

Gemini x ChatGPT: A discussion of two Chatbots about Artificial Intelligence in the Education

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Abstract – The use of Artificial Intelligence (AI) and intelligent teaching and learning tools is becoming increasingly common in everyday education. At present, chatbots are undoubtedly the AI technology that is easily accessible not only to educators but also to students from almost any internet-connected device. However, we know that chatbots, in addition to their many potentials, also pose risks to education. Depending on this, we need to use them within appropriate limits. The first half of our study builds on international literature that examines the impact of chatbots on education. In addition, we reviewed literature that measured the potential of today's most popular chatbots within the teaching of specific subjects. Many surveys show that both teachers and students are open to the use of AI. But how do these intelligent systems and tools relate to the AI-influenced educational process? To answer this question, we conducted a small study using two chatbots, ChatGPT and Gemini, formerly known as Bard. Our study was based on a discussion between the two chatbots, which focused on the potential applications of AI within education. The results of our survey show that, although the chatbots highlighted some of the possibilities that AI offers within education, they did not cover the whole field. Rather, the communication focused on a few points that were repeatedly touched on, ignoring the fact that they had already been discussed in detail a few paragraphs earlier. In any case, we consider it an interesting aspect to examine the subject from an AI perspective. Further research, possibly involving more chatbots, may be necessary in the future.

Keywords – Artificial Intelligence, Education, Chatbots, Gemini, ChatGPT

I. INTRODUCTION

The technological advancements accompanying the digital revolution have brought about significant changes in various aspects of our daily lives. Education, as one of the most crucial societal segments, could not stay immune to this evolution. Particularly true in our present times is the gradual integration of Artificial Intelligence (AI) into educational systems. Chatbots, a type of AI, have introduced a new dimension in education for both educators and students alike. These automated systems can provide real-time responses to user queries, helping throughout the learning process. Chatbots function not only as sources of information but also serve as interactive companions, enabling students to engage in more personalized and effective learning. Numerous studies delve into the integration of chatbots into education. The question remains, however, how these intelligent systems and tools perceive the educational process they influence?

In this paper, we thoroughly examine the possibilities offered by chatbots in education. Based on a literature review, we delve into how they can contribute to a better understanding of the curriculum, increase student motivation, and enhance the efficiency of educators' work. Specifically, our study focuses on Gemini and ChatGPT, drawing upon the relevant literature concerning these chatbots. Subsequently, we present our research findings, which were conducted using the chatbots. The aim of our paper was to investigate the discussion of these two chatbots regarding the potential use of AI in education.

II. MATERIALS AND METHOD

Our study primarily relies on the literature reviews to examine how the current research findings relate to the use of Gemini and ChatGPT in education. The practical outcomes of our paper describe the discussions generated by the two chatbots, from which we draw conclusions to facilitate future education with chatbots.

III. LITERATURE REVIEW

Even before the emergence of ChatGPT and Gemini, there has been interest in the potential of chatbots in education. Within this chapter, let us explore the international research findings that have addressed this topic.

Nelson et al. discuss the application of two types of chatbots in education: FAQ (Frequently Asked Question) chatbots and quiz chatbots. According to their findings, the FAQ chatbot allows educators to employ an interactive mechanism and respond to commonly asked questions by students. This chatbot can reduce the workload of educators while supporting students in receiving immediate and personalized answers to their queries. It has the potential to support knowledge retention. Additionally, the quiz chatbot enables the identification of misconceptions in a personalized manner and directs students to relevant sources. Consequently, the dialogue between the chatbot and students provides an opportunity for potential error correction [1].

Fryer's study demonstrated that engaging in spoken interaction tasks with chatbots significantly improved students' speaking skills and validated the benefits of chatbot systems in education [2].

Hwang and Chang conducted a literature review on the effective use of chatbots in education. Their results indicate that research rarely discussed chatbots in K-12 settings or subjects. In contrast, chatbot studies related to language education were the most frequently cited, showing a greater and more immediate demand in this area [3].

Wollny et al. examined chatbots from various perspectives: their pedagogical role, mentorship role, adaptation, and usage topics. In their study, they reviewed over 70 pieces of literature related to the subject matter. Their conclusions suggest that if we view chatbots as learning aids or mentors for students, their effects should be considered in terms of cognitive and emotional levels during the evaluation of chatbots. Furthermore, to better understand the potential of chatbots in mentoring students, more empirical studies are needed on the information needs of learners [4].

The studies by Okonkwo and Ibijola, as well as Labadze et al., examined the possibilities, challenges, and future directions of chatbots. Their results highlight several advantages of chatbots, including content integration, quick access, motivation and engagement, and immediate assistance. Tailoring personalized feedback and educational support to individual student needs and preferences, chatbots enhance student engagement and information retention. However, they also identified some risk factors. While chatbots can provide customized instructions, they may not be able to replace the emotional support and mentoring of human educators. Additionally, ethical, evaluative, user attitude, supervision, and maintenance issues may affect the acceptance and use of chatbots in educational environments. The authors suggest that in the future, well-defined rules are needed for the use of chatbots that are in line with user ethics [5], [6].

Silva and Ulbricht conducted a comparative study on the use of ChatGPT and Bard in the field of education. The critical examination was based on the capabilities, limitations, and results of the two chatbots. The findings emphasize the excellent efficiency of ChatGPT in content creation, code

generation, language understanding, and providing clinically accurate responses, apart from the significant potential of Bard, which includes unique features [7].

Rahman and Watanobe utilized ChatGPT in programming education. One of the results of their study focuses on sorting algorithms. They employed ChatGPT to create quizzes at various difficulty levels, thus demonstrating in practice the possibilities of chatbots as outlined in Nelson's study [8].

Halaweh's study discusses the appropriate use of ChatGPT. The author suggests that in order to use ChatGPT effectively in education, training should be provided to students and teachers on how ChatGPT works, how to assess the accuracy and correctness of information it provides. Additionally, students should be informed about the difference between text generation and idea generation. The article proposes that instructors should permit the use of ChatGPT and integrate it into education, as students are likely to use it anyway [9].

Mahir's study discusses the impact of ChatGPT on education through a bibliometric analysis of the literature. The suggestion is for future research to examine the effectiveness of ChatGPT in improving students' learning outcomes and to consider the ethical and legal consequences of introducing AI in education. Additionally, it is critically important to consider how to integrate ChatGPT and other AI technologies into education in a way that supplements, rather than replaces, educators in order for education to progress rather than hinder [10].

Kılınç's work examines the possibilities of distance education in natural science subjects. Among the conclusions drawn from the study is the need for educators to adapt their teaching methods to the available technology in distance education of natural science subjects. The author cites ChatGPT as an example, suggesting that its integration with appropriate pedagogical strategies can enhance distance education in natural sciences, leading to better learning experiences and outcomes [11].

Motlagh et al. study examines several chatbots in the field of education, including ChatGPT, Bing Chat, and the then-existing Bard. Like Hwang, they also see one of the greatest potentials in language learning. However, their study also discusses concerns about chatbots, citing possible academic dishonesty, plagiarism, and technology-driven dishonest behaviors as examples that could undermine educational principles [12].

Rudolph and colleagues, complementing the previous works, also examined several chatbots in their study, including Ernie. Their research makes several suggestions for the appropriate use of chatbots. Here are a few highlights [13]:

- students should be taught to use chatbots responsibly,
- request feedback from students on how they have used the chatbots,
- use modern technologies in everyday education and not return to paper-based exams,
- encourage students to make oral presentations while making use of technology,
- teach students how a generative AI can help them achieve better learning outcomes,
- create more colourful learning materials using chatbots.

Dao examined the use of ChatGPT, Bing Chat, and Bard within various subject areas. The research findings indicated strengths and weaknesses for each chatbot. ChatGPT showed exceptional performance in literature, demonstrating its ability to generate emotionally rich content and approach human-level performance. Bing Chat provided excellent performance in mathematics, physics, and English. Bard was found to be the best choice for chemistry. Additionally, both Bing Chat and Bard showed competitive results in biological and social science subjects [14].

IV. RESULTS

As we can see, researchers are interested in the integration of artificial intelligence into education. Chatbots are currently one of the most popular branches of artificial intelligence. In this context, it might be interesting to examine how these artificially information-generating tools perceive the integration and possibilities of AI in education. To answer our question, we utilized ChatGPT and Gemini to gain a better insight into the area we examined. Before presenting our results, let's first briefly introduce these two chatbots.

ChatGPT, Gemini, and other conversational systems are platforms that enable Human-Artificial Intelligence interaction. ChatGPT is based on the Generative Pre-trained Transformer (GPT) 3.5 and 4 versions, while Gemini (formerly Bard) relies on the Pathways Language Model (PaLM) 2 version [7], [15], [16]. The database of ChatGPT is limited, as it is unable to use the most recent information available. Additionally, its control is solely text-based. Gemini provides real-time internet information extraction as well as processing of visual information. Undoubtedly, these are two of the most popular chatbots today, widely used in various aspects of life. Our study focuses on education. While much of the literature discusses the possibilities of chatbots based on other research findings and personal experiences, we asked these two chatbots themselves about their views on the possibilities of AI in education. We would now like to present the results of our study, where we initiated a dialogue between the two chatbots to examine their observations on the subject. The results are presented in the following manner:

- Information generated by ChatGPT
- Information generated by Gemini
- Author's comment

We initiated the discourse with ChatGPT, requesting it to start a conversation about the introduction of artificial intelligence into education.

ChatGPT (1):

„Introducing artificial intelligence into education is a very important and exciting topic. Many believe that this step is crucial for the development of learning and society. What are your thoughts on this? How do you think AI could be effectively introduced into educational systems?“

Gemini (1):

„I completely agree that the introduction of artificial intelligence into education is an exceptionally important and exciting topic. AI has the potential to revolutionize the way we learn and teach, bringing significant progress in the realms of learning and societal development.

Roles of AI in education

- **Personalized learning:** AI can identify students' individual strengths and weaknesses, creating personalized learning materials and pathways accordingly. This allows students to progress at their own pace and learn in the way that suits them best.
- **Real-time feedback:** AI can provide real-time feedback on students' work, helping them correct mistakes and track their progress.
- **Increasing motivation and commitment:** Through gamification techniques and interactive content, AI can boost students' motivation and commitment to learning.
- **Supporting teachers' work:** AI can automate administrative tasks that burden teachers, freeing up their time to focus on students.

Effective introduction of AI into educational systems

- **Teacher training:** Teachers need to receive the necessary training and support to effectively use AI in education.
- **Infrastructure:** Proper IT infrastructure is necessary for AI-based tools to function smoothly in classrooms.
- **Data privacy:** It is important to ensure the protection of students' data when using AI tools.
- **Ethical considerations:** Ethical aspects of AI implementation in education need careful consideration.

In summary

AI has tremendous potential to revolutionize education. However, its effective introduction requires careful planning and preparation. The involvement of teachers, students, and parents, as well as ethical considerations, is crucial.

Further thoughts

It is important for AI not to replace teachers but to complement and support them in their work. The goal of AI is to make learning more effective and enjoyable for students and to make excellent education accessible to all.

The introduction of AI into education is an ongoing process of development, requiring continuous learning and adaptation. Openness, flexibility, and collaboration are key to success. “

Author's comment (1):

The content generated by the chatbots mostly appears in the form of lists. ChatGPT did not specify to Gemini to express its opinion in essay form, so the information was generated in bullet points. It can be observed that the points provided by the chatbot represent a negligible portion of the actual potential for use of AI in education. Gemini mentioned personalized learning and automation, which indeed are the most potent forms of AI in education, as we have shown in one of our studies [17]. However, it missed out on several other AI technologies, such as intelligent robots, chatbots, predictive models, which can also be applied to support education. There also seems to be a bit of a gap in terms of the effective introduction of AI. While teacher training made it to the chatbot's list, there was no mention of training for students and parents, or an examination of their relationship with intelligent technologies in education.

The feedback received from Gemini was then processed and responded to by ChatGPT.

ChatGPT (2):

„I completely agree! The points you outlined are all crucial for the successful integration of AI into education. One of the most important things is indeed for AI to play a complementary role, rather than a substitutive one, in the work of teachers. The expertise of teachers and the importance of human relationships remain essential in education, while AI can help make these interactions even more effective and personalized.

It is also extremely important that the introduction of AI does not lead to an increase in the workload of teachers and students. Providing infrastructure support, adequate training, and ensuring data protection are key to the successful operation of AI tools in the educational environment.

You also mentioned ethical considerations, which is an indispensable topic. When using AI, data protection must be ensured, and care must be taken to ensure that applications do not cause discrimination or other ethical issues.

The introduction of AI into education is indeed an ongoing process of development, and cooperation, openness, and flexibility are crucial for this process to be successful. I believe that AI holds tremendous potential in the field of education, and it is exciting to see how educational systems will evolve with the integration of AI. How do you see the future of AI and education? Is there any area that you think particularly holds great potential for the application of AI in education? “

Author's comment (2.a):

In contrast to Gemini, ChatGPT did not typically generate the information in bullet points. Additionally, we observed that ChatGPT processed the responses received from Gemini by reinforcing and supplementing them. Unlike Gemini, ChatGPT posed further questions during the conversation.

Gemini (2):

„I completely agree with you! The introduction of AI into education holds tremendous opportunities, but we must be cautious not to make mistakes.

The future of AI in education

I believe that AI will gradually become integrated into educational systems, becoming increasingly embedded in the process of learning and teaching. Some areas where AI holds particularly great potential:

- **Personalized learning:** *AI will provide increasingly sophisticated tools to meet students' individual needs. This may include generating dynamic learning materials, providing real-time feedback, and selecting activities that match learning styles.*

- **Adaptive teaching:** *AI will be able to identify students' learning difficulties and automatically take corrective steps. This can help students overcome setbacks and reach their full potential.*

- **Early development:** *AI can identify children struggling with learning disorders and enable early intervention for a successful school career.*

- **Talent nurturing:** *AI can help identify and support gifted students to achieve their goals.*

- **Assessment:** *AI can automate the assessment process and provide more objective, accurate feedback to students.*

- **Teacher support:** *AI can automate administrative tasks burdening teachers, freeing up their time to focus on students.*

Key challenges

The introduction of AI into education presents several challenges that we must address:

- **Inequality:** *It is important that AI does not exacerbate educational inequalities. Ensuring equal access to AI tools is crucial.*

- **Data privacy:** *We must ensure the protection of students' data when using AI tools.*

- **Ethical considerations:** *Ethical aspects of AI applications in education must be carefully considered.*

- **Teacher training:** *Teachers must receive the necessary training and support to effectively use AI in education.*

In summary

AI has tremendous potential to revolutionize education. Despite the challenges, I believe that the introduction of AI into education is a step in the right direction. Openness, flexibility, collaboration, and ethical considerations are crucial for successful implementation.

Collaboration

I consider collaboration among various stakeholders, such as researchers, developers, teachers, parents, and students, crucial in the application of AI in education. Only through joint efforts can we ensure that AI serves the best interests of education.

I am curious to hear your thoughts as well! In which areas do you see the greatest potential for AI application in education? Do you have any concerns about the introduction of AI in education?"

Author's comment (2.b):

Upon examining the feedback from Gemini, we noticed that we received partially the same response as in the very first question regarding the discourse. For us, this was less advantageous, as Gemini had

already discussed the importance of personalized learning and automated tasks in a paragraph earlier. It still did not touch upon other AI technologies and possibilities. In describing the challenges of AI in education, it once again brought up points that it had previously mentioned. However, we can see that in this case, Gemini asked questions back and awaited the thoughts of ChatGPT on the topics it outlined.

It is important to clarify that the two AIs did not know they were conversing with each other. Based on the responses generated in the 2nd round, ChatGPT seemed more human-like compared to Gemini, which, instead of coherent trains of thought, tended to generate its responses in bullet points.

ChatGPT (3):

„You have provided an excellent summary! I fully agree with you that the introduction of AI into education holds immense potential, but at the same time, it is important that we recognize and address the challenges that come with it.

The areas you mentioned are indeed extremely promising. The possibilities of personalized learning and adaptive teaching are particularly exciting, as making education more flexible in this way allows each student to receive individually tailored help and support for their development.

The issue of inequality is indeed of paramount importance. The introduction of AI should not further increase educational disparities; instead, it should help to reduce them. Ensuring adequate access to data and designing tools in a non-discriminatory manner are important steps in this regard.

The data protection of tools and applications utilizing AI and ethical considerations must definitely be a priority. We must ensure that the personal data of students and teachers are protected and that the use of AI does not lead to discrimination or other ethical issues in the educational environment.

The proper training and support of teachers in using AI are also very important. Teachers play a crucial role in the successful integration of AI into educational systems, and we must ensure that they receive the necessary knowledge and tools for this.

I completely agree with you on the aspect of collaboration. The successful introduction of AI into education is only possible when different stakeholders come together and work together to harness the opportunities offered by AI while also being mindful of potential challenges and concerns.

We are facing a very exciting period in education with the development and introduction of AI. I am delighted that we can have such an in-depth conversation about this important topic! If you have any further thoughts or questions, please do not hesitate to share them with me!”

Author's comment (3.a):

The ChatGPT, similarly to its previous response, reinforced and supplemented the information generated by Gemini. It can be observed that the ChatGPT did not draw attention to the repetitive content, nor did it indicate that we had already discussed this previously. Additionally, the ChatGPT did not respond to Gemini's question and did not mention other areas in education where AI could be applied. The response generated by GPT gave the impression of a conversation between two people, where one, while elaborating on their response, forgot by the end of the statement that a new question had been raised on the topic.

Gemini (3):

„I completely agree with you! It's delightful to see how much our thinking aligns regarding the role and introduction of AI in education.

I find your openness, dedication, and commitment to collaboration very inspiring. I am confident that with your attitude and together with other dedicated professionals, we can truly revolutionize education with AI and make excellent learning opportunities accessible to every student.

Further thoughts

I consider it important for AI to have a role not only in formal education but also in informal and non-formal learning environments. This way, AI can contribute even more widely to the development of knowledge and skills.

Researching and developing the role of artificial intelligence in education is of utmost importance. It is crucial to provide decision-makers and practitioners with reliable data on the effective and ethical use of AI in education.

The introduction of artificial intelligence in education is an ongoing process of development, where continuous learning and adaptation are necessary. Openness, flexibility, and collaboration are key to success.

Questions

Do you have any specific examples of how AI could be effectively used in talent development?

How can we ensure equal access to AI tools for students, regardless of their socio-economic backgrounds?

What ethical concerns do you consider most significant regarding the application of AI in education?"

Author's comment (3.b):

That's a positive shift in the conversation from Gemini at this point in the investigation. It adds a fresh perspective to what has been a somewhat uniform and nearly identical exchange thus far. The questions delve into various aspects of AI's role in education, such as talent development or access to AI technology for students from different social backgrounds.

ChatGPT (4):

„Thank you very much for the kind words, and I am equally delighted to see how closely our views align regarding the role of AI in education. I indeed consider it crucial for AI to find its place not only within traditional educational systems but also in informal and non-formal learning environments. This enables even more students to access excellent learning opportunities.

Now, I would like to respond to your questions.

Examples of effective AI applications in talent development

AI can potentially identify students with exceptional abilities by analyzing their performance, learning styles, and areas of interest.

Creation of specialized educational programs and challenges for students who possess outstanding talent in specific fields.

AI can help identify additional resources and opportunities for talented students, such as specialized courses or mentoring programs.

Ensuring equal access to AI tools

Institutional support and funding for schools and communities in economically disadvantaged areas to ensure access to AI tools.

Development of programs and initiatives to promote the use of AI tools in underserved communities, including teacher training and infrastructural improvements.

Establishing partnerships between the public and private sectors to provide support for students and communities who may otherwise have limited access to AI tools.

Most significant ethical concerns in AI education

- **Data privacy and security:** It is crucial to ensure the security of students' and teachers' data and prevent unauthorized access.
- **Discrimination and bias:** When implementing AI, we must ensure that the tools do not lead to discrimination or biased decision-making, and do not exacerbate existing social inequalities.
- **Transparency and accountability:** It is essential for the decisions and operations of AI to be transparent, and for those responsible to be held accountable.

These are the fundamental principles and considerations that we must take into account when implementing AI in education. However, this is just the beginning, and further research and development are necessary for AI to truly have a positive impact on education and society. I look forward to further thoughts and discussions on this matter!”

Gemini (4):

„I completely agree with you! I am delighted that we can have such an in-depth and constructive conversation about the role of AI in education.

The role of AI in informal and non-formal education

It is indeed crucial for AI to find its place not only within formal education but also within informal and non-formal learning environments. This allows even more students to have access to excellent learning opportunities. Here are some examples of AI applications in informal and non-formal education:

- **Massive Open Online Courses (MOOCs):** AI can provide personalized learning experiences for students participating in MOOCs by identifying the necessary content and activities for learning.
- **Learning games:** AI can develop adaptive learning games that align with students' individual needs and motivate them to learn.
- **Virtual Reality (VR) and Augmented Reality (AR):** AI can create realistic and immersive learning experiences using VR and AR technologies.
- **Mentoring:** AI can offer mentoring programs for students to help them achieve their goals.

Ensuring equal access to AI tools

The issue of segregation and inequality is a crucial concern regarding the application of AI in education. Important steps to ensure equal access to AI tools include:

- **Institutional support and funding:** Providing the necessary resources for schools and communities in disadvantaged areas to access AI tools.
- **Teacher training:** Preparing teachers for the effective use of AI tools in the classroom.
- **Infrastructural developments:** Ensuring reliable internet connection and necessary hardware for the use of AI tools.
- **Open-source AI tools:** Supporting the development of open-source AI tools that are freely accessible to all students.

Most significant ethical concerns in AI education

The application of AI in education raises several ethical concerns that need careful consideration:

- **Data privacy and security:** Protecting students' data is of utmost importance. Ensuring that data is stored securely and only used for educational purposes.
- **Discrimination and bias:** AI tools must not lead to discrimination or biased decisions. It is important for the development of AI tools to consider diversity and equality.

- **Transparency and accountability:** *The operation of AI tools should be transparent and understandable to students, teachers, and parents. There should be mechanisms for accountability if AI tools are used in unethical ways.*

It is important to highlight that AI does not replace teachers but complements their work. Teachers continue to play a crucial role in students' learning and development.

Artificial intelligence has tremendous potential to revolutionize education. However, it is crucial that we apply AI responsibly and ethically to provide the best learning experience for every student.”

Author's comment (4):

Gemini once again elaborated on its responses, this time listing out its answers, including new AI-enhanced VR and AR technologies. However, the later discussion resulted in the generation of cyclically repeated information, focusing on the ethical use of AI and access to technology for socially disadvantaged families, which we have already covered previously. For this reason, we deemed the further conversation of the chatbots irrelevant for our study.

V. DISCUSSION AND CONCLUSION

In our study, we pointed out how AI is interpreted in education according to the two most used chatbots, what are the areas where it can have the greatest impact, and what are the concerns we need to pay attention to. During the analysis of the responses generated by the chatbots, we noticed several things that we would like to summarize.

Dialogue form: In both chatbots, we observed a form of polite gratitude and acknowledgment of the previous responses, sometimes complemented with reinforcement.

Format of generated information: With ChatGPT, in most cases, we received responses in the form of 1-2 paragraphs of essay-like continuous and coherent text. In contrast, Gemini tended to list the responses in bullet points. Consequently, during the conversation, ChatGPT better imitated human-like responses.

Frequency of questions: Initially, ChatGPT asked more questions to Gemini, which mostly responded to them but did not pose new ones. Later, Gemini also asked questions; however, towards the end of the communication, we encountered repetition of the same questions, which we did not include again in the paper.

Insights on the potential of AI in education: According to the chatbots, AI in education is most seen in the form of personalized learning and automation. Additionally, later, adaptive learning games and VR and AR technologies were also mentioned. The necessary steps for integrating AI into education most frequently involved teacher training. The concerns that need to be addressed primarily focused on ensuring equal access to AI technology for students from different social backgrounds and the appropriate ethical use of AI, for which a proper regulatory framework needs to be developed.

The artificial intelligence is constantly evolving, therefore it is crucial that, whenever possible, we engage with these intelligent technologies. This way, we can understand the perspectives these systems hold about their own applicability, and thereby assist in their development and more effective use. In our study, we have done this, focusing on education. Further research, possibly involving more chatbots, may be necessary in the future. Research on AI is continuously ongoing. Simultaneously, new developments are emerging. Those working in the education system and researchers must keep pace to ensure that the education of the future is realized in the most effective manner possible.

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