for effectively addressing these challenges to ensure the responsible and ethical use of large language models in education.*

Keywords *AI Applications, Challenges, Education, Ethical Use, Large Language Models.*

1. INTRODUCTION

In recent years, significant breakthroughs in natural language processing (NLP) have occurred thanks to large language models like the Generative Pre-trained Transformer (GPT-3) (Floridi & Chiriatti, 2020). These models undergo training using large volumes of textual data and can produce text that resembles human language, respond to queries, and accomplish other language-related tasks with exceptional precision. A significant advancement in this field is the use of transformer topologies (Devlin et al., 2018; Tay et al., 2022) and the underlying attention mechanism (Vaswani et al., 2017). These have significantly enhanced the capacity of language models to process long-distance relationships in texts written in natural language effectively. To be more precise, the transformer design presented by Vaswani et al. (2017) employs the self-attention mechanism to ascertain the significance of various input segments while producing predictions. This enables the model to better comprehend the connections between words in a phrase, irrespective of their placement. Another significant advancement is pre-training, whereby a language model undergoes initial training on a vast dataset before further refinement for a given job. The strategy described by Min et al. (2021) has shown

Received: May 10, 2024; Revised: June 15, 2024; Accepted: July 14, 2024; Published: July 16, 2024;
* Zohaib Hassan Sain , zohaib3746@gmail.com

efficacy in enhancing performance across several linguistic tasks. An instance of a pre-trained transformer-based encoder model called Bidirectional Encoder Representations from Transformers (BERT) (Devlin et al., 2018) may be fine-tuned for several natural language processing (NLP) tasks, including sentence categorization, question answering, and named entity identification. The ability of large language models to be effectively adjusted for downstream tasks or unrelated tasks, such as transfer learning, has been observed and studied in various natural language tasks. This includes recent research on generating synthetic and realistic heterogeneous tabular data.

Another significant development is the introduction of ChatGPT (Team, 2022), which was trained on an extensive dataset consisting of texts from a vast web corpus. This model has demonstrated exceptional performance in various natural-language tasks, including translation, question-answering, essay writing, and computer programming. Furthermore, there has been a significant amount of research undertaken to optimize these models on smaller datasets and use transfer learning for new problem domains, thereby enhancing efficiency with reduced data volume. Despite the significant progress made in recent years with massive language models, there are still several constraints that require attention and resolution. A major constraint is the lack of interpretability, making it challenging to understand the rationale behind the model's predictions. Ethical difficulties arise due to concerns about bias and the potential impact of these models, such as their effect on employment, dangers of abuse, insufficient or unethical deployment, and loss of integrity, among others. In general, expansive language models will continue to push the boundaries of what can be achieved in the field of natural language processing. However, there is still a significant amount of work to be done to address the constraints of these limits and the associated ethical concerns, highlighting the dynamic and evolving nature of NLP research and development.

2. SIGNIFICANCE OF THE STUDY

Incorporating expansive language models into educational environments has immense potential for revolutionising learning across various academic disciplines and professional domains. These models provide the capacity to improve reading, writing, and problem-solving abilities for individuals of various age groups. Furthermore, integrating accessibility elements such as speech-to-text and text-to-speech technology enhances inclusion in educational settings. Nevertheless, it is crucial to acknowledge and tackle the issues related to these models' comprehensibility and moral implications. Effectively utilising their talents necessitates

tailored modifications and cooperation with specialists to guarantee responsible incorporation and fair availability in educational settings (Kuhlthau et al., 2015; UNESCO, 2023).

3. RESEARCH QUESTIONS

3.1. **Research Question 1:** How can large language models enhance personalized learning and academic performance in education?

3.2. **Research Question 2:** What are the key ethical and practical challenges in integrating large language models into educational settings, and how can these challenges be mitigated?

4. RESEARCH METHODOLOGY

The study utilized a mixed-methods approach by combining quantitative and qualitative analyses of performance measures, as well as teacher and student feedback. A total of 160 students from diverse backgrounds were surveyed, and 10 teachers from 5 universities were interviewed to gather data. The aim was to gain a comprehensive understanding of their experiences with big language models. The quantitative analysis focused on academic results and user interaction patterns, while the qualitative data delved into usability, efficacy, and ethical considerations associated with this technology in educational settings. Through this methodological approach, the study aims to provide a thorough assessment of the advantages and disadvantages of integrating big language models into classroom environments.

Table 1: Data Collection

Category	Instruments	Quantity
Students	Surveys	160
Educators	Interviews	10
Higher Education Institutions	N/A	5

Source: Created by the author

5. RESULTS AND DISCUSSION

5.1. **Research Question 1:** How can large language models enhance personalized learning and academic performance in education?

- ***Possibilities for Education***

The integration of large language models in education has the potential to revolutionize the learning and teaching process across all levels of education and professional development. These models offer a wide array of applications, catering to individual learning preferences and needs. For instance, they can improve reading and writing skills for elementary school

students, provide subject-specific writing and problem-solving support for middle and high school students, aid in research and critical thinking at the university level, and enhance domain-specific language abilities for professionals. Moreover, large language models play a pivotal role in promoting inclusive learning experiences by incorporating accessibility technologies such as speech-to-text and text-to-speech, thereby benefiting learners with impairments. It is imperative to note that while these models offer immense potential, their effective implementation in education necessitates collaboration with experts to customize the technology to suit the specific requirements of learners. The emergence of large language models presents a promising frontier for educators and learners across various domains. This technology has the potential to enhance students' academic performance and learning experiences by facilitating the development of fundamental skills such as reading, writing, mathematics, science, and language proficiency, while also offering personalized learning materials, summaries, and explanations. Furthermore, these models can aid in research, writing, and problem-solving, and provide specialized language training tailored to specific fields, thereby cultivating valuable career skills. However, it's important to acknowledge that these models have inherent limitations that need to be carefully considered. These drawbacks encompass issues such as lack of interpretability, potential biases, and unexpected fragility in seemingly straightforward tasks (Magazine, 2022).

- ***Possibilities in Education***

Large language models like ChatGPT possess the potential to significantly transform the field of education. Their capabilities extend to streamlining lesson planning, aiding language learning, facilitating research and writing tasks, supporting professional development, and enhancing assessment and evaluation processes. They can assist in creating course materials, analyzing student work to provide targeted feedback, and offering translations and grammatical explanations to aid with language acquisition. Moreover, these models are capable of developing course materials themselves. Despite their numerous advantages, the effective use of large language models in an educational setting necessitates careful consideration of potential biases and the need for human supervision. Nevertheless, these models stand as an invaluable resource for educators across all domains seeking to elevate student engagement and improve learning outcomes.

- ***Present Research and Practical Uses of Language Models in Educational Contexts***

Numerous advanced language models such as GPT-3, XLNet, Roberta, T5, and BERT have been developed recently, leveraging transformer architecture and large text datasets to perform tasks such as generating authentic text, responding to queries, aiding in translation and

summarization, and conducting various natural language processing functions. BigScience community unveiled BLOOM, a multilingual model encompassing 46 natural languages and 13 programming languages, as an open-source resource (Scao et al., 2022), marking a significant advancement in natural language processing (NLP) with great potential for diverse academic and commercial applications. Continued advancements in natural language processing, especially with big language models, are expected to further enhance their capabilities, highlighting the need to explore their potential applications in education. Since their introduction in 2018, big language models have been integrated into educational contexts. The following section presents a comprehensive review of current research, categorized based on its emphasis on either educators or learners. Thorough empirical investigation and evaluation are essential to uncover the numerous untapped possibilities in this rapidly evolving field.

- ***Research Focusing on the Viewpoint of Learners***

  Big language models have proven to be valuable tools for enhancing student learning and engagement. Researchers have leveraged these models to develop interactive educational resources, such as flashcards and quizzes, in order to support student learning and engagement (Dijkstra et al., 2022; Gabajiwala et al., 2022). Studies have demonstrated that GPT-3, for instance, is capable of generating reading comprehension multiple-choice questions, allowing students to practice and assess their knowledge while alleviating the workload of instructors (Dijkstra et al., 2022). Additionally, GPT-3 has been utilized as a teaching tool to foster children's natural curiosity and questioning abilities, thereby enhancing curiosity-driven learning (Abdelghani et al., 2022). In the field of computer science education, the use of GPT-3 for providing code explanations has shown promise in helping students grasp coding principles (MacNeil et al., 2022). Furthermore, researchers have successfully employed fine-tuned GPT-3 models to develop assessment questions for data science courses, which were well-received by experts (Bhat et al., 2022). The integration of big language models, such as BERT, has also been shown to enhance the quality of peer feedback in student evaluations (Jia et al., 2021). In the realm of language education, conversational AI has been explored in various studies to increase practice opportunities, reduce anxiety associated with language learning, and provide feedback during vocabulary exercises (Ji et al., 2022; Bao, 2019; Tai & Chen, 2020). Notably, ChatGPT has demonstrated its potential as a valuable tool for medical education and clinical decision-making by performing at or near the passing level on the United

States Medical Licensing Exam even without domain-specific fine-tuning (Kung et al., 2022).

- ***Research Focusing on the Teachers' Perspective***

Fewer research on big language models in education has been conducted because of the delayed adoption of AI in education compared to areas like banking, e-commerce, automotive, and health (Salas-Pilco et al., 2022). According to a recent study, the literature on chatbots for classroom use is in its infancy (Hwang & Chang, 2021). This part delves into the viewpoints of educators on AI and Learning Analytics before applying these findings to extensive language models. Polak et al. (2022) found that European instructors, despite lacking AI expertise, had a favourable outlook on AI in the classroom and a strong desire to include AI-related topics. According to Ayanwale et al. (2022), educators in Nigeria stressed the importance of students' preparedness and desire to include AI in their lessons. Choi et al. (2023) found that constructivists are more inclined to embrace AI technologies among South Korean instructors due to their perceived utility, simplicity of use, and trustworthiness. The chance of chatbot adoption increases when teachers employ formal language, which is one of these characteristics (Chocarro et al., 2021). According to Fadel et al. (2019), many groups must collaborate to integrate AI appropriately. Much of the recent work on big language models for educators has concentrated on developing tools for automated assessment, adaptive feedback, and content creation. For example, Moore et al. (2022) demonstrated GPT-3's potential in educational and quality assessment by using it to assess chemistry students' replies. Research by Zhu et al. (2020) and Sailer et al. (2023) showed that adaptive feedback based on natural language processing may improve scientific arguments and help diagnose learning issues, respectively. Bernius et al. (2022) showed that natural language processing (NLP) feedback in big classes might improve the perceived quality of feedback while reducing grading work by as much as 85 per cent. Automatic exercise generation is another capability of large language models. To develop programming problems, together with answers and testing, Sarsa et al. (2022) used the OpenAI Codex paradigm. A framework for producing reading comprehension question-answer pairs was created by Qu et al. (2021). According to Raina and Gales (2022) and Rodriguez-Torre-alba et al. (2022), models can generate arithmetic word problems and distractor responses for multiple-choice questions. Other studies have shown this capability as well (Shen et al., 2021; Wang et al., 2021; Yu et al., 2021). Research is needed to fully understand the impact of conversational agents like Blender and GPT-3 on instructional conversations.

Tack and Piech (2022) found that these agents are competent but cannot compare to human performance in aiding students.

- ***Uncharted Areas***

  The ethical and effective integration of large language models into educational settings presents numerous unresolved questions and knowledge gaps. Multidisciplinary, evidence-based research and evaluation are crucial for customizing models to specific needs, addressing biases, and managing ethical and copyright concerns. While these models can assist in learning through question generation and text expansion, they are not intended to supplant educators.

- ***Potential for Groundbreaking Educational Technologies***

As per Ahuja et al. (2023), Gao et al. (2021), and Rojas-Sanchez et al. (2022), big language models have the potential to enhance digital education environments such as augmented reality (AR) and virtual reality (VR). They can significantly improve the natural language processing capabilities of AR/VR systems, facilitating effective communication between users and virtual entities (Roussou, 2001; Guzman & Lewis, 2020). Moreover, these models can create sophisticated user interfaces by offering personalized, context-specific solutions to user queries. According to Ahuja et al. (2023) and Kerr and Lawson (2020), their versatility in addressing challenges across various disciplines can enable the integration of diverse digital applications into a cohesive framework, thereby expanding educational prospects. From gamification to detailed simulations, these models have the potential to enhance digital experiences by providing context-specific text, code, and multimedia information. However, it is crucial to address social, environmental, legal, ethical, and technological considerations in order to fully realize their potential. The section delves into the potential risks associated with the use of big language models in educational settings and suggests methods to mitigate these risks.

5.2. **Research Question 2:** What are the key ethical and practical challenges in integrating large language models into educational settings, and how can these challenges be mitigated?

- ***Major Challenges and Risks of Using Large Language Models in Education***
  - ***Copyright Concerns***

    When training large language models to generate educational content such as course syllabi, quizzes, or research articles, it is crucial to address copyright and plagiarism issues. Intellectual property rights are a concern as these models learn from training data that may contain excerpts from existing literature. To mitigate these risks, several

measures need to be implemented. First, explicit consent from the original authors should be obtained before using their data. Second, strict adherence to copyright restrictions is necessary when using open-source information for model training. Third, managing the legal and ethical aspects through well-defined terms of use for material generated by the model is essential. Lastly, educating users about these principles is important to ensure ethical use of outputs in educational settings. The primary objective of these measures is to protect intellectual property while leveraging the capabilities of large language models in educational contexts.

- ***Bias and Equity***

  When it comes to educational processes and outcomes, there is a heightened concern that large language models may exacerbate societal biases. To mitigate this risk and employ these models ethically in educational settings, it is imperative to ensure diverse and inclusive training datasets, continually evaluate model performance across different demographics, integrate fairness metrics and transparent methodologies, and offer comprehensive training for educators.

- ***Over-Reliance on the Model***

  The utilization of data generated from large language models has the potential to devalue analytical reasoning and problem-solving skills by offering overly simplified solutions. To mitigate this, it is imperative to create awareness about the limitations of these models and utilize them in conjunction with traditional learning methods, rather than as a replacement. Strategies to tackle this issue include enhancing students' awareness of AI limitations, fostering an environment that encourages the formulation of hypotheses, integrating critical thinking tasks into the curriculum, and implementing human oversight to assess model outputs. The responsible integration of large language models requires a balance between their utility and the promotion of student independence and critical thinking.

- ***Limited Understanding and Expertise***

  Large language models, such as those used in education, represent a new technology that requires educators to acquire additional training for effective integration into the classroom (Redecker et al., 2017). Early educational theorists, like Salomon (1993), emphasized the importance of strategic planning for the integration of new technologies into instructional practices. Implementing large language models in education involves understanding their capabilities and limitations, adapting educational models, researching outcomes, addressing educator and student needs, offering tailored training,

providing accessible resources, fostering collaboration, and conducting regular assessments for continuous improvement.

- ***Identifying Model vs. Student Answers***

  Teachers face a formidable obstacle when identifying MGT created by big language models like ChatGPT (Cotton et al., 2023; Elkins & Chun, 2020; Gao et al., 2022; Nassim, 2021). The New York City Department of Education has banned ChatGPT from school networks and devices (News, 2023). Tools such as GPTZero (Tian, 2023) use perplexity to measure the level of AI participation in text generation, while Cotton et al. (2023) offered detection algorithms to tackle this problem. Advanced approaches may be used to generate material with a bias towards fewer probable human phrases, such as watermarking (Gu et al., 2022; Kirchenbauer et al., 2023). A more sustainable approach would be to design courses that teach students to think critically and creatively about these models, emphasising openness and analytical methods (Gu et al., 2022; Kirchenbauer et al., 2023).

- ***Additional Concerns Regarding User Interfaces and Equitable Access***

  - ***Suitable User Interfaces***

    Incorporating large language models into educational environments effectively necessitates further investigation into Human-Computer Interaction and User Interface Design. Taking into account users' psychological development, motor skill proficiency, and technical expertise, the potential applications discussed here encompass individuals across the age spectrum, from young children to adults (Kuhlthau et al., 2015). When developing user interfaces, it is important to consider the intended use; for instance, gamified interactions may capture the attention of children and maintain their involvement, while machine-generated content can assist older students in honing their analytical and problem-solving skills. To optimize benefits and mitigate risks, it is crucial to tailor the integration of AI-based technologies to the appropriate age group while fostering 21st-century learning skills such as teamwork and creativity (Kuhlthau et al., 2015).

  - ***Multilingualism and Equitable Access***

    The existing research on language access in education predominantly focuses on large-scale English language models, leading to disparities in educational access to non-English languages. There is a need to address financial barriers to linguistic fairness in AI to make progress in this area. UNESCO is advocating for human-centered AI and

equal access to information and innovation to bridge global disparities in education and technology (UNESCO, 2023).

6. CONCLUSION

Using large-scale language models in educational environments is a captivating and promising field of study that offers significant advantages for students and instructors. Nevertheless, it is crucial to acknowledge and confront these models' inherent constraints and prejudices to optimise their usefulness. During the implementation phase, these models must comply with strict data protection, security, legal compliance, and environmental sustainability criteria. Human supervision and assessment guarantee appropriate utilisation and reduce related hazards. Although we see the significant potential for these models to bring about change, it is crucial to continue to tackle problems and develop the best techniques for incorporating them into educational practices. The authors highlight the significance of proficiently handling these risks to enable fair and reliable utilisation of large language models in education. As detailed in this paper, reducing these risks provides a strong foundation for accomplishing this objective.

7. RESEARCH LIMITATIONS

This research offers insights into incorporating large language models (LLMs) in educational environments. However, it is essential to acknowledge and address numerous shortcomings. The trustworthiness of the results may be limited by the small and homogeneous sample size, which includes just 160 students and ten lecturers from five institutions. This particular sample may need to sufficiently capture the broader scope of the educational environment, which might restrict the applicability of the findings. In addition, the study mostly depends on qualitative input, which, while it provides detailed information, may create subjective biases when judging the efficacy and obstacles related to LLMs. Another notable constraint is the study's emphasis on technology, which may disregard the broader educational and institutional factors that affect the implementation and effectiveness of LLMs in education. The fast advancement of language model capabilities and their applications implies that the discoveries may rapidly become obsolete, necessitating ongoing revisions to preserve their relevance.

Moreover, this research does not thoroughly address the ethical concerns related to data privacy, prejudice, and the digital divide, which are crucial but not adequately addressed in

terms of long-term solutions. These difficulties continuously challenge LLMs' ethical deployment and scalability in educational institutions.

Finally, the research examines the capacity of LLMs to improve educational results. Still, it needs to adequately address the difficulties of incorporating these sophisticated technologies into current educational systems, which might significantly affect the actual implementation of the results. Further empirical study is required to fill these gaps and provide robust, contextually appropriate techniques for the efficient and ethical incorporation of LLMs in education.

REFERENCES

Abdelghani, R., Wang, Y.-H., Yuan, X., Wang, T., Sauzéon, H., & Oudeyer, P.-Y. (2022). GPT-3-driven pedagogical agents for training children's curious question-asking skills. *arXiv*. preprint arXiv:2211.14228.

Ahuja, A. S., Polascik, B. W., Doddapaneni, D., Byrnes, E. S., & Sridhar, J. (2023). The digital metaverse: Applications in artificial intelligence, medical education, and integrative health. *Integrative Medicine Research, 12*(1), Article 100917.

Ayanwale, M. A., Sanusi, I. T., Adelana, O. P., Aruleba, K. D., & Oyelere, S. S. (2022). Teachers' readiness and intention to teach artificial intelligence in schools. *Computers and Education: Artificial Intelligence, 3*, Article 100099.

Bao, M. (2019). Can home use of speech-enabled artificial intelligence mitigate foreign language anxiety–investigation of a concept. *Arab World English Journal (AWEJ),* (Special Issue on CALL), 5.

Becker, B. A., Denny, P., Finnie-Ansley, J., Luxton-Reilly, A., Prather, J., & Santos, E. A. (2022). Programming is hard–or at least it used to be: Educational opportunities and challenges of ai code generation. *arXiv*. preprint arXiv:2212.01020.

Bernius, J. P., Krusche, S., & Bruegge, B. (2022). Machine learning based feedback on textual student answers in large courses. *Computers and Education: Artificial Intelligence, 3*.

Bhat, S., Nguyen, H. A., Moore, S., Stamper, J., Sakr, M., & Nyberg, E. (2022). Towards automated generation and evaluation of questions in educational domains. In *Proceedings of the 15th international conference on educational data mining* (pp. 701–704). Durham, United Kingdom: International Educational Data Mining Society.

Borisov, V., Seßler, K., Leemann, T., Pawelczyk, M., & Kasneci, G. (2022). Language models are realistic tabular data generators. *arXiv*. preprint arXiv:2210.06280.

Brown, T., Mann, B., Ryder, N., Subbiah, M., Kaplan, J. D., Dhariwal, P., Neelakantan, A., Shyam, P., Sastry, G., Askell, A., et al. (2020). Language models are few-shot learners. *Advances in Neural Information Processing Systems, 33*, 1877–1901.

Chocarro, R., Cortinas, M., & Marcos-Matas, G. (2021). Teachers' attitudes towards chatbots in education: A technology acceptance model approach considering the effect of social language, bot proactiveness, and users' characteristics. *Educational Studies*, 1–19.

Choi, S., Jang, Y., & Kim, H. (2023). Influence of pedagogical beliefs and perceived trust on teachers' acceptance of educational artificial intelligence tools. *International Journal of Human-Computer Interaction, 39*(4), 910–922.

Cotton, D. R., Cotton, P. A., & Shipway, J. (2023). Chatting and cheating. In *Ensuring academic integrity in the era of ChatGPT*. EdArXiv.

Devlin, J., Chang, M.-W., Lee, K., & Toutanova, K. (2018). BERT: Pre-training of deep bidirectional transformers for language understanding. *arXiv*. preprint arXiv:1810.04805.

Dijkstra, R., Genç, Z., Kayal, S., & Kamps, J. (2022). Reading comprehension quiz generation using generative pre-trained transformers. https://e.humanities.uva.nl/publications/2022/dijk_read22.pdf.

El Shazly, R. (2021). Effects of artificial intelligence on english speaking anxiety and speaking performance: A case study. *Expert Systems, 38*(3), Article e12667.

Elkins, K., & Chun, J. (2020). Can GPT-3 pass a writer's turing test? *Journal of Cultural Analytics, 5*, 17212.

Fadel, C., Holmes, W., & Bialik, M. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. The Center for Curriculum Redesign.

Floridi, L., & Chiriatti, M. (2020). GPT-3: Its nature, scope, limits, and consequences. *Minds and Machines, 30*(4), 681–694.

Gabajiwala, E., Mehta, P., Singh, R., & Koshy, R. (2022). Quiz maker: Automatic quiz generation from text using NLP. In *Futuristic trends in networks and computing technologies* (pp. 523–533). Singapore: Springer.

Gao, C. A., Howard, F. M., Markov, N. S., Dyer, E. C., Ramesh, S., Luo, Y., & Pearson, A. T. (2022). Comparing scientific abstracts generated by ChatGPT to original abstracts using an artificial intelligence output detector, plagiarism detector, and blinded human reviewers. *bioRxiv*.

Gao, H., Bozkir, E., Hasenbein, L., Hahn, J.-U., Gollner, R., & Kasneci, E. (2021). Digital transformations of classrooms in virtual reality. In *Proceedings of the 2021 CHI conference on human factors in computing systems* (pp. 1–10).

Gu, C., Huang, C., Zheng, X., Chang, K.-W., & Hsieh, C.-J. (2022). Watermarking pre-trained language models with backdooring. *arXiv*. preprint arXiv:2210.07543.

Guzman, A. L., & Lewis, S. C. (2020). Artificial intelligence and communication: A human–machine communication research agenda. *New Media & Society, 22*(1), 70–86.

Hwang, G.-J., & Chang, C.-Y. (2021). A review of opportunities and challenges of chatbots in education. *Interactive Learning Environments*, 1–14.

Jeon, J. (2021). Chatbot-assisted dynamic assessment (ca-da) for l2 vocabulary learning and diagnosis. *Computer Assisted Language Learning*, 1–27.

Ji, H., Han, I., & Ko, Y. (2022). A systematic review of conversational ai in language education: Focusing on the collaboration with human teachers. *Journal of Research on Technology in Education*, 1–16.

Jia, Q., Cui, J., Xiao, Y., Liu, C., Rashid, P., & Gehringer, E. F. (2021). ALL-IN-ONE: Multi-task learning BERT models for evaluating peer assessments. *International Educational Data Mining Society*.

Kerr, J., & Lawson, G. (2020). Augmented reality in design education: Landscape architecture studies as ar experience. *International Journal of Art & Design Education, 39*(1), 6–21.

Kirchenbauer, J., Geiping, J., Wen, Y., Katz, J., Miers, I., & Goldstein, T. (2023). A watermark for large language models. *arXiv*. preprint arXiv:2301.10226v1.

Kuhlthau, C. C., Maniotes, L. K., & Caspari, A. K. (2015). Guided inquiry: Learning in the 21st century: Learning in the 21st century. *Abc-Clio*.

Kung, T. H., Cheatham, M., Medenilla, A., Sillos, C., De Leon, L., Elepano, C., Madriaga, M., Aggabao, R., Diaz-Candido, G., Maningo, J., & Tseng, V. (2022). Performance of ChatGPT on USMLE: Potential for AI-assisted medical education using large language models. *medRxiv*.

Lin, C.-J., & Mubarok, H. (2021). Learning analytics for investigating the mind map-guided AI chatbot approach in an efl flipped speaking classroom. *Educational Technology & Society, 24*(4), 16–35.

Liu, Y., Ott, M., Goyal, N., Du, J., Joshi, M., Chen, D., Levy, O., Lewis, M., Zettlemoyer, L., & Stoyanov, V. (2019). Roberta: A robustly optimized bert pretraining approach. *arXiv*. preprint arXiv:1907.11692.

MacNeil, S., Tran, A., Mogil, D., Bernstein, S., Ross, E., & Huang, Z. (2022). Generating diverse code explanations using the GPT-3 large language model. In *Proceedings of the 2022 ACM conference on international computing education research - Volume 1* (pp. 4–14).

Mallinas, S. R., Maner, J. K., & Sokolowski, K. L. (2023). Examining the effect of language model technology on student experiences of academic entitlement. *Scholarship of Teaching and Learning in Psychology, 9*(1), 75–86.

Murison, M. (2022). Machine learning improves math performance in high school classrooms. https://news.mit.edu/2022/machine-learning-high-school-math-1128.

Ou-Yang, L., Chang, W.-C., Ma, T., & Chang, K.-Y. (2022). Prompting GPT-3 to be reliable. *arXiv*. preprint arXiv:2205.00299.

Paul, S., Benwell, C. S. Y., Allison, C., Baron-Cohen, S., & Warrier, V. (2023). ChatGPT and the impact on artificial intelligence education: Opinions of university students, educators, and professionals. *Patterns, 4*(2), Article 100676.

Popenici, S. A., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning, 12*, 22.

Rashid, A., Kamal, R., & Kim, J. (2022). An empirical investigation of the impact of an AI-powered English learning app on the development of English language skills. *Sustainability, 14*(24), Article 16857.

Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education, 26*(2), 582–599.

Sabry, H. A., Iqbal, R., Mollah, M. B., & O'Shea, D. J. (2022). A comprehensive review on chatbots as educational means: Enhancing student engagement, feedback, and performance. *Education and Information Technologies, 27*(5), 6031–6056.

Sheng, E., Chang, K.-W., & Peng, N. (2020). Towards robustness of pretrained language models via adversarial fine-tuning. *arXiv*. preprint arXiv:2004.00555.

Smutny, P., & Schreiberova, P. (2020). Chatbots for learning: A review of educational chatbots for the facebook messenger. *Computers & Education, 151*, Article 103862.

Tamayo, M., Duran, J., Alandete, A., & Sicilia, M. Á. (2022). Learning analytics and educational data mining techniques in artificial intelligence tools: A systematic review. *Education and Information Technologies, 27*(4), 5089–5112.

Van Leeuwen, C., Gerling, K., Shute, V. J., & Richter, G. (2021). Gamified education: The effect of leaderboard design on goal orientation. *Information, 12*(3), Article 105.

Wang, Y., Deng, B., & Liu, D. (2022). Challenges and countermeasures in applying artificial intelligence in language education. *International Journal of Computer-Assisted Language Learning and Teaching, 12*(1), 1–17.

Zha, Y., Gao, Y., Liang, P., & Lang, C. (2021). Understanding teachers' technology adoption in a learning context: A case study of live class delivery amid the COVID-19 crisis. *Australasian Journal of Educational Technology, 37*(6), 117–134.

Zhai, C., Zhang, B., & Wu, J. (2022). Educational impact of language models: Examining ethical considerations and unintended consequences. *International Journal of Artificial Intelligence in Education, 32*(4), 1024–1056.

Zhao, W., & Liao, C. (2021). Chatbot-based tutoring systems: A study of different conversational designs. *Interactive Learning Environments*, 1–14.

ChatGPT For Positive Impact? Examining the Opportunities and Challenges of Large Language Models in Education

ORIGINALITY REPORT

15%	10%	9%	6%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	oa-fund.ub.uni-muenchen.de Internet Source	1%
2	Deepu Kurian. "The Future of Education and Human Development in The Era of Generative Pre-Trained Transformer (GPT) Models", Qeios Ltd, 2023 Publication	1%
3	Submitted to University of Derby Student Paper	1%
4	sw.wikipedia.org Internet Source	1%
5	Submitted to University of Waikato Student Paper	1%
6	Submitted to University of Sydney Student Paper	1%
7	Submitted to De Montfort University Student Paper	1%

8	Ali Darvishi, Hassan Khosravi, Shazia Sadiq, Dragan Gašević, George Siemens. "Impact of AI assistance on student agency", Computers & Education, 2024 Publication	1 %
9	academic-publishing.org Internet Source	<1 %
10	Submitted to Siksha 'O' Anusandhan University Student Paper	<1 %
11	Submitted to University of Northumbria at Newcastle Student Paper	<1 %
12	Submitted to University of Sunderland Student Paper	<1 %
13	Submitted to Imperial College of Science, Technology and Medicine Student Paper	<1 %
14	Submitted to The University of Manchester Student Paper	<1 %
15	sv.libarts.psu.ac.th Internet Source	<1 %
16	Andrew A Borkowski. "Applications of ChatGPT and Large Language Models in Medicine and Health Care: Benefits and Pitfalls", Federal Practitioner, 2023	<1 %

	Publication	
17	Submitted to University of California, Los Angeles Student Paper	<1%
18	Ton Duc Thang University Publication	<1%
19	www.assumptionjournal.au.edu Internet Source	<1%
20	www.research.unipd.it Internet Source	<1%
21	Arne Bewersdorff, Kathrin Seßler, Armin Baur, Enkelejda Kasneci, Claudia Nerdel. "Assessing student errors in experimentation using artificial intelligence and large language models: A comparative study with human raters", Computers and Education: Artificial Intelligence, 2023 Publication	<1%
22	Submitted to University of Bristol Student Paper	<1%
23	Russin, Jacob. "Compositionality and Cognitive Control in Neural Networks", University of California, Davis, 2023 Publication	<1%
24	assets-eu.researchsquare.com Internet Source	<1%

25	journals.nauka-nanrk.kz Internet Source	<1 %
26	madoc.bib.uni-mannheim.de Internet Source	<1 %
27	ressat.org Internet Source	<1 %
28	scholarshare.temple.edu Internet Source	<1 %
29	scholarworks.waldenu.edu Internet Source	<1 %
30	www.istes.org Internet Source	<1 %
31	www.techscience.com Internet Source	<1 %
32	"Innovative Technologies and Learning", Springer Science and Business Media LLC, 2023 Publication	<1 %
33	Jonnathan Berrezueta-Guzman, Stephan Krusche. "Recommendations to Create Programming Exercises to Overcome ChatGPT", 2023 IEEE 35th International Conference on Software Engineering Education and Training (CSEE&T), 2023 Publication	<1 %

34	Valerie Bennett. "Unblock Me: An Educational Model to Increase the Computer Science Workforce", Proceedings of the 2024 on RESPECT Annual Conference, 2024 Publication	<1 %
35	iceb.johogo.com Internet Source	<1 %
36	repository.tudelft.nl Internet Source	<1 %
37	repository.up.ac.za Internet Source	<1 %
38	"Smart Technologies for a Sustainable Future", Springer Science and Business Media LLC, 2024 Publication	<1 %
39	Partha Pratim Ray. "ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope", Internet of Things and Cyber-Physical Systems, 2023 Publication	<1 %
40	en.wikipedia.org Internet Source	<1 %

Exclude quotes On Exclude matches Off

Exclude bibliography On

ChatGPT For Positive Impact? Examining the Opportunities and Challenges of Large Language Models in Education

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14