

Chatgpt Revolutionizes Education: Improves Learning Through Conversational AI

IJIMSR, Vol. 2, No. 2, (2024) 24.2.2.017

Dr. Ajit Samgonda Patil

D.Y. Patil School of Engineering and Management
Kolhapur.

Email: ajitspatil@gmail.com

***Dr. Vinayak Ishwar Pujari**

Department of Computer Application
D.Y. Patil School of Engineering and Management
Kolhapur.

Email: vinayakpujari86@gmail.com

***Corresponding author**

Received 24th May 2024; Accepted 18th June 2024

KEYWORDS: Artificial Intelligence, Learning, Chatbots, ChatGPT, Personalized Education

Chatgpt Revolutionizes Education: Improves Learning Through Conversational AI

Dr. Ajit Samgonda Patil

D.Y. Patil School of Engineering and Management

Kolhapur.

Email: ajitspatil@gmail.com

Dr. Vinayak Ishwar Pujari

Department of Computer Application

D.Y. Patil School of Engineering and Management

Kolhapur.

Email: vinayakpujari86@gmail.com

ABSTRACT

The instructive atmosphere is assumed novel gears by artificial intelligence (AI), which takes the control to transform out-of-date education and knowledge approaches. This article delivers a full examination of artificial intelligence (AI) skills, their likely habits in teaching, and the encounters related with them. We dialog around chatbots and connected procedures that can impersonator human-human communications and generate script that seems humanoid when assumed natural language effort. Current chatbots, such as ChatGPT, have many aids, but their tender in the schoolroom grants important ethical and applied subjects as well. In adding to inspiring accountable and moral usage, the writers expect to proposal valued info on how AI may be positively combined into the instructive situation to advantage both teachers and scholars.

KEYWORDS: Artificial Intelligence, Learning, Chatbots, ChatGPT, Personalized Education

1. INTRODUCTION

A novel age of invention and alteration in numerous corrections, counting teaching, has been carried around by artificial intelligence (AI). Artificial Intelligence (AI) technologies present new gears and claims that could revolutionize conventional approaches to education. AI has a plethora of possible applications in teaching, counting enhancing student engagement, learning outcomes, productivity, and instantaneous response. Personalized learning platforms, automatic score schemes, and intelligent tutoring systems are objective a some of the instructive uses for AI previously in use. These initiatives hold great promise for raising student achievement in the classroom and enabling educators to deliver extra specialized instruction For example, bright teaching schemes might adjust classes to see the requirements of individual scholars by if tailored response and provision. Educators can allocate more time to other

crucial tasks, such as example preparation and scholar assistance, by utilizing automatic marking schemes. Personalized learning platforms have the possible to increase students' inspiration and appointment by if customized learning experiences based on their separate requirements and interests. Even with all of its benefits, participating AI into teaching grants significant ethical and practical tests. These concerns contain the possible for it to aggravate the disparities in education that already exist as well as the biased nature of AI algorithms by design. Furthermore, appropriate training and assistance are required to help teachers successfully integrate AI into their pedagogy.

This study goals to deliver a summary of the literature on artificial intelligence applications in teaching, with a emphasis on chatbots and ChatGPT—progressive AI schemes that can produce answers that resemble those of a human based on natural language models. Practical

and ethical issues near the request of AI in teaching will be covered in addition to the technology's possible advantages. The writers hope to deliver useful info on in what way AI may be positively implemented hooked on the instructive setting to assist teachers and scholars by highlighting important research areas. The writers also hope to add to the continuing conversation on the part of AI in teaching and endorse the moral and accountable application of these skills to progress the processes of teaching and learning.

2. ARTIFICIAL INTELLIGENCE

In modern life, artificial intelligence (AI) is flattering more and more commonplace. The ways in which artificial intelligence (AI) has impacted human life are numerous and include Web-based info admission, bulletin and performing ingesting, individual documentation by investigation schemes, economic marketplace act, peoples getting good expenses, and pedestrian and vehicle navigation. The academic prospects could quickly developed actual as AI develops. It has the power to totally convert a number of social spheres, counting business, health care, and teaching (Alawi, 2023), but what is it exactly? John McCarthy first used the term "artificial intelligence" in 1955 to characterize the ability to program a computer to act in ways that a human would be measured smart. AI, according to Kurzweil (1990), is the practice of making machineries that are talented of ringing out tasks that normally need humanoid intellect. Even though these initial meanings of artificial intelligence are numerous periods old, they offer a helpful home to jump when major the field: is AI really bright, and if not, what distinguishes it? In actuality, artificial intelligence (AI) is not intrinsically intelligent; rather, it possesses the capability to positively complete tasks that are naturally associated with intelligence (Chiu et al., 2022; Mertala et al., 2022). Despite its ability to distinguish among an image of a car and one of a multicolored, artificial intelligence is non inherently cognizant of the ideas behind cars or rainbows. Algorithms and programs built on massive data form the operational heart of artificial intelligence (Zhang, 2023). As a result, artificial intelligence (AI) is too distinct as a division of computer science that focuses on studying the fundamentals of intellect by developing intelligent artifacts that mimic human intellect over a sequence of algorithmic procedures (Dwivedi, 2021). Nevertheless, AI has developed into a novel multidisciplinary and interdisciplinary discipline that syndicates a diversity of technologies and knowledge, with computer science, statistics, info philosophy, and arithmetic (Mata et al., 2018). Thus, it is feasible to

provide a more thorough definition: Artificial Intelligence (AI) is clear as any philosophy, procedure, or method that kinds it cooler for machineries, specially computers, to analyze, pretend, deed, and discover humanoid supposed procedures and behaviors (Lu, 2019). No human or artificial intelligence is flawless (OpenAI, 2023). Praised as a revolutionary skill (Dwivedi et al., 2021), its unique intelligence capabilities have eased human society's progressive shift into the AI era (Ye, 2021). Intelligent robotics, neural networks, machine learning, advanced image credit, natural language processing, intelligent expert systems, and advanced robotics are only a rare of the many arenas enclosed by the connected skills (Anweiler & Ramet, 2019; Mondal et al., 2020).

3. CHATBOTS

Most deployed AI skills for aiding training and knowledge events is the Chatbot scheme (Okonkwo & Ade-Ibijola, 2020). According to Claritia et al. (2018), a chatbot is an smart manager that can converse with a operator by replying suitably to a series of questions. As a dialogue system, a chatbot must to be able to comprehend the discourse's gratified and know the social and emotional requirements of the users as they are speaking. People can cooperate with numerical plans as if they remained consuming a chat with a actual being meanwhile it mimics and understands humanoid message (Ciechanowski, 2019). Furthermore, a chatbot's accuracy and amount of database determine how well it performs; a larger database results in better performance. The application of natural language processing (NLP) is necessary for the progress of chatbots. A machine can understand, evaluate, and interpret natural human languages thanks to NLP technology. Figure 1 illustrates the operation of a chatbot. Eliza, the original chatbox, was designed in 1966 and had a psychotherapist's function. Parry and Alice followed in 1972 and 1995, respectively. Modern chatbots like SmarterChild, Apple Siri, Amazon Alexa, IBM Watson, Microsoft Cortana, and Google Assistant are developed as technology progresses (Reis et al., 2018).

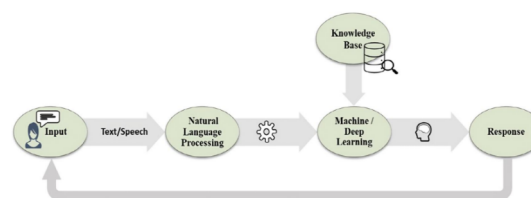


Figure 1. How a Chatbot functions (Aleedy et al., 2022, p. 662)

4. CHATGPT

"A powerful machine learning software that usages the Generative Pre-trained Transformer (GPT) algorithm to produce human-like answers to text-based ideas" is how ChatGPT, which was introduced by OpenAI (San Francisco, CA) in November 2022, characterizes the situation. A large body of data, including textual chats, books, webpages, and articles, was used to train ChatGPT. But ChatGPT can respond to suggestions in a conversational way because to a fine-tuning procedure that incorporates dialogue optimization (Health, 2023). A family of refined verbal replicas called Generative Pre-trained Transformers (GPTs) uses deep learning to improve its output. Big datasets are castoff to sequence these replicas. In reply to a user's query, GPTs generate suitable phrases and words or images by classifying designs and regularities in the information (Rospigliosi, 2023). ChatGPT can perform a broad range of tasks, such as text summarization, query replying, original writing (verse or falsehood), creating good lengthy or petite system gratified (blog posts), responding to conversational prompts, elucidating difficult topics, ideas, or melodies, and correcting mistakes in current cipher or creating novel ciphers (Eke, 2023).

Research demonstrating ChatGPT's natural aptitude has included passing scores on exams for law school (Choi et al., 2023) and leaders of professional management (MBA) (Terwiesch, 2023). ChatGPT is a well-liked tool for obtaining prompt responses to a wide range of queries, after simple to difficult subjects. Its volume to understand usual linguistic interrogations and produce humanoid similar replies has contributed to its popularity. For instance, it may succinctly summarize a lengthy academic paper in only one sentence, even if some of the words in the statement simply begin with the letter "q." In addition to identifying the issue, it even offers precise fixes when it is programming itself. In a short period of time, ChatGPT has shown to be an invaluable tool for professionals and students alike. The most recent version, ChatGPT-4, was free on March 14, 2023. It is demanded to be extra controlling and accomplished of handling extra difficult jobs. ChatGPT-4 was trained using a broader range of sources. The replica's greater scope allows extra classy natural language processing features. It is more adaptive and capable of managing difficult tasks because of its skill to aim and understand prompts in a variety of fields. When a operator uploads a copy and wants a report, for instance, the copy is thoroughly described. Level handwritten questions supplied as visuals are answered by it (OpenAI, 2023).

5. ARTIFICIAL INTELLIGENCE IN EDUCATION (AIED)

The method we study has remained meaningfully impacted by AI skills (Chen et al., 2020), especially since deep learning technologies have developed so quickly (Chan & Zary, 2019). In fact, artificial intelligence in education (AIED) has remained recognized as a distinct theoretical investigate topic since at least the 1980s (Williamson & Eynon, 2020). The making of AI-based instructive skills and the application of AI to acquire knowledge, assess, and recover instruction are the two approaches of AIED (Holmes et al., 2019).

Social, cultural, pedagogical, and economic aspects are all included in AIED (Selwyn, 2016). In directive to support and progress the instructive process, it entails the use of AI skills, such as chatbots, robots, bright tutoring systems, education analytics consoles, adaptive education schemes, and mechanical valuation (Chen et al., 2020). In particular, the technologies a chatbot uses, such as artificial neural networks, machine learning, deep learning, and natural language processing, might affect its capabilities (Nirala et al., 2022). Early chatbots used natural language processing (NLP) mechanisms (Melián-González et al., 2021) or keyword matching mechanisms (Weizenbaum, 1966). Voice interactive interfaces began to appear as advances in computer and speech recognition technologies (Guttormsen et al., 2011). The first chatbots were unreliable because they couldn't provide pupils accurate responses in the middle of a discussion. Their answers left room for interpretation and sometimes led to learners who were not very valuable as teachers (Yin et al., 2021). However, modern chatbots have advanced dramatically, increasing their possible for use in instructive settings (Fryer et al., 2019). As of right now, chatbots have primarily been used in education to provide feedback, promote metacognitive growth, promote health and wellness, and respond to student questions (Chen et al., 2023).

AI has a great deal of potential to enhance teaching, learning, pedagogical innovations, assessment, and educational administration, even though its impact on education is yet unclear (Holmes, 2021). (Chen et al., 2020). Although artificial intelligence (AI) has the possible to completely transform teaching, more than only advanced AI computing technologies are needed to achieve successful educational results (Castaneda & Selwyn, 2018). To notify instructional project and technical innovation, the use of technology should be tightly aligned with educational and learning theories

(Bower, 2019). Regarding the theoretical outline of AI-maintained education, Zheng et al. (2021) assert that, in order to maximize learning efficiency and effectiveness, learning material, pedagogical techniques, and the use of AIED technology should be merged. Teachers and practitioners should take into account six essential components when creating AI-supported learning activities in order to meet the desired learning goals: learners, tasks, context, educational methods, communication techniques, and the use of AI knowledges (Zheng et al., 2021).

AIED Examples

AIED is categorized under three paradigms by Ouyang and Jiao (2021):

- AI-directed: in which the student is viewed as the beneficiary;
- AI-supported: in which the student is viewed as the traitor;
- AI-empowered: in which the student is viewed as the frontrunner.

In the first example, learners are the clients of AI services, which are used to represent and guide cognitive learning under the impact of behaviorism. Within the second paradigm, which is theoretically grounded in cognitive and social constructivism, AI facilitates learning as students work in tandem with the technology. According to the third paradigm, which is founded on connectivism, artificial intelligence (AI) enhances learning, enables students to take charge of their education, and increases student intelligence through a synergistic partnership between various system components, including the learner, the instructor, information, and technology. AI has been seen as a prevailing instrument in the arena of teaching that can facilitate the development of fresh examples in instructional project, technical innovation, and instructive investigate that would then be impractical to accomplish through traditional modalities of instruction (Hwang et al. 2020)

6. POSSIBLE ASSISTANCES OF AIED

POSSIBLE ASSISTANCE FOR SCHOLARS

Cumulative incentive and appointments amongst scholars is one of the key results of using AI (Xia et al., 2022). Their interest in learning is piqued (Lin & Chang, 2020), and interactive learning environments are facilitated by specific technologies such as Smart Sparrow, which encourage student involvement with instructional content (Karsenti, 2019). Numerous lessons take also shown that the use of AI knowledge can significantly increase academic performance

(Khan et al., 2021; Kim et al., 2021). According to Winkler and Söllner (2018), it greatly enhances learning results and student satisfaction while optimizing students' learning potential and accomplishment (Clarizia et al., 2018). Promoting and improving personalized learning experiences may be a contributing factor to this high level of motivation and accomplishment (Cunningham-Nelson et al., 2019). To this end, AI-powered gears like ALEKS and Knewton make adapted education tracks. Such adapted knowledge knowledges and supplies provide to beginners' sole assets and weaknesses (Brown et al., 2020).

Not only do students receive customized assignments in AI-enabled environments (Hirankerd & Kittisunthonphisarn, 2020), but they also receive immediate, personalized response founded on an examination of their effort and knowledge procedure. For example, learners can receive customized response on textual assignments from Grammarly, InstaText, and QuillBot, and on coding challenges from Codecademy. Through the identification and learning from their own mistakes, this personalized assistance that is provided step-by-step and in a timely manner promotes self-reflection, self-directed learning, and self-regulation (Chiu et al., 2023a). Additionally, it gives students guidance on academic matters, assisting them in making important choices about their different academic programs and activities (Ismail & Ade-Ibijola, 2019). Using AI technology also equips students with 21st-century abilities like creativity and critical thinking, making it easier to evaluate and analyze complicated skills.

Notably, AI indorses collective knowledge (Ruan et al., 2019) and progresses noble message services (Hill et al., 2015), which helps students progress their communiqué aptitudes in verbal education surroundings and facilitates ongoing discourse (Vazquez-Cano, 2021). Furthermore, according to Jain et al. (2018), these individualized learning settings not only improve the caliber of teaching but too encourage relaxed knowledge and facilities for vulnerable and underprivileged inhabitants, including singular teaching kids (Chassignol et al., 2018). For instance, Llorente and coworkers' study from 2021 shown how dyslexic pupils' reading comprehension can be enhanced by AI-based educational interventions. In a similar vein, Zhang and colleagues' appraisal after 2020 noted that AI-based education capitals can improve the academic performance of students with autism spectrum condition. These results imply that AI

might be a valuable device for assisting scholars by learning impairments and enabling them to reach their greatest potential.

Regarding the affective domain, research indicates that students who use AI have a additional optimistic boldness and more sureness in their knowledge outcomes (Hsieh, 2020). This is because AI enables scholars to learn in stimulating and contented environments, which boosts their self-esteem and lowers their nervousness about learning (Rooein, 2019). For instance, low-achieving pupils felt less ashamed and more capable and useful after interacting with humans and robots (Chiu et al., 2023a). According to a 2019 education by Crompton and classmates, middle school pupils' anxiety levels could be effectively decreased by an AI-based educational intervention. Consequently, AI has the ability to reduce pupils' worry and provide them with the tools and self-assurance they need to prosper in their theoretical life.

7. POSSIBLE ASSISTANCES FOR INSTRUCTORS AND ADMINISTRATORS

AI shows itself to be a very useful tool for educators, who are the other side of the coin. They have industrialized optimistic arrogances as a consequence of the integration of AI knowledge into administration, learning, and teaching (Aldosari, 2020). First off, by inspiring and encouraging self-reflection, the application of AI knowledges has been originate to enhance teaching competency (Jaiswal & Arun, 2021) and education skills (Aldeman et al., 2021). Since AI recovers educators' understanding of scholars' knowledge processes and provides solutions for supporting their students, it offers adaptive teaching practices (Aldeman et al., 2021; Jia et al., 2021). Rendering to Graesser (2016), it adapts to the behaviors and emotions of the students. Due to its ability to offer models for teaching evaluation and recommendations for enhancing instructional strategies, AI also helps teachers advance professionally (Gunawan et al., 2021; Hu, 2021). Significantly, AI provides pupil evaluations according to their achievement levels (Durall & Kapros, 2020). Educators can examine and appraise a scholar's learning capacity by means of an bright and automatic scheme that is shaped by AI-powered chatbots (Durall & Kapros, 2020).

Upon submission, the chatbots gather the consequences and communicate them to the educators, enabling them to monitor their scholars' advancement and expedite tasks through technologies such as Gradescope, Autolab, and AI tutor (Okonkwo & Ade-

Ibijola, 2020). AI also makes it possible to record data on student learning and keep an eye on how students are learning (Chiu et al., 2023b; Westera et al., 2020). For instance, a wide variety of multimodal data, such as electroencephalography, eye trailing, and physiological sensing, have been used to gain a comprehensive understanding of beginners' stages and to produce a good forecast of their knowledge presentation (Giannakos et al., 2019). Pronunciation correction and speech recognition are examples of advanced AI features that could make learning a overseas verbal easier (Vincent-Lancrin & Van der Vlies, 2020). AI technologies simplify administrative roles by closely monitoring and predicting students' performance (Akmese et al., 2021). These technologies are also useful in addressing student disengagement and successfully lowering student dropout rates. This is because initial cautionary structures founded on long-term datasets make forecast and risk identification easier (Brown et al., 2020).

Moreover, a great deal of repetitive labor can be replaced by AI technology, which lessens the workload for administrators and teachers (Chan & Zary, 2019). As a result, by studying, rating, and charitable scholars response on their errands, chatbots lessen the administrative burden on teachers. Teachers can save several hours of time by using tools like AutoGradr and Repl.it, which score schoolwork and exams automatically. This time can be used for lesson planning, student support, or specialized growth. Knowledge organization schemes motorized by AI have a lot to offer both students. Chatbots are being used by a number of universities to help scholars during non-business hours and respond to their inquiries. In order to deliver tailored teaching, help scholars, ease decision-making tasks, and indorse valuation, they are also utilized in academic programs, school cafeterias, libraries, and student affairs (Hopcan et al., 2022). Future learning management systems should become increasingly more advanced as AI technology develops (Koedinger et al., 2012, Ramesh & Lakshmi, 2018, Saha & AlAmri, 2019).

8. ETHICAL ISSUES

While using AI technology is strongly advised, it is significant to be conscious of their limits. Rapp et al. (2021) state that it does not appear to be enough to assess a chatbot just on the basis of its efficacy, usefulness, and capacity to satisfy and engage users. First of all, it brings up moral questions about possible misuse and dishonesty. People may erroneously think that they are speaking with chatbots instead of actual

people (Adamopoulou & Moussiades, 2020). Serious worries were raised by the European Consumer Organization's (BEUC) Deputy Director General over ChatGPT's potential to "manipulate and deceive people" (McCallum, 2023). Because they believe ChatGPT disseminates US political propaganda, it has already been outlawed in Iran, Venezuela, China, Russia, and Belarus (Wodecki, 2023). Another important concern is user privacy (Okonkwo & Ade-Ibijola, 2020). Due to privacy concerns, Italy is the first nation in the West to outlaw ChatGPT (McCallum, 2023). Notably, a number of well-known AI experts, such as Elon Musk and Steve Wozniak, the co-founder of Apple, signed an open letter cautioning that AI "may pose serious risks to society and humanity" rather than limiting their worries to ethics or privacy (Vallance, 2023). The creation and programming of chatbots presents another significant difficulty (Rahman et al., 2017). As per Grosz's (2018) findings, computational linguistics and natural language processing (NLP) systems also bring up some of the gravest possible problems, like failures in conversation systems, the effect of social Chatbots on interpersonal communication, and problems with system performance. The input data determines how accurate the chatbot will be in presenting its information. developing a chatbot system is an ongoing process that calls for regular, sometimes challenging supervision and maintenance. It might also respond negatively, for as by providing malware programs. Jobin et al. (2019) outlined the following eleven ethical guidelines for artificial intelligence in order to address these problems: (1) transparency (2) justice also fairness (3) nonmaleficence (4) accountability (5) confidentiality (6) generosity (7) independence (8) faith (9) pride (10) sustainability and (11) solidarity. When utilized for teaching, chatbots' general limitations—which were previously mentioned—inevitably come to light. Generally speaking, they cause teachers to concern around the usage of papers as a form of valuation and raise concerns about academic integrity (Eke, 2023). Concerns regarding the possible moral dilemmas surrounding the application of Chatbots and ChatGPT in the classroom include the following ones:

- Dependability and correctness of the info it gifts
- Possible prejudices in the information, subsequent in biased or misleading responses
- Confidentiality subjects meanwhile it might gather and stock personal information about students
- Queries around the part of educators and the influence on the occupation marketplace for teachers
- Absence of humanoid communication, dropping

the excellence of the educational experience for students

- Over- dependence and dependence on skill
- Worries around the human rights of intelligent stuff
- Slide and responsibility as it strength be problematic to identify how choices are existence complete by the chatbot

AIED investigate also shows a poor connection to instructional strategies and educational viewpoints, ignoring the complex and multidimensional risks and problems associated with teaching and learning using AI. Furthermore, Goel and Polepeddi (2018) stress the significance of accessibility and equity for all scholars. Making sure AI-based educational tools don't reinforce prejudices or maintain inequities is crucial, and they must be created with operator confidentiality and data security in mind (Jia et al., 2021). Despite claims that AIED knowledges—ChatGPT in particular—weakens abstract integrity, there are obstacles to their outline and addition into instructive institutes due to a lack of knowledge about them (Hussin, 2018). As a result, academic institutions must accept ChatGPT as an essential part of research and pedagogy (Eke, 2023). It is non difficult to forecast the ChatGPT's influence on teaching will increase in the coming times, given that a form of the program called Microsoft 365 Copilot was additional to Office apps, such as Word, Excel, PowerPoint, and Outlook. This was achieved by using machine learning to analyse information since a diversity of bases, counting telemetry facts, operator response, and Microsoft's personal knowhow to deliver active references, automatic matter resolve, and modified direction (Stallbaumer, 2023). Thus, more investigation is required to determine the possible educational advantages of these new technologies as well as how best to apply them (Chiu, 2023b; Hwang & Chang, 2021) in order to distinguish between text- and idea-generation (Halaweh, 2023). By incorporating AI- built instructive tools into their curriculum and rules appropriately, we may contribute to make the following age group of scholars for a upcoming in which AI plays an increasingly significant part in their survives (UNESCO, 2021).

9. CONCLUSION

Artificial intelligence (AI) in education has many benefits but also some drawbacks. AI may increase productivity, engagement levels, and learning results by creating new opportunities for personalized instruction, feedback, and support. However, it is impossible to ignore the moral and practical concerns related to using AI in teaching. The possible for prejudice in AI algorithms and the necessity of

adequate teacher preparation and support are significant issues that need to be resolved. The use of chatbots and ChatGPT in particular demonstrates the promise for modified knowledge, linguistic teaching, and response submissions in teaching. The comprehension and usefulness of AI-integrated learning and teaching environments have advanced significantly in recent literature. In a variety of situations and roles, these environments allow the use of AIED technologies as partners, trainers, facilitators, or instruments. However, these situations have grown more detailed, raising the question of how much ChatGPT can revolutionize education and requiring additional research and development.

Ultimately, to guarantee the moral and suitable submission of AI in schooling, politicians, researchers, and teachers must work organized. By deciding the subjects elevated by AI skills and creation use of their welfares, we can create a more reasonable and real instructive scheme that delivers kids with the custom-made teaching, response, and provision they need.

REFERENCES

- [1] Adamopoulou, E., & Moussiades, L. (2020). Chatbots: History, technology, and applications. *Machine Learning with Applications*, 2, 100006. <https://doi.org/10.1016/j.mlwa.2020.100006>
- [2] Akmese, O. F., Kor, H., & Erbay, H. (2021). Use of machine learning techniques for the forecast of student achievement in higher education. *Information Technologies and Learning Tools*, 82(2), 297-311. <https://doi.org/10.33407/itlt.v82i2.4178>
- [3] Alawi F. (2023). Artificial intelligence: The future might already be here. *Oral Surgery Oral Medicine Oral Pathology Oral Radiology*, 12, S2212-4403(23)00003-2. <https://doi.org/10.1016/j.oooo.2023.01.002>
- [4] Aldeman, N. L. S., Aita, K., Machado, V. P., da Mata Sousa, L. C. D., Coelho, A. G. B., da Silva, A. S., Mendes, A. P. D., Neres, F. J. D., & do Monte, S. J. H. (2021). Smartpath (k): A platform for teaching glomerulopathies using machine learning. *BMC Medical Education*, 21(1), 248. <https://doi.org/10.1186/s12909-021-02680-1>
- [5] Aldosari, S. A. M. (2020). The future of higher education in the light of artificial intelligence transformations. *International Journal of Higher Education*, 9(3), 145-151. <https://doi.org/10.5430/ijhe.v9n3p145>
- [6] Aleedy, M., Atwell, E., & Meshoul, S. (2022). Using AI Chatbots in Education: Recent Advances Challenges and Use Case. In *Artificial Intelligence and Sustainable Computing: Proceedings of ICSISCET 2021* (pp. 661-675). https://doi.org/10.1007/978-981-19-1653-3_50
- [7] Anweiler, O., & Ramet, P. (2019). The reform of the Soviet educational system: Between modernization and ideological control. In *Gorbachev and the Soviet Future* (pp. 142-163). Routledge. <https://doi.org/10.4324/9780429043505-7>
- [8] Bower, M. (2019). Technology-mediated learning theory. *British Journal of Educational Technology*, 50(3), 1035-1048. <https://doi.org/10.1111/bjet.12771>
- [9] Brown, M., McCormack, M., Reeves, J., Brook, D. C., Grajek, S., Alexander, B., & Weber, N. (2020). 2020 Educause Horizon Report Teaching and Learning Edition (pp. 2-58). EDUCAUSE.
- [10] Castaneda, L., & Selwyn, N. (2018). More than tools? Making sense of the ongoing digitizations of higher education. *International Journal of Educational Technology in Higher Education*, 15(22), 2-10. <https://doi.org/10.1186/s41239-018-0109-y>
- [11] Chan, K. S., & Zary, N. (2019). Applications and challenges of implementing artificial intelligence in medical education: Integrative review. *JMIR Medical Education*, 5(1), e13930. <https://doi.org/10.2196/13930>
- [12] Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial intelligence trends in education: A narrative overview. *Procedia Computer Science*, 136, 16-24. <https://doi.org/10.1016/j.procs.2018.08.233>
- [13] Chen, X., Xie, H., Zou, D., & Hwang, G. J. (2020). Application and theory gaps during the rise of artificial intelligence in education. *Computers & Education: Artificial Intelligence*, 1, 100002. <https://doi.org/10.1016/j.caeai.2020.100002>
- [13] Chen, Y., Jensen, S., Albert, L. J., Gupta, S., & Lee, T. (2023). Artificial intelligence (AI) student

- assistants in the classroom: Designing chatbots to support student success. *Information Systems Frontiers*, 25(1), 161-182.
<https://doi.org/10.1007/s10796-022-10291-4>
- [14] Chiu, T. K. F., Meng, H., Chai, C. S., King, I., Wong, S., & Yeung, Y. (2022). Creation and evaluation of a pre-tertiary
- [15] Artificial Intelligence (AI) curriculum. *IEEE Transactions on Education*, 65(1), 30-39.
- [16] <https://doi.org/10.1109/TE.2021.3085878>
- [17] Chiu, T. K. F., Moorhouse, B. L., Chai, C. S. & Ismailov, M. (2023a). Teacher support and student motivation to learn with Artificial Intelligence (AI) based chatbot. *Interactive Learning Environments*. Published online: 06 Feb 2023.
<https://doi.org/10.1080/10494820.2023.2172044>
- [18] Chiu, T. K. F., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023b). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 4, 100118.
<https://doi.org/10.1016/j.caeai.2022.100118>
- [19] Choi, J. H., Hickman, K. E., Monahan, A., & Schwarcz, D. B. (2023). ChatGPT goes to law school. *Minnesota Legal Studies Research Paper*, 23(03). <https://doi.org/10.2139/ssrn.4335905>
 Ciechanowski, L., Przegalinska, A., Magnuski, M., & Gloor, P. (2019). In the shades of the uncanny valley: An experimental study of human–chatbot interaction. *Future Generation Computer Systems*, 92, 539-548.
<https://doi.org/10.1016/j.future.2018.01.055>
- [20] Clarizia, F., Colace, F., Lombardi, M., Pascale, F., & Santaniello, D. (2018). Chatbot: An education support system for student. *International symposium on cyberspace safety and security*. Springer. https://doi.org/10.1007/978-3-030-01689-0_23
- [21] Crompton, H., Burke, M., Gregory, K. H., & Johnson, L. (2019). An investigation of the effects of an AI math tutor on student anxiety. *Educational Technology Research and Development*, 67(2), 453-472.
- [22] Cunningham-Nelson, S., Boles, W., Trouton, L., & Margerison, E. (2019). A review of chatbots in education: Practical steps forward. 30th annual conference for the Australasian association for engineering education (AAEE 2019): Educators becoming agents of change: Innovate, integrate. Motivate: Engineers Australia.
- [23] Durall, E., & Kapros, E. (2020). Co-design for a competency self-assessment chatbot and survey in science education. *International conference on human-computer interaction*. Springer.
https://doi.org/10.1007/978-3-030-50506-6_2
- [24] Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A.K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., ... Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging , opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 57, 101994.
<https://doi.org/10.1016/j.ijinfomgt.2019.08.002>
- [25] Eke, O. D. (2023). ChatGPT and the rise of generative AI: Threat to academic integrity? *Journal of Responsible Technology*, 13, 100060.
<https://doi.org/10.1016/j.jrt.2023.100060>
- [26] Fryer, L. K., Nakao, K., & Thompson, A. (2019). Chatbot learning partners: Connecting learning experiences, interest and competence. *Computers in Human Behavior*, 93, 279-289.
<https://doi.org/10.1016/j.chb.2018.12.023>
- [27] Giannakos, M. N., Sharma, K., Pappas, I. O., Kostakos, V., & Velloso, E. (2019). Multimodal data as a means to understand the learning experience. *International Journal of Information Management*, 48, 108-119.
<https://doi.org/10.1016/j.ijinfomgt.2019.02.003>
- [28] Goel, A. K., & Polepeddi, L. (2018). Jill Watson: A virtual teaching assistant for online education. In C. Dede, J. Richards, & B. Saxberg (Eds.), *Learning engineering for online education: Theoretical contexts and designbased examples* (pp. 120-143). Routledge.
<https://doi.org/10.4324/9781351186193-7>
- [29] Graesser, A. C. (2016). Conversations with auto tutor help students learn. *International Journal of*

- Artificial Intelligence in Education, 26(1), 124-132. <https://doi.org/10.1007/s40593-015-0086-4>
- [30] Grosz, B. J. (2018). Smart enough to talk with us? Foundations and challenges for dialogue capable AI systems. *Computational Linguistics*, 44(1), 1-15. https://doi.org/10.1162/COLI_a_00313
- [31] Guilherme, A. (2019). AI and education: The importance of teacher and student relations. *AI & Society*, 34(1), 47-54. <https://doi.org/10.1007/s00146-017-0693-8>
- [32] Gunawan, K. D. H., Liliyasi, L., Kaniawati, I., & Setiawan, W. (2021). Implementation of competency enhancement program for science teachers assisted by artificial intelligence in designing HOTS-based integrated science learning. *Jurnal Penelitian dan Pembelajaran IPA*, 7(1), 55-65. <https://doi.org/10.30870/jppi.v7i1.8655>
- [33] Guttormsen, M., Bürger, A., Hansen, T. E., & Lietaer, N. (2011). The SiRi particle-telescope system. *Nuclear Instruments & Methods in Physics Research Section A*, 648(1), 168-173. <https://doi.org/10.1016/j.nima.2011.05.055>
- [34] Halaweh, M. (2023). ChatGPT in education: Strategies for responsible implementation. *Contemporary Educational Technology*, 15(2), ep421. <https://doi.org/10.30935/cedtech/13036>
- [35] Health, T. L. D. (2023). ChatGPT: Friend or foe? *The Lancet: Digital health*, 5(3), e102. [https://doi.org/10.1016/S2589-7500\(23\)00023-7](https://doi.org/10.1016/S2589-7500(23)00023-7)
- [36] Hill, J., Ford, W. R., & Farreras, I. G. (2015). Real conversations with artificial intelligence: A comparison between human–human online conversations and human–chatbot conversations. *Computers in Human Behavior*, 49, 245-250. <https://doi.org/10.1016/j.chb.2015.02.026>
- [37] Hirankerd, K., & Kittisunthonphisarn, N. (2020). E-learning management system based on reality technology with AI. *International Journal of Information and Education Technology*, 10(4), 259-264. <https://doi.org/10.18178/ijiet.2020.10.4.1373>
- [38] Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Boston: Centre for Curriculum Redesign. https://doi.org/10.1007/978-3-030-23207-8_20
- [39] Holmes, W., Hui, Z., Miao, F., & Ronghuai, H. (2021). *AI and education: A guidance for policymakers*. UNESCO Publishing.
- [40] Hopcan, S., Polat, E., Ozturk, M. E., & Ozturk, L. (2022). *Artificial intelligence in special education: A systematic review*. Interactive Learning Environments. Published online: 06 May 2022. <https://doi.org/10.1080/10494820.2022.2067186>
- [41] Hsieh, Y. Z., Lin, S. S., Luo, Y. C., Jeng, Y. L., Tan, S. W., Chen, C. R., & Chiang, P. Y. (2020). ARCS-assisted teaching robots based on anticipatory computing and emotional big data for improving sustainable learning efficiency and motivation. *Sustainability*, 12(14), 5605. <https://doi.org/10.3390/su12145605>
- [42] Hu, J. J. (2021). Teaching evaluation system by use of machine learning and artificial intelligence Methods. *International Journal of Emerging Technologies in Learning*, 16(5), 87-101. <https://doi.org/10.3991/ijet.v16i05.20299>
- [43] Hussin, A. A. (2018). Education 4.0 made simple: Ideas for teaching. *International Journal of Education and Literacy Studies*, 6(3), 92-98. <https://doi.org/10.7575/aiac.ijels.v6n3.p92>
- [44] Hwang, G. J., & Chang, C. Y. (2021). A review of opportunities and challenges of chatbots in education. *Interactive Learning Environments*. Published online: 18 Jul 2021. <https://doi.org/10.1080/10494820.2021.1952615>
- [45] Hwang, G. J., Xie, H., Wah, B. W., & Gasevic, D. (2020). Vision, challenges, roles and research issues of artificial intelligence in education. *Computers & Education: Artificial Intelligence*, 1, 100001. <https://doi.org/10.1016/j.caeai.2020.100001>
- [46] Ismail, M., & Ade-Ibijola, A. (2019). Lecturer's apprentice: A chatbot for assisting novice programmers. In *2019 international multidisciplinary information technology and engineering conference (IMITEC)* (pp. 1-8). IEEE. <https://doi.org/10.1109/IMITEC45504.2019.9015857>

- [47] Jain, M., Kumar, P., Bhansali, I., Liao, Q., Truong, K., & Patel, S. (2018). FarmChat: A conversational agent to answer farmer queries. *Proceedings of ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, 2(4), 1-22. <https://doi.org/10.1145/3287048>
- [48] Jaiswal, A., & Arun, C. J. (2021). Potential of artificial intelligence for transformation of the education system in India. *International Journal of Education and Development Using Information and Communication Technology*, 17(1), 142-158.
- [49] Jia, J., Zhang, D., & Gao, F. (2021). Learning analytics and artificial intelligence in mathematics education: A systematic review. *International Journal of Educational Research*, 107, 101831.
- [50] Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature Machine Intelligence*, 1(9), 389-399. <https://doi.org/10.1038/s42256-019-0088-2>
- [51] Karsenti, T. (2019). Artificial intelligence in education: The urgent need to prepare teachers for tomorrow's schools. *Formation et Profession*, 27(1), 112-116. <https://doi.org/10.18162/fp.2019.a166>
- [52] Khan, I., Ahmad, A. R., Jabeur, N., & Mahdi, M. N. (2021). An artificial intelligence approach to monitor student performance and devise preventive measures. *Smart Learning Environments*, 8(1), 1-18. <https://doi.org/10.1186/s40561-021-00161-y>
- [53] Kim, H. S., Kim, N. Y., & Cha, Y. (2021). Is it beneficial to use AI chatbots to improve learners' speaking performance? *Journal of ASIA TEFL*, 18(1), 161-178. <https://doi.org/10.18823/asiatefl.2021.18.1.10.161>
- [54] Koedinger, K. R., Corbett, A. T., & Perfetti, C. (2012). The Knowledge-Learning-Instruction (KLI) framework: Bridging the science-practice chasm to enhance robust student learning. *Cognitive Science*, 36(5), 757-798. <https://doi.org/10.1111/j.1551-6709.2012.01245.x>
- [55] Kurzweil, R. (1990). *The age of intelligent machines*. MIT Press. Lin, M. P.-C., & Chang, D. (2020). Enhancing post-secondary writers' writing skills with a chatbot. *Journal of Educational Technology & Society*, 23(1), 78-92.
- [56] Llorente, A. M., Ladera, V., Contreras, P., & Conde, L. (2021). Efficacy of a computerized intervention based on artificial intelligence for improving reading comprehension in students with dyslexia. *Frontiers in Psychology*, 12, 641005.
- [57] Lu, Y. (2019) Artificial intelligence: a survey on evolution, models, applications and future trends. *Journal of Management Analytics*, 6(1), 1-29. <https://doi.org/10.1080/23270012.2019.1570365>
- [58] Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. <http://discovery.ucl.ac.uk/1475756/>
- [59] Mata, J., de Miguel, I., Duran, R. J., Merayo, N., Singh, S. K., Jukan, A., & Chamania, M. (2018). Artificial intelligence (AI) methods in optical networks: A comprehensive survey. *Optical Switching and Networking*, 28, 43-57. <https://doi.org/10.1016/j.osn.2017.12.006>
- [60] McCallum, S. (2023, April 1). ChatGPT Banned in Italy over Privacy Concerns. BBC. <https://www.bbc.com/news/technology-65139406>
- [61] McCarthy, J., Minsky, M. L., Rochester, N., & Shannon, C. E. (1955). A proposal for the Dartmouth summer research project on artificial intelligence. *AI Magazine*, 27(4), 12-14.
- [62] Melián-González, S., Gutiérrez-Taño, D., & Bulchand-Gidumal, J. (2021). Predicting the intentions to use chatbots for travel and tourism. *Current Issues in Tourism*, 24(2), 192-210. <https://doi.org/10.1080/13683500.2019.1706457>
- [63] Mertala, P., Fagerlund, J., & Calderon, O. (2022). Finnish 5th and 6th grade students' pre-instructional conceptions of artificial intelligence (AI) and their implications for AI literacy education. *Computers and Education: Artificial Intelligence*, 3, 100095. <https://doi.org/10.1016/j.caeai.2022.100095>

- [64] Mondal, B. (2020). Artificial intelligence: State of the art. Recent Trends and Advances in Artificial Intelligence and Internet of Things, 389-425. https://doi.org/10.1007/978-3-030-32644-9_32
- [65] Nirala, K. K., Singh, N. K., & Purani, V. S. (2022). A survey on providing customer and public administration based services using AI: Chatbot. Multimedia Tools and Applications, 1-32. <https://doi.org/10.1007/s11042-021-11458-y>
- [66] Okonkwo, C. W., & Ade-Ibijola, A. (2020). Python-bot: A chatbot for teaching python programming. Engineering Letters, 29(1), 25-35.
- [67] OpenAI. (2023, March). GPT-4 Developer Livestream [Video]. YouTube. <https://www.youtube.com/watch?v=outcGtbnMuQ>
- [68] Ouyang, F., & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. Computers & Education: Artificial Intelligence, 2, 100020. <https://doi.org/10.1016/j.caeai.2021.100020>
- [69] Porter, B., & Grippa, F. (2020). A platform for AI-enabled real-time feedback to promote digital collaboration. Sustainability, 12(24), 1-13. <https://doi.org/10.3390/su122410243>
- [70] Rahman, A., Al Mamun, A., & Islam, A. (2017). Programming challenges of chatbot: Current and future prospective. In 2017 IEEE region 10 humanitarian technology conference (R10-HTC) (pp. 75-78). IEEE. <https://doi.org/10.1109/R10-HTC.2017.8288910>
- [71] Ramesh, V., & Lakshmi, R. (2018). Use of artificial intelligence in learning management system for adaptive assessment. International Journal of Innovative Technology and Exploring Engineering, 7(7S), 240-243. <https://doi.org/10.35940/ijitee.K7373.0787S18>
- [72] Rapp, A., Curti, L., & Boldi, A. (2021). The human side of human-chatbot interaction: A systematic literature review of ten years of research on text-based chatbots. International Journal of Human-Computer Studies, 151, 102630. <https://doi.org/10.1016/j.ijhcs.2021.102630>
- [73] Reis, A., Paulino, D., Paredes, H., Barroso, I., Monteiro, M. J., Rodrigues, V., & Barroso, J. (2018). Using intelligent personal assistants to assist the elderly: an evaluation of Amazon Alexa, Google Assistant, Microsoft Cortana, and Apple Siri. In 2018 2nd international conference on technology and innovation in sports, health and wellbeing (TISHW) (pp. 1-5). IEEE. <https://doi.org/10.1109/TISHW.2018.8559503>
- [74] Rooein, D. (2019). Data-driven edu chatbots. In companion proceedings of the 2019 world wide web conference (pp. 46-49). <https://doi.org/10.1145/3308560.3314191>
- [75] Rospigliosi, P. A. (2023). Artificial intelligence in teaching and learning: what questions should we ask of ChatGPT? Interactive Learning Environments, 31(1), 1-3. <https://doi.org/10.1080/10494820.2023.2180191>
- [76] Ruan, S., Willis, A., Xu, Q., Davis, G. M., Jiang, L., Brunskill, E., & Landay, J. A. (2019). Bookbuddy: Turning digital materials into interactive foreign language lessons through a voice chatbot. In Proceedings of the sixth (2019) ACM conference on learning@ scale (pp. 1-4). <https://doi.org/10.1145/3330430.3333643>
- [77] Saha, S., & Al Amri, S. (2019). A review of artificial intelligence applications in learning management systems. International Journal of Emerging Technologies in Learning, 14(1), 162-176.
- [78] Selwyn, N. (2016). Is technology good for education? Malden, Polity Press.
- [79] Stallbaumer, C. (2023, March 16). Introducing Microsoft 365 Copilot – A Whole New Way to Work. Microsoft 365. <https://www.microsoft.com/en-us/microsoft-365/blog/2023/03/16/introducing-microsoft-365-copilot-a-whole-new-way-to-work/>
- [80] Terwiesch, C. (2023). Would chat GPT3 get a Wharton MBA? A prediction based on its performance in the operations management course. Mack Institute for Innovation Management at the Wharton School, University of Pennsylvania.

- <https://mackinstitute.wharton.upenn.edu/wp-content/uploads/2023/01/ChristianTerwiesch-Chat-GTP-1.24.pdf>
- [81] UNESCO. (2021). Artificial intelligence in education: Opportunities, challenges and risks. UNESCO.
- [82] Vallance, C. (2023, March 31). Elon Musk among experts urging a halt to AI training. BBC. <https://www.bbc.com/news/technology-65110030>
- [83] Vazquez-Cano, E., Mengual-Andres, S., & Lopez-Meneses, E. (2021). Chatbot to improve learning punctuation in Spanish and to enhance open and flexible learning environments. *International Journal of Educational Technology in Higher Education*, 18(1), 33. <https://doi.org/10.1186/s41239-021-00269-8>
- [84] Villegas-Ch, W., Sánchez-Viteri, S., & Roman-Cañizares, M. (2021). Academic activities recommendation system for sustainable education in the age of COVID-19. *Informatics*, 8(2), 29. <http://dx.doi.org/10.3390/informatics8020029>
- [85] Vincent-Lancrin, S., & Van Der Vlies, R. (2020). Trustworthy artificial intelligence (AI) in education: Promises and challenges. OECD Education Working Papers, 218. OECD Publishing, Paris, <https://doi.org/10.1787/a6c90fa9-en>
- [86] Weizenbaum, J. (1966). ELIZA—a computer program for the study of natural language communication between man and machine. *Communications of the ACM*, 9(1), 36-45. <https://doi.org/10.1145/365153.365168>
- [87] Westera, W., Prada, R., Mascarenhas, S., Santos, P. A., Dias, J., Guimaraes, M., Georgiadis, K., Nyamsuren, E., Bahreini, K., Yumak, Z., Christyowidiasmore, C., Dascalu, M., Gutu-Robu, G., & Ruseti, S. (2020). Artificial intelligence moving serious gaming: Presenting reusable game AI components. *Education and Information Technologies*, 25(1), 351-380. <https://doi.org/10.1007/s10639-019-09968-2>
- [88] Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. *Learning, Media and Technology*, 45(3), 223-235. <https://doi.org/10.1080/17439884.2020.1798995>
- [89] Winkler, R., & Söllner, M. (2018). Unleashing the potential of chatbots in education: A state-of-the-art analysis. In *Academy of management annual meeting (AOM)*. <https://doi.org/10.5465/AMBPP.2018.15903abstract>
- [90] Wodecki, B. (2023, February 24). China cracks down on ChatGPT access. *AI Business*. <https://aibusiness.com/nlp/china-cracks-down-on-chatgpt-access>
- [91] Xia, Q., Chiu, T. K. F., Lee, M., Temitayo I., Dai, Y., & Chai, C. S. (2022). A self-determination theory design approach for inclusive and diverse artificial intelligence (AI) K-12 education. *Computers & Education*, 189, 104582. <https://doi.org/10.1016/j.compedu.2022.104582>
- [92] Ye, H. (2021, June). A review on the application of virtual reality technology in ideological and political teaching. In *2021 2nd International Conference on Artificial Intelligence and Education (ICAIE)* (pp. 712-715). IEEE. <https://doi.org/10.1109/ICAIE53562.2021.00156>
- [92] Yin, J., Goh, T. T., Yang, B., & Xiaobin, Y. (2021). Conversation technology with micro-learning: The impact of chatbot-based learning on students' learning motivation and performance. *Journal of Educational Computing Research*, 59(1), 154-177. <https://doi.org/10.1177/0735633120952067>

