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Review Article

AI ChatGPT and student engagement: Unraveling dimensions through PRISMA analysis for enhanced learning experiences

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ABSTRACT

This PRISMA-based literature review aims to assess and analyze the measurement of student engagement dimensions within AI ChatGPT interactions. The central question is how to effectively evaluate these dimensions using established methods and leverage insights to enhance AI ChatGPT's capacity to foster student engagement. The systematic review of PRISMA methodology identifies 16 relevant peer-reviewed research. All relevant and eligible research according to PRISMA methodology are analyzed to comprehend the intricacies of student engagement in AI ChatGPT interactions. The synthesis of these findings unveils the current state of knowledge on AI ChatGPT's influence on student engagement and uncovers opportunities for future research. This review underscores AI ChatGPT's potential as an educational tool, offering personalized experiences that bolster student engagement and learning outcomes. The systematic review established that, even though using ChatGPT has many advantages such as enhancing student engagement and academic involvement and supporting inquiry-based learning. However, there are some negative aspects such as lacking empathy and human emotions, limited contextual understanding, increased technology dependence and possibility of Inaccurate or Biased Information. In summary, this PRISMA-based review contributes to understanding the measurement of student engagement within AI ChatGPT. It identifies best practices, laying the foundation for further research and development. By optimizing AI ChatGPT's effectiveness, educators and developers can craft more engaging and tailored learning experiences, ultimately enhancing educational outcomes.

Keywords: artificial intelligence, ChatGPT, teaching, learning, student engagement

INTRODUCTION

ChatGPT is a variation of the GPT-3's (generative pre-trained transformer 3) artificial intelligence (AI) language model, which was developed by OpenAI. It was introduced in 2021 and is explicitly intended to produce conversational and human-like language. It has attracted a lot of media and technological attention. ChatGPT is built on the transformer architecture, which Mhlanga (2023) first described in his study and has

subsequently been widely applied to natural language processing problems. With 175 billion parameters, ChatGPT is one of the largest language models currently available and stands out for its vastness. Its capacity to complete various linguistic tasks with little or no task-specific training, including translation, summarization, question answering, and text production.

Language translation, content creation, and language modeling are just a few of the uses for ChatGPT that have been reported since its debut. It has been demonstrated that ChatGPT can produce accurate translations between languages and summaries of lengthy materials that are cogent and educational. ChatGPT has also been used to develop chatbots that can converse with users and respond to inquiries, showcasing its capacity to comprehend and act upon inputs in natural language. The fact that it can produce plausible and coherent writing has also garnered a lot of interest and controversy, raising questions about the possible applications and effects of AI in the language processing field (Firat, 2023).

Due to its simplicity of usage, ChatGPT has recently gained a lot of acceptance in educational institutions. Despite the opposition that AI is seeing in its battle to be accepted in educational institutions, its users are rising every day. This model can help with assessment design, essay production, and language translation in educational settings. It also allows users to ask and answer various questions, summarize materials, and engage in peer-to-peer interaction. According to Cotton et al. (2023), a model like this might also show innovation in writing on virtually any issue, from a single paragraph to a complete research piece that can be viewed as persuasive or almost convincing. The use of ChatGPT and other language models, which can be used in various contexts, including writing assistance, language acquisition, research, and administration, is also suggested by Zhai (2022) who believed that tertiary education could gain significantly from their use. Thus, it may be argued that ChatGPT has the potential to be a helpful tool for research and education in general.

The following are some of the approaches through which student engagement using ChatGPT can be understood. The approaches include a study of the self-determination theory (SDT), an analysis of Bloom's taxonomy on student engagement, the justification for using ChatGPT in schools, an analysis of the unique features that have made ChatGPT popular among students, and so on.

LITERATURE REVIEW

Self-Determination Theory

SDT is a theory of motivation that informs its class-room applications by using conventional empirical methods to construct its theory. The 40-year-old theory is based on the premise that all students, regardless of their gender, socioeconomic status, nationality, or cultural background, have inherent growth tendencies (such as intrinsic motivation, curiosity, and psychological needs) that serve as a foundation for their high-quality classroom engagement and positive school functioning. While other motivation theories describe how students' expectations, assumptions, and goals affect their engagement in the classroom, SDT is distinctive in that it emphasizes the instructional task of reviving students' internal motivational resources as the essential step in promoting high-quality engagement (Chiu, 2022).

In other words, SDT pinpoints every student's intrinsic motivational resource and suggests how teachers might engage, cultivate, and vitalize these resources throughout instruction to promote high-quality student engagement. The hypothesis recognizes that occasionally, students lack motivation, exhibit disaffection, and behave irresponsibly. SDT research identifies the classroom conditions that support and vitalize students' inner motivational or intrinsic motivation resources versus those that neglect, undermine, and thwart them to resolve the apparent paradox of having these resources on the one hand while displaying disaffection on the other. In doing so, SDT examines how different levels of student involvement are a function of how students' internal resources interact with the classroom environment (Xia et al., 2022).

Different motivational phenomena (like intrinsic motivation) and research problems (like how extrinsic rewards affect intrinsic motivation?) have emerged and required empirical examination as SDT research has progressed. To explain these motivating events and respond to the study issues they were related to, five mini theories arose. A few mini-theories, such as the basic needs theory, emphasize psychological needs as innately motivating resources and detail how they relate to students' motivation, high-quality engagement,

efficient functioning, and psychological wellness in a foundational and nutrient-like manner. The main topics of the organismic integration hypothesis are the internalization and reasons why pupils initiate socially significant but not intrinsically motivated acts (Al-Jubari, 2019).

The merging of traditional classrooms with the extensive use of computerized teaching and learning methods, known as blended learning environments, results from the fast-expanding interest in technology-based learning contexts among instructors and learners. Face-to-face instruction and computer- or technology-assisted teaching make up the majority of mixed-learning environments.

It's crucial to remember that these two learning styles are frequently blended and dis-cussed in the classroom. The debate between SDT and technology-enhanced out-of-class language learning remains mostly unexplored in the literature regarding students studying English as a foreign language (EFL) who have little to no exposure to it outside of the classroom (Xia et al., 2022).

Student Engagement

Academic achievement and the efficiency of learning are both impacted by student participation in the classroom (Aycicek & Yapar Yelken, 2018). Students who vigorously participate in their education are likely to retain knowledge, develop their capacity for critical thought, and relate what they have learned to real-world circumstances (Bond et al., 2020). Furthermore, students who participate actively in class have reasonable attendance rates, do better academically, and have more hopeful attitudes toward knowledge (Bedenlier et al., 2020).

Group projects and interpersonal interactions in the classroom also foster co-operation and the development of communication skills (Bond & Bedenlier, 2019). Teachers play a crucial part in fostering student engagement by fostering a welcoming and inclusive learning environment, promoting participation, and providing opportunities for experiential learning. The achievement of academic objectives and putting students on the path to future success in their chosen occupations depend on student participation (Abdelrahman et al., 2017).

Table 1 contains a sample of 16 articles that show the contributions of ChatGPT in amplifying student engagement. For the purposes of authenticity, the articles, which are used in this research paper have been tabulated, clearly showing the name of the author and year of publication, the size of the sample tested, the aim of the study as well as the main findings from the individual article.

Some extracted articles used for this study are listed in **Table 1**.

Table 1. Scopus database

Author	Country	Sample	Data collection	Research design	Research goals	Major findings
Ausat et al. (2023)	Indonesia	-	Questionnaire	Critical literature review	Article tries to analyze role of ChatGPT in improving student productivity in higher education.	While work output & the workability of students in universities has been improved courtesy of chat GPT software, caution must be taken by both students & their lecturers on how to use AI platform, so as to strike balance between speed & creativity in their day to day lives.
Božić and Poola (2023)	Croatia	-	Survey	Literature review	To establish relationship, if there is, between education & ChatGPT.	ChatGPT is at center of education. Both students & teachers are currently using ChatGPT, at different capacities, as a result, there needs to be a limit as to which AI can be used.

Table 1 (Continued). Scopus database

Author	Country	Sample	Data collection	Research design	Research goals	Major findings
Cotton et al. (2023)	United Kingdom	-	-	Observational research	To improve student engagement, teamwork, & accessibility with ChatGPT in higher education, & analyzes possible benefits & drawbacks of it.	To engage in group discussions, presentations, or other interactive activities, where knowledge & skills are needed & this can encourage autonomous learning & critical thinking while making it more challenging for students to accomplish their projects using ChatGPT or other AI language models.
de Castro (2023)	Ireland	-	Survey	Critical literature review	Research aimed at establishing both benefits & limitations of using ChatGPT in student engagement.	Educational system may benefit from increased student engagement, tailored learning opportunities, & improved teaching methods, to name just a few benefits of ChatGPT. But there are some negative implications as well, such as concerns about your privacy, academic integrity, & the probability of bias.
Essel et al. (2022)	South Africa	68 undergraduate students	Questionnaire	Survey & quantitative research	To integrate with chatbot, students may be helped to relate what they are learning to actual problems or precedents, which will motivate them to think critically about what they are learning.	Students who interacted with chatbot performed better than those in control cohort who interacted with course instructor, main findings & arguments support value of using chatbots in higher education.
Firat (2023)	Türkiye	-	-	Observational research	To boost independence & autonomy of self-directed learners by offering individualized guidance, support, & feedback through ChatGPT to enhance their motivation & engagement.	Advanced AI technology like ChatGPT's model has potential to close gaps in global education & promote self-directed learning by facilitating interactive & dynamic learning environments that allow people to have productive conversations, clear up their doubts, & explore different viewpoints.
Jauhiainen and Guerra (2023)	Uruguay	-	Questionnaire	Observation	Aim of it was to examine opportunities & challenges of using ChatGPT in higher education & discuss potential risks & rewards of these tools.	It discovered that if use of ChatGPT is not regulated, there is a great likelihood of academic dishonesty in learning institutions.

Table 1 (Continued). Scopus database

Author	Country	Sample	Data collection	Research design	Research goals	Major findings
Kasneci et al. (2023)	Germany	-	-	Observational research	To customize learning experiences, increase student involvement & engagement, & produce instructional material using models.	Creating engaging, interactive instructional materials, including quizzes & flashcards, assigning self-directed projects, that may be utilized to enhance student learning & build their own concepts & solutions.
Kasneci et al. (2023)	Germany	-	Questionnaires	Critical literature review	It endeavored to find out potential benefits & problems related with educational applications of large language models, from student & teacher perspectives, using ChatGPT.	While using ChatGPT, caution must be taken, lest we lose human creativity.
King (2023)	Tennessee	-	Survey	Critical literature review	Research aimed at finding out influence that use of AI has brought in higher institutions of learning for example universities.	University students have more of misused ChatGPT in manner in which they handle their assignments. They no longer take their time in fact finding, they just pick information from AI platform.
Mhlanga (2023)	South Africa	-	-	Literature review & observational research	Encourage teachers to use ChatGPT in a way that enhances their teaching strategies & promotes students' engagement in analytical & critical thinking.	Use of language models to create instructional material, improve student interaction & engagement, & customize learning experiences.
Muñoz et al. (2023)	Peru	350 students & instructors	Questionnaire	Literature review	This study aimed to examine impact of ChatGPT on student motivation as well as engagement.	According to research, ChatGPT encourages students to become more motivated & involved in their education. Consequently, to enhance student learning results, policymakers should encourage adoption of ChatGPT in educational system.
Qadir (2022)	Qatar	-	Survey	Qualitative research	To find out impact of ChatGPT in education system.	Quality of ChatGPT & other AI systems depends on quality of training data, but they reinforce prejudices & disseminate false information. Use of generative AI in education creates ethical issues like risk of students using it in an unethical or dishonest manner & possibility of human jobs being lost.

Table 1 (Continued). Scopus database

Author	Country	Sample	Data collection	Research design	Research goals	Major findings
Tlili et al. (2023)	China	-	Survey	Qualitative instrumental case study	This study examines role of ChatGPT in education settings, amongst early adopters, through a qualitative instrumental case study.	When evaluated through prisms of educational transformation, response quality, personality, emotional intelligence, & ethics, ChatGPT has had a role in influencing direction that learning in our school has taken. Since students may learn some things on their own, teachers are no longer required to do everything for them.
Vasconcelos et al. (2023)	Brazil	-	Survey	Literature review & single-case study	It aimed at demonstrating role of AI in improving academic student engagement.	It's findings showed how ChatGPT & Bing Chat can support students in growing in their capacity to think critically & reflectively, as well as in their ability to be creative & solve problems.
Zhai (2022)	Georgia	-	Survey	Systematic literature review	It intended to find out the views of various users of ChatGPT, their levels of satisfaction & dissatisfaction as well as gauge their views on future of AI.	ChatGPT has shown many satisfactions amongst users. They specifically have shown their excitement over ChatGPT.

Measuring Student Engagement

Engagement taxonomy

The framework of Bloom's taxonomy can be used to categorize stages of thinking. In recent years, the learning processes associated with the use of technology have been studied using a framework based on Bloom's taxonomy, which has been widely employed in educational research. Because of these factors, Bloom's taxonomy was chosen as the framework to assess students' cognitive abilities while they engaged in learning activities (Appleton et al., 2008).

In Bloom's taxonomy, one of the subtypes is the cognitive domain. From lower to higher order thinking skills, these include remembering (ability to recall information such as dates, events, places, ideas, definitions, formulas, and theories); understanding (ability to grasp the meaning of the information and express it in own words and/or cite examples); and applying (ability to apply knowledge or skills to new situations, use information and knowledge to solve a problem, answer a question) (Brooks & Weaver, 2017).

The focus of cognitive engagement is the student's internal investment in the learning process, which includes the psychological traits they possess on the inside or their non-visible characteristics that encourage effort in learning, understanding, and mastering the knowledge or skills that are emphasized in their academic work (Abdul Latif et al., 2017).

The behavioral engagement domain enquires about how students perform in class, how they participate in extracurricular events, and how attentive they are in their academic engagement. Students' behaviors in relation to the classroom or school norms, prospects, or rules are examined in studies on students' in-class behavior (Christenson et al., 2012).

When a student behaves positively by adhering to classroom or school expectations, that shows higher student engagement. When a student behaves negatively, such as by disrupting class or defying an administrator, that shows lower engagement or disengagement (Clark, 2015). Student involvement in school-

related activities, such as participation in school-sponsored events or in-class activities, constitutes the second factor of behavioral engagement (Abeysekera & Dawson, 2015).

Psychological engagement focuses more on internal, invisible features rather than the normal outward observable features (Coates, 2007). When measuring student engagement based on the psychological student engagement taxonomy, the focus is usually on the feeling of identification or the sense of belonging exhibited by the student, the closeness with the teachers, as well as the relationship with the other students in the classroom or school setting (Al-Harbi & Alshumaimeri, 2016).

Academic engagement, on the other hand, is determined by factors including time on task and credits gained toward graduating and finishing your homework (Castro et al., 2015). Academic engagement also encompasses activities like finishing projects and spending time on tasks. Academic engagement is a growing area of study in higher education. The academic engagement has been conceptualized as a "positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption." Vigor specifically refers to strong levels of energy and mental toughness during studying, as well as the persistence and excitement to put in time, especially in the face of challenges (Appleton et al., 2008).

Intense involvement in one's studies while experiencing a sense of challenge, inspiration, and pride is referred to as dedication. Lastly, absorption is defined by intense concentration, being gleefully absorbed in work such that time passes swiftly, and even finding it challenging to extricate oneself from academic responsibilities. As a result of their success and accomplishment of their goals, pupils may feel driven and engaged (Avery et al., 2018). Therefore, rather than referring to a brief and particular condition, academic engagement refers to a persistent affective and cognitive state of contentment toward studying and learning.

Constructs of student engagement

Table 2 shows the engagement constructs.

Table 2. Engagement constructs

Name	Construct definition
Engagement	A. How much participation in academic and extracurricular activities students have, how much they are aware of and care about the educational objectives. B. When psychological needs (such as autonomy, belonging, and competence) are attained in cultural enterprises such as family, school, and the workplace, engagement occurs and is shown in effect, behavior, and cognition; if not, disaffection takes place. C. Relationship between an individual's actions & their synergy, which comes in three different ways (behavioral, emotional, & cognitive), D. Good emotional tone & sustained behavioral engagement in learning tasks (as opposed to disengagement). E. Action, effort, & perseverance with schoolwork as well as general emotional moods while engaging in learning activities.
Engagement in schoolwork	F. Involves both actions and feelings and is influenced by ideas of capability and control (I can), principles and objectives (I want to), and social connectivity (I belong).
Academic engagement	G. The level of student motivation for learning and academic success.
School engagement	H. Engagement subcategories include behavioral (attending school), cognitive (investing in learning), and emotional (reactions to teachers, students, academics, and school). I. Within student, peer group, classroom, and institutional contexts, affective, behavioral, and cognitive engagement subtypes. J. Subtypes of engagement are behavioral (observable activities), cognitive (perceptions and beliefs), and affective (feelings towards school, teachers, and peers).
Student engagement	K. Willingness to engage in customary academic activities and subtly noticeable cognitive, behavioral, and affective indications of students' engagement in particular academic tasks. L. Engagement of students in the events provided as part of the school curriculum. M. Academic/cognitive (students' efforts, investments, and learning techniques), social, behavioral, participatory (peer interactions), and emotional (feelings of connection to the school, including their performance, the environment at school, and relationships with others).
Student engagement in academic work	N. Psychological process involves focus, interest, commitment, & effort that students put into their academic study. O. The psychological investment made by the student in, and the effort put forth to learn, comprehend, or master the academically intended knowledge, abilities, or crafts.

Table 2 (continued). Engagement constructs

Name	Construct definition
Student engagement in/with school	P. Participatory behavior & attitudes toward secondary school programs (emotional & behavioral states). Q. Continuous engagement (including behavioral, emotional, and cognitive aspects); response to difficulty (ideally, engages positively). R. Academic (such as time on task), behavioral (such as involvement), cognitive (such as self-regulated learning), and psychological (such as belonging) engagement.
Participation Identification	S. Taking part in school (at four progressively higher levels) and feeling like you belong there and value what you learn there are two aspects of identification with school.

Students' engagement using technology

Technology has been effectively incorporated into class-room instruction and is studied through the approach of the technology acceptance model (TAM) (Ma'rifah & Sinaga, 2023). Technology developments have created new possibilities for raising classroom student engagement. Researchers have recommended several cutting-edge technologies that can assist teachers in developing more dynamic and engaging learning experiences for their pupils (Caverly, 2017).

In order to increase the frequency of student involvement, many instructors employ technology to support them and enhance student learning opportunities. This involves the usage of clickers or Keypads, and interactive student response systems. Gamification is a type of technology that makes learning more entertaining and engaging by incorporating characteristics seen in games. Teachers may raise student enthusiasm and promote active involvement by adding gamification to class activities. Another promising technology is virtual and augmented reality, which gives students immersive experiences that replicate real-world events (Antonenko, 2015).

Another technology that may provide teachers with knowledge of their students' levels of engagement, academic success, and areas of difficulty is learning analytics. Researchers have come up with many methods of measuring student engagement in the classroom with time. These techniques are based on empirical information and have been proven to be successful in capturing students' levels of engagement and participation in the learning process. Classroom observation is one of the most popular techniques in which trained observers record and evaluate students' activities, interactions, and levels of participation while a class is ongoing. Student surveys are another useful tool for gathering information on how engaged, interested, and motivated students are in the classroom (Bedenlier et al., 2020).

Other techniques include evaluations of one's own performance, tracking of attendance and participation in class, and evaluations of student performance. These techniques give teachers insightful information on how engaged their students are, and they assist in identifying areas, where their instructional techniques need to be improved to boost engagement and enhance learning results. Teachers may better understand their students' needs and modify their teaching strategies to create a more encouraging and inclusive learning environment that promotes engagement and academic achievement by employing research-based methodologies to evaluate student engagement (Antonenko, 2015).

According to Peterson et al. (2020), using KeyPad in a big classroom was quite beneficial. KeyPad technology was implemented in classes to see if it would increase students' involvement. It turned out that it did because it is a straight-forward technology with empirical evidence of its efficacy. TAM is majorly being implemented online or instead e-learning in learning institutions, as it has been proven to be the most effective way of student engagement (Castañeda & Selwyn, 2018).

E-learning, at times, referred to as online learning, has been applied in practically all higher learning institutions all over the world during the past 15 to 20 years (Chaipidech & Srisawasdi, 2016). The ability for students to use an online system that manages their coursework, materials, chats, and tests online has allowed it to surpass conventional teaching and learning techniques in the meantime. The expansion and maintenance of their e-learning platforms have attracted millions of dollars from universities worldwide (Cheng et al., 2018). Two of the well-known online learning systems are Blackboard and Moodle. Some colleges employ e-learning applications they developed themselves. It is essential to have a deeper knowledge of why students use (or do not use) e-learning for the implementation to be appropriately optimized (Peterson et al., 2020).

Using ChatGPT to engage students

To be successful in the digital era, one ought to have a distinct "autodidactic" profile. This profile is identified by a strong desire to gain knowledge, the capacity to trace and use digital materials, and the readiness to accept accountability for one's own knowledge. Because they are better able to navigate the constantly shifting landscape of the digital world, employers are continuously seeking individuals who own these potentials. The process of learning independently without the direction or assistance of a teacher or instructor is known as autodidactic or self-directed learning. Open educational practices (OEPs) and other OEPs are frequently used in autodidactic learning, which depends on the independence and autonomy of the learner to control their personal procedure (Firat, 2023).

According to Schweder and Raufelder (2022), autodidactic learning allows students to control their own education and growth, learn at their own pace, and tailor their learning to suit their own necessities and aims. Thanks to OERs and other OEPs that are becoming more widely used, anyone can now more easily obtain top-notch learning resources and materials. According to Schweder and Raufelder (2022), this has contributed to the democratization of education and increased its accessibility and affordability. At this time, ChatGPT, a recent AI development by OpenAI that attracted 1 million users in just 5 days, seems aspirational enough to advance this aid.

Maximum student engagement and the fact that ChatGPT allows for simple navigation and fast access to the internet's vast knowledge base make the research of ChatGPT's capacity to improve autodidactic learning vitally. It might pinpoint the most effective strategies and methods for applying chatbots and other AI tools in education and offer direction for the direction of education and the application of technology to learning in the future. By being aware of how ChatGPT might encourage the independence and independent study of autodidactic learners, students may use these technologies to aid and increase their own engagement and development more effectively (Firat, 2023).

For students to connect with one another and actively participate in their study, ChatGPT may be a potent tool. It can help kids develop ideas, do tasks, and practice their language abilities. ChatGPT can produce information and explanations that can aid students in understanding the subject matter by accepting keywords or phrases associated with a certain topic. It can give suggestions for improving the structure of the work as well as comments on writing tasks and the detection of grammatical faults. Students can converse using ChatGPT, which can offer feedback on their grammar and vocabulary, to learn to speak different languages (Lund & Wang, 2023).

Justification for growth of ChatGPT among students

According to the research, students use ChatGPT and other AI-powered tools because they provide individualized and adaptive guidance, immediate feedback, and easy access to learning resources. These tools are anticipated to increase in popularity and usage in education as they develop and improve. ChatGPT is fast rising and greatly used by students worldwide because of its own popularity. It is estimated that ChatGPT grew by one million users just within five days. This means that the ChatGPT in itself is famous, and for this reason, many learners have heard about it and are actively using it, to remain relevant and up to date in their schoolwork (Mhlanga, 2023).

ChatGPT can participate in many discussions that are currently going on, comprehend and react to input in natural language, and provide interactive and personalized support. As a result, ChatGPT is a potential tool for open education since it can increase the independence and autonomy of self-taught learners and is both practical and adaptive. ChatGPT can potentially improve motivation and engagement among self-directed learners by offering individualized guidance, support, and feedback (Ausat et al., 2023).

The use of chatbots and AI in education has been looked into in several research. This research has found a number of reasons why students are increasingly using ChatGPT and other AI-powered tools, as shown in **Figure 1**.

Figure 1. Justification for using ChatGPT (adapted from Mhlanga, 2023)

1. **Ease and accessibility:** Students like the accessibility and ease of AI-powered tools like ChatGPT. These materials are available to them throughout on any inter-net-connected gadget, from any locality, at all times.
2. **Personalization as well as adaptability:** AI-driven materials may be attuned to meet every learner's unique requirement and preference. For instance, ChatGPT may adjust to a student's writing style and offer individualized feedback and recommendations based on their particular skills and limitations.
3. **Instant feedback and support:** AI-powered tools may provide students with instant feedback and support on their work, which can allow them to improve their performance and stay motivated. Particularly ChatGPT may provide students writing critique, fresh idea suggestions, and assistance with better work structuring.
4. **Language practice:** Chatbots and AI-powered systems like ChatGPT may offer students language practice and feedback on their language abilities, which can be especially useful for students who are learning a foreign language.
5. **Cost-effectiveness:** Many AI-powered products, like ChatGPT, are free or inexpensive, making them an economical alternative for students who may not have the ability to pay for pricey study aids or tutoring services.

Support That ChatGPT Makes for Students

ChatGPT can be a powerful tool for students to interact and engage in their learning in many ways. Due to its excellent and individualized features, ChatGPT is an AI language model that has gained widespread acceptance from people, making it a useful tool for various uses. Being a free program makes it available to anybody with an internet connection, which is one of the main factors in its success (Qadir, 2022).

Due to its excellent and tailored features, ChatGPT is a useful tool for people. Users may easily access this free program from any location at any time because it can be loaded on a range of devices. It can create learning exercises, save time and effort, narrate tales, provide answers, summarize, and propose ideas. It is also quite configurable, allowing users to create a tool that is unique to them. Overall, ChatGPT is a really creative and adaptable technology that is revolutionizing how people study and interact with knowledge (Halaweh, 2023).

ChatGPT helps students in so many ways, making it the students' favorite tool for learning and engagement. For example, ChatGPT helps students in completing assignments, answering complicated questions, some of which cannot be solved by an average human brain, helps students in writing, and providing timely feedback, feed-back, ChatGPT also helps in generating examples, generating Possible solutions, ex-plaining concepts, laws, theories, as well as facts (Anders, 2023).

Literature Review Summary

In summary of the topic under study: A review of methods for measuring and analyzing student engagement generated through AI ChatGPT, ChatGPT is a useful resource for students all across the world due to its capacity to offer individualized guidance across a range of engagement metrics. ChatGPT can offer tailored and efficient support that caters to the particular needs of each individual student by utilizing the most recent developments in natural language processing and machine learning. ChatGPT can give students the assistance and direction they need to succeed, whether they are doing projects, responding to inquiries, writing and providing comments, coming up with creative and adaptable technology, or elaborating on ideas and legislation.

Even though the body of research has already done a substantial job of highlighting ChatGPT's advantages in raising student engagement, there are still unanswered questions and possible directions for further research. A thorough analysis of the moral issues related to ChatGPT usage in educational contexts is one essential component. A careful examination of the ethical ramifications of using AI, like ChatGPT, to increase student engagement is necessary. These aspects include data protection, consent, and responsible technology usage. Further research is needed to fully understand ChatGPT's potential to promote accessibility and inclusion for children from diverse backgrounds and abilities. Moreover, there is a need to investigate how prolonged usage of ChatGPT affects students' critical thinking. Through the examination of these facets, scholars may offer significant perspectives on the dynamic field of AI in education and offer counsel to educators and policymakers regarding the maximization of ChatGPT's advantages while mitigating its possible disadvantages.

METHODOLOGY

Systematic Review

In order to scientifically identify, assess, and synthesize all the data that is pertaining to a particular research paper or field of study, one ought to carry out a research process known as a systematic review. It is a particular type of literature review, which employs a deep and rigorous procedure to trace down, assess, as well as summarize all publications that are available on a certain area of study (Mhlanga, 2023).

In a systematic review data must be extracted only from the selected database and the quality of the included studies must be weighed, and the findings must be synthesized deeply. The research questions must be evidently defined, a search strategy must be established, studies must be screened and selected based on prearranged inclusion as well as exclusion criteria, and data must be obtained from the chosen studies (Mhlanga, 2023).

Due to the fact that the studies extracted aim to provide a full and impartial valuation of the knowledge that is already available on a given topic, systematic reviews are mainly used to direct decision-making in policy and practice. Furthermore, they can categorize areas in which a lot of study is necessary and gaps in the body of currently available research. Systematic reviews are frequently regarded as the highest quality of evidence in evidence-based practice because they follow a rigid and open method to minimize bias and ensure that all relevant material is incorporated (Firat, 2023).

PSCOC Structure

Table 3 shows PSCOC structure.

Table 3. PSCOC structure

Structure	Definition
Population	The study population in this research paper was students, in their various learning institutions.
Subject	Student engagement using Chat GPT.
Comparison	It compares different taxonomies of student engagement, academic, behavioral, cognitive, & psychological.
Outcomes	Students concentrate more on academic engagement at expense of rest of taxonomies of engagement.
Context	Trying to understand why ways in which Chat GPT can be used to maximize student engagement at various learning institutions.

Search Process

PRISMA methodology

PRISMA (preferred reporting items for systematic reviews and meta-analyses) methodology is a popular method employed when conducting some deep analysis, especially when conducting a research paper.

To address the need for a uniform, and open method of reporting the findings of systematic reviews and meta-analyses of a typical research, PRISMA methodology was created in 2009 (Cotton et al., 2023).

Identification is the process of choosing and varying the most suitable keywords to use when searching for articles. To improve the accuracy of the articles, keywords are necessary during the search process. Four important keywords were chosen for this study: ChatGPT, methods, analyzing, and student engagement. Synonyms, related words, and variations of the primary keywords were also looked up in an online Scopus database, along with research keywords from earlier studies and expert opinions, in an effort to diversify the keywords (Zhai, 2022).

Numerous vital functions of systematic reviews have been documented. They can address questions that would otherwise be impossible for individual studies to answer, they can spot issues in primary research that should be fixed in follow-up studies, and they can develop or assess theories explaining how or why phenomena occur. Syntheses of the state of technical know-how in a field are useful because they allow future research priorities to be determined. Because of this, systematic reviews produce a variety of knowledge for their many users, including patients, healthcare professionals, academics, and policy makers (Firat, 2023).

Studies' selection

In the screening phase, appropriate articles are chosen using inclusion or exclusion criteria to create the systematic literature review (SLR) (Chiu, 2022). The screening process involved several articles that had been successfully obtained during the identification step. To begin with the year of publication had to be aligned within the last three years (2020-2023) to make sure that the information extracted was updated properly too. There are a number of motives why this time frame was chosen. In the first place, it was consistent with the idea of research maturity in light of the fact that numerous relevant papers have successfully collected trustworthy data throughout this time.

Because of the significant increase in publications related to the topics covered in "a review of methods for measuring and analyzing student engagement generated through AI ChatGPT," only articles published in English and those with open access were chosen for quality control to prevent reading and comprehension difficulties. Since the major goal of this SLR was to identify past re-search findings rather than past research reviews, articles that were solely reviews were also omitted. As a result, only articles containing pertinent empirical data were taken into consideration for this study.

Eligibility Criteria

Eligibility criteria that were used while extracting the articles can be summarized, as follows:

1. Articles published between the years 2020 to 2023.
2. Articles published only in English.
3. Articles with Specific key words, that is, ChatGPT, methods, analyzing, and student engagement.
4. Articles with open access.
5. Articles containing pertinent empirical data.

Process of Identifying Relevant Literature Through PRISMA

Figure 2 shows PRISMA framework.

Assessment Quality Criteria of Present Study

Table 4 shows assessment criteria, which has been adapted from the checklist by Hamzah et al. (2022).

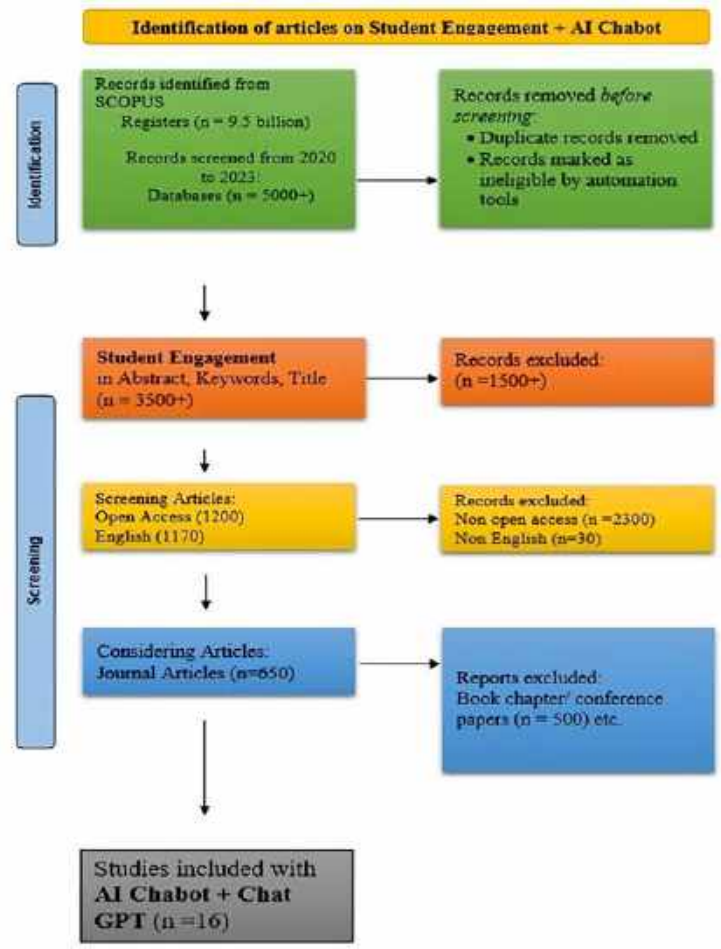

Figure 2. PRISMA framework (Page et al., 2021)

Table 4. Quality analysis check

Items	Answer (Y/N)
Is research question stated in a clear & concise manner? Is theory testable & evidenced by data?	
Do the findings of the study significantly advance the field of study? Does it deepen our comprehension of the research problem and hypothesis?	
Are the findings of the data analysis presented in a clear manner and backed up by the data? Are the statistical techniques suitable for the research hypothesis and question?	
Is a thorough and current overview of the research field is provided by the literature review? Is the review of the literature pertinent to topic of research?	
Is there a deep description of the data collection and analysis techniques? The research question and hypothesis must be compatible with the methodologies.	
Does the statistical analysis employed to address the research question make sense?	
Does the study plan try to reduce bias and error? Can inferences be made with this sample size? Can the study be repeated with ease?	
Is the research paper well-written, with precise and concise language? Are the facts and tables clearly presented and labeled?	

RESULTS

Due to the nature of this research paper, and the need to make it more professional, sixteen studies were selected. All of these 16 studies have been considered in the research because of their relevance to the research topic. However, there were several other studies, which were excluded under the inclusion and exclusion criteria from the Scopus database. Only the most suitable studies, which were considered best in answering the research questions, were chosen. All these studies tried to give their contribution on the on the area of analysis; a review of methods for measuring and analyzing student engagement generated through AI ChatGPT. It is noted that majority of the studies (10 out of 16) adopted qualitative methods.

Table 5. Number of studies by research method approach

Quality scale	Very poor	Poor	Fair	Good	Very good	Total
Number of studies	0	0	0	2	14	16
Percentage (%)	0.00	0.00	0.00	12.50	87.50	100

Table 5 shows number of studies by research method approach. Summary in percentage of the Hamzah et al.'s (2022) assessment of quality criteria is shown in **Table 5**.

16 selected files were measured on the Hamzah et al.'s (2022) scale, and the result showed that they were all so good. On the five-points scale, there were no "very poor" studies nor a "poor one". No single study was rated "fair" as all ranged from "good" to "very good". A whole 87.50% of the studies selected were "very good" with only 12.50% being rated "good". In general, the selected studies can be trusted to give valid research.

Primary Research Question

How can the different dimensions of student engagement generated through AI ChatGPT be effectively measured and analyzed using existing methods, and what insights can be gained from this analysis to improve the effectiveness of ChatGPT in promoting student engagement?

Through ChatGPT, the learning process has been made seamless. Student engagement has been improved hundredfold. Learning that is tailored to the needs of each student is now possible using ChatGPT, if their unique learning preferences, styles, and requirements are recognized. Students may become more motivated to learn as a result of this.

Also, Interactive learning activities including quizzes, games, and simulations are available through ChatGPT to students. These can be made to be both entertaining and instructive, which will help to keep kids interested and paying attention. ChatGPT Also gives real-time feedback: Students may receive feedback on their performance, development, and comprehension of the subject matter in real-time with ChatGPT. Students that are driven to keep learning might use this to pinpoint areas, where they need to improve.

Secondary Research Question

How can existing methods of measuring student engagement be applied to analyze the effectiveness of student engagement generated through ChatGPT?

Student engagement is frequently measured through surveys. One can always conduct a poll to find out how involved students are using ChatGPT, how valuable they think the tool is, and how happy they are with the learning process in general.

Learning analytics

Learning analytics can be used to monitor how frequently students use ChatGPT, the kinds of activities they take part in, and how much time they spend on the platform in order to gauge their level of engagement.

Self-reported information

Using self-report tools like journals or logs, teachers can ask students to provide information about their degree of engagement with the ChatGPT. With the use of this information, educators may learn more about how and how much students are engaging with the platform.

Observations

By keeping an eye on students as they use ChatGPT, observations can be made to gauge how engaged they are. The degree to which students are using the technology to support their learning can be determined by observations of how they are using it.

Data on achievement

By contrasting the academic results of students who use ChatGPT against those who do not, data on achievement can be used to gauge student involvement. If the students who use ChatGPT perform higher, it may be concluded that the tool is successful in energizing learners and enhancing academic performance.

Table 6. Overall percentage of various dimensions of student engagement using ChatGPT

SN	Reasons why students use ChatGPT in educational setup	Dimension of engagement using ChatGPT				SN	S?	Percentage
		A	B	C	P			
1	Ease & accessibility		x			S4	Yes	Academic
2	Personalization & adaptability		x			S5	Yes	43.75%
3	Exam preparation	x				S1	Yes	
4	Language practice	x				S3	Yes	Behavioral
5	Cost-effectiveness				x	S14	Yes	31.25%
6	Enhanced understanding			x		S15	Yes	
7	Learning at own pace	x				S10	Yes	
8	Comprehensive knowledge base	x				S11	Yes	Cognitive
9	Multilingual support	x				S12	Yes	12.50%
10	Self-directed learning		x			S2	Yes	
11	Interactive simulations		x			S6	Yes	
12	Reduced anxiety		x			S7	Yes	
13	Enhanced critical thinking			x		S16	Yes	Psychological
14	Continuous learning	x				S8	Yes	12.50%
15	Preparation for future				x	S9	Yes	
16	Immediate academic feed back	x				S13	Yes	

Note. SN: Study number; A: Academic; B: behavioral; C: Cognitive; P: Psychological; &S. Significant

Table 6 presents the findings from an SLR on the use of ChatGPT in educational settings, focusing on reasons why students use ChatGPT, and the corresponding dimensions of engagement facilitated by the technology. The overall percentage for academic engagement is 75.00%, indicating a strong association between ChatGPT use and academic-related engagement. Behavioral engagement contributes 31.25%, primarily through language practice activities. Cognitive engagement dimensions collectively contribute 37.50%, emphasizing the role of ChatGPT in supporting understanding, personalized learning, and knowledge acquisition. Psychological engagement dimensions collectively contribute 12.50%, emphasizing aspects such as critical thinking, anxiety reduction, and continuous learning.

DISCUSSION

The aim of this discussion section is to examine 16 studies that were collected from the SCOPUS database and grouped according to how much they concentrated on various aspects of student engagement. Each of the sixteen articles that were examined was released between September 30th, 2022, and the onset of 2023. This ensured that all the extracted files were accurate and up to date. According to the data, as indicated in **Table 6**, ChatGPT may improve active student engagement and learning. Although some research, for example (studies 10 and 11) suggested otherwise, its performance and knowledge were not totally excellent across all engagement characteristics. The usage of ChatGPT also raises a number of potential problems, such as the generation of false or inaccurate information, which necessitates a strong disclaimer when using ChatGPT in student engagement. Consequently, quick action is required to overcome these possible problems and maximize the usage of ChatGPT in teaching. Two of the studies were concerned with behavior and behaviorism, while five dealt with behavior, two cognition, and two psychologies. Seven of them emphasized boosting pupils' academic involvement. In order to understand the significance of the 16 studies and their significance on the many dimensions of student involvement, it is required to analyze each component as it is represented in the studies.

Various Engagement Dimensions

On academic Student engagement, seven studies were keenly analyzed to find out their contribution to this dimension of learning. Precisely, 43.75% of the studies focused on academic student involvement. These studies looked at students' active participation in their academic endeavors, such as their engagement with the course material, participation in class discussions, and completion of tasks. The findings of this research indicate the need of fostering an atmosphere that encourages student motivation, self-control, and active learning methods. Additionally, it draws attention to the advantages of giving students chances to interact and cooperate with their professors and fellow students (Cotton et al., 2023; Essel et al., 2022). According to Muñoz et al. (2023), academic engagement is a critical component of successful learning and has a big impact

on how students perceive their educational experiences. It speaks to how much a student invests in their academic endeavors–how much enthusiasm, involvement, and participation they show. Engaged students perform better academically and develop more fully as a whole because they are more driven, committed, and motivated to their studies.

According to Cotton et al. (2023), several factors make it crucial to involve students in their academic path. The first benefit is that it improves their learning experience by encouraging a good and engaging learning atmosphere in the classroom. Students have a deeper comprehension of the material when they actively participate in discussions, pose questions, and work with their classmates. Additionally, they experience a stronger sense of participation in the educational process, which gives the material a deeper level of significance and application to their everyday lives (Cotton et al., 2023).

In academic engagement, educators give students an opportunity to develop higher-order thinking skills by encouraging them to analyze, evaluate, and apply topics. Also, through academic engagement, students get helped to become self-directed, and problem-solving individuals. They also become more equipped to face difficulties in the future, both in the classroom and in their surrounding (Tlili et al., 2023).

Behavioral engagement was represented by 31.25% of the total studies. This aspect of student engagement focuses on the students' outward activities and demeanor in academic contexts. Aspects like attendance rates, punctuality, participation in extracurricular activities, and observance of classroom regulations were examined in this research. The results of these research suggest that fostering good habits, outlining precise expectations, and emphasizing student accountability improves overall student involvement and academic achievement (Kasneci et al., 2023; Mhlanga, 2023). ChatGPT provides rapid support and feedback (Mhlanga, 2023). In order to measure their progress and pinpoint areas for improvement, students can submit their work to the model and immediately receive feedback. Students who receive timely feedback are more likely to actively participate in their studies, make required corrections, and strive for continual improvement. This feedback also provides a direction for the student to proceed in which in turn encourages behavior.

Additionally, ChatGPT can be a useful tool for self-directed learning. The model is available to students 24/7 from anywhere, allowing for self-paced study. Without being constrained by time, they can search out information, consider many viewpoints, and participate in interactive dialogues. This accessibility encourages students to take charge of their education and follow their passions outside of the convention-al classroom, which shapes their behavior.

Two studies focused on the topic of cognitive student engagement. This aspect of engagement is mostly concerned with the effort and commitment that students make to their educational endeavors. Aspects including critical thinking, deep learning techniques, and problem-solving abilities have been covered in the studies. These studies' results point to the significance of developing teaching strategies that promote higher-order thinking, present worthwhile challenges, and motivate learners to actively analyze and apply their knowledge (Halaweh, 2023; Zhai, 2022). Furthermore, ChatGPT can support inquiry-based learning. The technique encourages higher-order thinking abilities by providing open-ended questions and encouraging pupils to explore various lines of reasoning. As they discuss, assess, and synthesize material with the model, students are more cognitively engaged and are better able to think critically and independently.

The remaining two studies (12.50%) specifically addressed psychological student engagement. Students' emotional and affective connection to the learning process is usually reflected in this aspect of engagement. It's possible that this research looked at things like student motivation, self-efficacy, and emotional health. The results of these research indicate that improving psychological engagement and general aca-demic performance in students can be accomplished by providing a friendly and inclusive learning environment, encouraging good emotions, and cultivating a sense of belonging and ownership in them (King, 2023; Vasconcelos et al., 2023). An encouraging and compassionate learning environment can be offered through ChatGPT. Students have the chance to communicate their ideas, worries, and feelings by conversing with the role model. The model can provide support, validation, and understanding, fostering a feeling of psychological safety. Students' motivation, self-confidence, and overall involvement in their study can all be improved by this strong emotional connection.

Additionally, ChatGPT can provide unique and fulfilling learning opportunities that are tailored to each student's interests and needs. The model can encourage a sense of relevance and ownership by tailoring its answers to students' choices and learning styles. Students' internal motivation and psychological engagement are increased when they see that their distinctive viewpoints are valued.

From these 16 studies, the emphasis placed on each of the four aspects of student engagement offers important new information about the complexity of engagement. Studies on academic student engagement are frequently conducted, which emphasize the value of active student participation, whereas behavioral engagement studies emphasize the importance of ethical behavior. The emphasis placed on students' cognitive processing and emotional participation in the learning process stresses the significance of this attention.

The findings suggest that organizations and educators should embrace multifaceted approaches to student involvement by addressing various factors at once. Education professionals can foster an environment that encourages active learning, positive behaviors, critical thinking, and emotional well-being by concentrating on academic, behavioral, cognitive, and psychological factors. In order to increase educational outcomes and student performance, these findings urge for the creation of comprehensive techniques that enable students to become actively engaged learners.

From the analysis above, academic student engagement takes the bigger portion. This therefore means that most students gain more academically when using ChatGPT, than any other dimension of engagement.

Missing components of critical thinking due to student use of ChatGPT

From the review of the studies, one of the areas of interest was the analysis of the missing components of critical thinking. According to de Castro (2023), such components include: reduced analytical thinking, limited possibilities for problem-addressing, lack of diverse perspectives, incomplete understanding of how decisions are made, and reduced metacognition and replication. On reduced analytical thinking, studies revealed that ChatGPT offers quick responses and justifications, which can deter students from using their analytical thinking skills to the fullest. Without actively examining or challenging the information supplied from AI software, they can start to rely on the model's responses alone. Critical thinking abilities that entail evaluating data, making inferences, and coming to personal opinions may be hampered as a result (Kasneci et al., 2023).

ChatGPT also creates limited possibilities for problem-addressing. Applying knowledge to practical settings and addressing complex problems are two key components of critical thinking. Although ChatGPT can help by providing solutions, it might not sufficiently push students to participate in active problem-solving techniques. Students may not fully develop their problem-solving abilities if they are not given chances to think critically and work independently on difficult challenges (de Castro, 2023). Another missing component of critical thinking is lack of diverse perspectives. ChatGPT creates responses based on patterns in the training data, which may add biases or restrict the variety of viewpoints. The exposure to various points of view that students need to have in order to develop their capacity for critical thought may be hampered as a result. The model's recommendations could unintentionally reinforce preexisting biases or restrict students' capacity to properly assess many points of view on a particular subject.

An incomplete understanding of how decisions are made is another very important missing component of Critical thinking due to the use of ChatGPT. Making education decisions requires careful consideration of many aspects, supporting data, and prospective outcomes. The understanding of decision-making processes offered by ChatGPT might not be complete. Students' ability to take wise decisions may be endangered if they purely rely on the ChatGPT's replies without understanding the fundamental expectations or evaluating the precision of the data supplied (Kasneci et al., 2023). Finally, reduced metacognition and replication is a point of concern in regard to critical thinking. Metacognition, or the process of reflecting on one's own thought progressions, is a vital part of critical thinking. Despite the fact that ChatGPT might offer quick solutions, it might not inspire students to consider their own ideas or perform self-evaluation. The development of critical thinking abilities and self-directed learning may be hampered in the absence of reflection and metacognitive practices.

Side Effects of Using ChatGPT in Student Engagement

From the data obtained from the studies aforementioned, it was established that, even though using ChatGPT has many advantages, there are also negative repercussions. The following points should be considered in relation to ChatGPT's potential negative effects on student engagement:

1. **Overreliance on AI:** If ChatGPT becomes a student's only source of knowledge and direction, they may become unduly dependent on it. Their inability to seek out perspectives outside of AI model as a result of this overreliance may prevent them from developing their critical thinking, problem-solving, and problem-finding skills (de Castro, 2023).
2. **Lack of human creativity and connectivity:** Research suggests that, unless ChatGPT is used measurably, very important aspects of humanity will be lost. The human creativity as well as the critical thinking required of a man will be lost due to over dependence on AI platform (Kasneci et al., 2023). ChatGPT is an AI model, therefore it lacks the emotional intelligence and interpersonal skills that a human teacher or peer may offer.

RESEARCH IMPLICATIONS

As earlier discussed, student engagement through ChatGPT has come with a couple of both positive and negative impacts. As link up, this section of the research paper will highlight them in bullet forms.

Some of the positive impacts of using ChatGPT on student engagement are, as follows:

1. **Personalized and interactive learning experiences are possible using ChatGPT, which enhances the learning process (Mhlanga, 2023):** The model is available for students to interact with in-depth inquiries, clarification requests, and meaningful interactions. This can assist students gain a deeper knowledge of the subject matter and can also cater to their unique learning needs.
2. **Open accessibility:** ChatGPT is available at all times, enabling students to ask questions or participate in conversations outside of regular class times (Cotton et al., 2023). This adaptability gives students the power to take charge of their education and get help whenever they need it.
3. **Individualized support:** ChatGPT can provide tailored advice based on each student's individual needs (Firat, 2023). The model may adjust its responses to offer pertinent information, justifications, and resources while accommodating various learning styles and paces by assessing the student's queries and answers.
4. **Enhanced interactivity:** Using ChatGPT to connect with others can make learning more interactive and interesting (Cotton et al., 2023; Firat, 2023; Kasneci et al., 2023). Asking questions in a conversational style and getting prompt answers could be more entertaining for students. This casual method of instruction helps encourage a positive outlook on education. ChatGPT enables students to move on at their own pace, which supports self-paced learning. They can enquire further about particular subjects, broaden their research, and go over ideas again as necessary. Increased motivation and engagement may result from this freedom and control over the learning process.
5. **Assistance with difficult topics:** Some subjects might be difficult for children to understand, and they can be reluctant to ask questions in a classroom setting (Essel et al., 2022). Students can easily ask questions about difficult subjects in a judgment-free setting like ChatGPT without worrying about looking foolish.

The negative impacts are, as follows:

1. **ChatGPT lacks empathy and human emotions because it is an AI language model:** The emotional support and connection that real teachers offer to their students may be lost (Kasneci et al., 2023). For pupils who require individualized emotional support or have particular learning needs, the lack of emotional awareness and support might be problematic.
2. **Limited contextual understanding:** On occasion, ChatGPT may have trouble determining the relevance or goal of a student's query (King, 2023). It might just respond to the text given, which might result in misunderstandings or inaccurate information. This constraint may make it difficult to communicate and learn effectively.

3. **Technology dependence:** Using ChatGPT a lot to engage students can result in a dependency on technology that is too great. Students might become less likely to approach live teachers for assistance or have direct conversations with peers (de Castro, 2023). Over-reliance on AI systems may limit social connections and impede the growth of critical communication and teamwork abilities.
4. **Possibility of inaccurate or biased information:** ChatGPT draws its learning from the enormous amounts of text data that are available online, some of which may be biased, inaccurate, or contain out-of-date information (de Castro, 2023). The model may unintentionally encourage or maintain inaccurate or prejudiced beliefs if it is not adequately trained or supervised. Students may become misinformed as a result and may lack the ability to think critically.
5. **Ethical issues:** The application of AI to education poses ethical issues with ownership, security, and privacy of personal data. It's important to carefully evaluate privacy laws and protections before collecting and retaining student data in order to customize ChatGPT interactions (Qadir, 2022). Using AI for tests, grading, or making decisions regarding students' academic progress also has ethical ramifications that need to be carefully considered.

CONCLUSIONS

By identifying the individual learning preferences, ChatGPT can provide students with content that is more relevant to them and feedback that is more specific to their needs. Moreover, ChatGPT automates administrative tasks like scheduling, grading, and administrative support, freeing up instructors' time to focus on teaching and enhance their relationships with students. However, data privacy, algorithmic biases, transparency, and accountability are just a few of the crucial ethical challenges that must be resolved as a result of the use of AI in education. As a result, careful planning and thinking must go into making sure GPT is used effectively and responsibly.

The study concludes by arguing that ChatGPT has enormous potential to improve education standards and accessibility. However, successful adoption demands collaboration between educators and ChatGPT developers in order to guarantee ethical and effective use. The implementation of ChatGPT in education must eventually be guided by thorough evaluation of ethical, social, and practical issues in order to provide more individualized, effective, and efficient instruction for all students.

The study has some limitations considerably related to generalization. In meta-analysis studies, a pool of studies is created by making specific restrictions to obtain more generalizable results. In this research, a year-based limitation has been set between 2020-2023, restricting it to three years since ChatGPT was launched in November 2022 and it was only considered logical to include studies from past three years. Only three out of 16 studies were published in 2022 while all the remaining studies were published in 2023. The year-based limitation is thus justified. This has led to the formation of a data pool reduced to 16 articles. Quantitatively, these 16 articles can be considered as 16 findings. The researcher conducted a meta-analysis based on these 16 findings. The generalizability of the results obtained after the meta-analysis is weak. The study, in its current form, still contributes to science. However, by adjusting the standards in PRISMA and increasing the number of articles, more generalizable results can be achieved depending on the size of the obtained pool.

Future research should give precedence to a comprehensive examination of the ethical implications associated with the use of ChatGPT in the classroom. This should center on matters like data security, user agreement, and responsible technology usage. Furthermore, in order to guarantee equal educational opportunities, research on the tool's ability to improve accessibility and inclusion for students from varied backgrounds is essential. Research on the effects of extended ChatGPT use on students' critical thinking abilities will be longitudinal and will shed light on how to strike a balance between AI support and the growth of intrinsic cognitive capabilities. Ultimately, optimizing ChatGPT's advantages while reducing any possible downsides requires the creation of instructional regulations and teacher training initiatives that support ethical AI inclusion in the classroom.

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