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The Effectiveness of AI in Personalised Teaching: A Review

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Abstract- Using Artificial Intelligence (AI) is no longer limited to business operations to achieve greater efficiency in today's world. With the recent release of GPT5, resources are ever easier to find and read through, cutting down on hours of research time for students and educators alike. Seeing students at all academic levels use AI to learn new languages, create designated routines for studying, or write homework assignments is now a common sight. The use of AI in education is a widely discussed topic among scholars. The following literature review draws findings from several papers found on academic databases, including Google Scholar, Springer Nature, Emerald, and IEEE Xplore, with the primary research question in mind: *How effective is AI as a personalised tutor?* Our study aims to answer this question by synthesizing related works on the issue, without focusing on any one subject or academic level in which AI can be made to serve as a personal educator/helper. At the same time, we also seek to discuss how ethical this phenomenon is, and whether schools should ditch traditional teaching methods for AI-equipped tools.

Keywords: AI in teaching, personalised teaching, AI as a personalised tutor, AI tutors, ChatGPT, AI in education, democratization of education

II. INTRODUCTION

Artificial intelligence (AI) has significantly altered the way professors teach. It has made personalised learning feasible and scalable. AI is increasingly being utilized to tailor content, speed, and feedback to each student's unique needs. This includes adaptive learning platforms, intelligent tutoring systems (ITS), and, right now, big language models like ChatGPT [1], [2]. Researchers found that this change made students more involved, allowed them to learn on their own, and helped them do better in school overall [3, 6]. As AI gets easier to access, college students are using it to help them with their schoolwork. They utilize them for a lot of different things, like learning a new language or getting help with their homework [6]. AI-based tutoring systems have evident advantages, such as being available at any time of the day, being able to teach in numerous ways, and making students less reliant on teachers. Nonetheless, the incorporation of AI in educational contexts raises numerous serious concerns. Critics raise various questions, including the possibility that AI teachers would not adequately address students' social and emotional needs in the same manner that human educators can [5], [7], [9]. It has been noticed that students who are already at a disadvantage do not have equal access to AI educators. There is growing concern that over-reliance on AI technologies will impair children's capacity to acquire critical thinking abilities and

solve problems autonomously [8]. This study aims to find out how useful artificial intelligence may be for individualized training as things change. This is done by looking at both old studies and new data collected through a systematic literature review. The study includes a lot of different levels and subjects of education. It looks at how AI affects education by weighing the pros and cons of possible benefits against ethical and practical problems that haven't been solved yet [4].

III. METHODOLOGY

We drew results for this paper by conducting a systematic literature review of past works done on this topic and other related areas pertaining to AI in education by other authors. We used a total of 23 research papers taken from well-reputed journals like Springer Nature, IEEE XPLORE, AIP Publishing, ISRES Publishing, and a book chapter from Intech Open to synthesize our findings.

IV. LITERATURE REVIEW

Modern education is being reshaped with the use of Artificial Intelligence (AI), which enables personalised learning experiences to adapt to a user's individual needs and preferences [1], [7]. AI-driven content, as well as educational and student-centric model sequences, are now leveraged by adaptive learning systems to deliver personalized instructions, pacing, and assessments to learners [2]. In our research, we came across two models: a) the educational model, and b) the student model. The educational model (better known as the pedagogical model) designs learning objectives, provides distributed practice sessions until mastery of the topic, and offers corrective feedback at regular intervals. On the other hand, the student model is responsible for constantly tracking performance to adjust task difficulty levels such that it fits within each learner's zone of proximal development [2], [6]. Intelligent Tutoring Systems (ITS) such as Betty's Brain and MetaTutor act as effective platforms for students to self-examine and self-regulate their learning strategies and often include key functions such as goal setting, reflective evaluation, and self-monitoring - all of which lead to better learning outcomes and skill transfer [3]. Generative AI (GAI) systems such as ChatGPT further broaden the horizons of these capabilities by imitating human-like speech, offering 24/7 availability, and delivering multi-channel resources catered to each user's auditory, visual, and kinesthetic learning preferences [2], [6].

In one of the studies used as a reference in this paper, a survey of 247 undergraduate students concluded that a total of 68.8% of the students admitted to employing ChatGPT for personalised tutoring, thus highlighting the model's rapid adoption rate, as well as its perceived effectiveness in nurturing engagement and comprehension even among university students [6].

Even though several benefits relating to knowledge acquisition and learner engagement are listed as key benefits to the use of AI in teaching, concerns related to data privacy and security, socio-emotional development, and algorithmic bias still face AI tutors [7].

Moreover, the risk of learners becoming over-reliant on AI systems is always looming just over the horizon, with experts across literature arguing that students' tendency to *"prefer faster solutions (stemmed from generative AI recommendations) over slower ones backed by practicality is limiting their ability to make decisions, critically explore content for educational and research purposes, and perform comprehensive analytical reasoning"* [8].

Some scholars contend that using AI tutors in teaching may also broaden the gap between privileged and underprivileged students across borders, with the latter receiving the short end of the stick [7]. This notion is backed by the argument that historically underrepresented populations usually get to use the AI teaching tools once it has already been made available to the large-scale public, when making changes to the system may prove to be more difficult than if it had been pointed out in the pilot-testing period (when historically well-supported populations had the opportunity to try it out). As a result, when the underrepresented groups use the tools, it does little to cater to their way of learning, as the model has already been programmed for their well-represented counterpart [9]. On top of that, AI systems cannot yet cater to learners' socio-emotional needs by offering the same level of sympathy as human tutors, and only using AI tools in teaching may also inhibit students from realising their higher-order needs, such as teamwork and creativity [3], [5]. Furthermore, most AI learning tools remain solely focused on very specific performance metrics, oftentimes only that relating to the content the student needs help with, and thus overlooks other key areas of importance such as general competencies and the learning agency of students, as defined in frameworks like the OECD Learning Compass 2030 [5], [9].

One interesting study we came across delved into the use of AI for the *processes* of learning rather than the *products* of education. As defined by the author of the original paper, the product of a learning program would be an essay that a student writes, which can then be used to gauge the student's understanding of a certain subject - or in other words, the process by which they were able to learn about said subject. The same study then went on to investigate how AI learning tools could be used to reduce maths anxiety in students and concluded that the practical application of AI in mathematics improved learners' acumen in the subject by giving them a heightened sense of control and value [3].

Even though AI tutors are versatile enough to promise the democratization of education on a global scale by attenuating the impact of teacher shortages and expanding the reach of quality education to remote and underserved communities [4], this feat still requires global governments to address technological barriers so that strong data governance can be guaranteed.

Lastly, we believe that while AI is effective as a personalised tutor - helping students attain one-on-one lesson plans catered to their individual needs, among other things - it alone cannot be used as a method of imparting beneficial knowledge. As such, crucial principles like honesty, empathy, respect, responsibility, and kindness cannot be taught to students without the existence of an actual teacher in the learning space from whom learners will pick up on manners, etiquette, and good conduct simply through observation.

V.FINDINGS & DISCUSSION

AI is reshaping the entire framework of personalised learning across all levels, from early childhood to higher education and even vocational training. Its growing ability to deliver catered instruction to students stems from its roots in automated adaptive learning systems backed by its capability to analyse learner behaviour, and deliver dynamic feedback without a significant lapse in time. Current literature confirms that AI-based personalised learning systems stimulate better learning outcomes, enhance students' engagement, and give learners better access to education, despite questions around overreliance, empathy gaps, and fairness being raised.

Throughout all stages of learning, AI tutors and Intelligent Tutoring Systems (ITS) have displayed the potential to replicate or even surpass some of the benefits of interpersonal human interaction between teachers and students in the classroom. Some studies we reviewed highlighted how AI supplements student learning by offering on-the-spot adaptation to a learner's pace, skill level, and progress so that they're not under- or overwhelmed by the study load; hence, helping instructors bridge learning gaps more effectively than traditional classroom methods [2], [7]. Tools like MetaTutor and ChatGPT, among other dialogue-based platforms, have exhibited the ability to foster metacognitive skills such as self-regulation, goal-setting, and reflection in learners [2], [3], [11]. As such, these systems have become increasingly important in higher education and self-learning conditions, where individual attention from instructors is limited [24]. A study by OECD published in the OECD Digital Education Outlook in 2021 [9] mentioned how AI-based platforms can aid educators in having a better understanding of their students so that they can intervene with the students' learning journey at the right time. For instance, chatbots and automated tutors provide instantaneous feedback and generate constructive learning frameworks that are in line with a learner's current level of understanding [6], [11], [18]. AI tutors are especially helpful in mathematics and language education, where studies have shown that they

increase information retention through techniques like spaced repetition and retrieval practice, often at a much lower cost and higher availability than human alternatives [3], [5], [16].

A noteworthy benefit of using AI tutors is their ability to promote equity in education. Personalised AI systems have been proven to provide access to quality teaching resources, which is particularly helpful in underserved communities and in communities where experienced tutors are rare [12], [20], [21]. Technical schools in the UAE used AI-enabled tools in vocational education and have reported that it helped reduce dropout rates and supported student progress through predictive modelling and personalised content delivery [10]. Likewise, students with disabilities, language learners, and students from multinational or multicultural backgrounds all reported having benefited from the ability of AI tools to cater instructions across sensory modes (text, audio, and video) [10], [22], [23].

From an analytical point of view, personalised AI tutors are associated with enhanced learner motivation and knowledge acquisition. Studies have shown how AI tools helped improve psychological engagement and the overall quality of learning by adjusting the task complexity and providing on-the-spot support through feedback [6], [21]. Generative AI tools, specifically, such as ChatGPT, are more adept at helping students achieve better performance in problem-solving and reflective thinking [13], [15], [23]. These AI tools also help tutors by reducing grading time, making content creation less time-consuming, and serving personalised alerts for each learner - all of which helps educators allocate more time to the human-centric aspect of teaching.

Despite all this, AI systems have multiple limitations. One of the most frequently discussed concerns across the literature is the absence of human empathy in AI-driven education tools. Even though AI can simulate conversational flow and give learners immediate feedback on their performance, it often struggles to understand emotional cues, subtle lapses in motivation, or socio-cultural dynamics that humans can easily manage [3], [6], [12]. Multiple researchers have warned against over-reliance on AI, stating that it would lead to reduced educational diversity and over-standardised student experiences [14].

An increasing number of research studies are also highlighting the effect of overreliance on AI systems for learning, stating that doing so is weakening students' critical thinking skills over time [8], [18]. On top of that, algorithmic bias and data privacy issues remain pressing since AI systems are constructed upon a bed of training data obtained through machine learning (ML), and the responses provided by the AI tool will only be as fair as the data it was provided with. In other words, faulty or biased data may lead to further discrimination than traditional learning experiences [17].

Evidence from Gabriel et al. [3] and OECD [9] both show that blended learning environments - where AI and human teachers co-exist side by side - yield the best outcomes.

Furthermore, AI systems may often tend to be too lenient or over-affirming, which may lead to students developing a false sense of proficiency, which will only affect them negatively down the line [11], [14].

Some learners have also mentioned that they feel 'disconnected' with the AI when the responses come in too fast or are too impersonal [13]. Technical and vocational learners may have a higher likelihood of feeling this way since their study content is mostly based on practical and applied methods [10], [20].

VI. CONCLUSION

To conclude, we affirm that AI plays a significant role in transforming education by way of increased personalisation. Its core strengths lie in automating and scaling individual support, improving engagement, and making education more accessible. Needless to say, if AI systems should be implemented across all educational levels and scenarios, they must first be built ethically - keeping cultural and socio-dynamic context in mind, and used alongside human intellect. Instead of making the whole discussion about one or the other, AI tutors should be used to augment rather than replace human educators. While AI systems provide automated instructions, instantaneous personalised feedback, and access to a large pool of information, human teachers can nurture students through empathy and instill core morals and values in them, to ensure learners turn out to be good people and not just good students. At the end of the day, the efficacy of AI in education isn't just a measure of how fast it can help students get the work done, but rather about whether it can be used to foster pedagogical integrity, data transparency, and inclusivity within students.

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