P-ISSN: 2709-6254	Journal of Development and Social Sciences	Apr-June 2024, Vol. 5, No.2
O-ISSN:2709-6262	https://doi.org/10.47205/jdss.2024(5-II)30	[313-323]

Journal of Development and Social Sciences
www.jdss.org.pk

RESEARCH PAPER

Tailoring Shadow Education: Leveraging ChatGPT to Transform Private Tutoring Landscape to Optimized Performance of Students

[1]Dr. Samra Afzal*,[2]Dr. Shazia Zamir and [3]Dr. Muhammad Asghar Ali

1. Assistant Professor, Department of Educational Sciences, National University of Modern Languages, Islamabad
2. Assistant Professor, Department of Educational Sciences, National University of Modern Languages, Islamabad
3. Assistant Professor, Department of Education Women University of AJ&K Bagh, Pakistan

***Corresponding Author:** safzal@numl.edu.pk

ABSTRACT

The present research was intended to investigate the ChatGPT role as a private tutor in the context of its significance and effect on students' satisfaction and academic performance. The advent of technological innovations like ChatGPT and AI tools has changed the panorama of globally expanding private tutoring through the integration of AI tools. A quantitative research approach along with a descriptive research method was designed to accomplish the present research. A total of 151 university students were sample of research, selected through a simple random sampling technique. Results displayed that students were agreed about ChatGPT as a private tutor in the context of effectiveness, active engagement, personalized guidance, positive interaction, constructive feedback, integration, recommendations, and user interface. ChatGPT as a private tutor has significant effect on students' satisfaction with positive relationship. Students may be provided training in the use of AI tools like ChatGPT for private tutoring. Program developers of AI may address potential biases, challenges and misuse of AI applications in education.

KEYWORDS ChatGPT, Performance, Private Tutoring, Shadow Education, Tailoring

Introduction

Private tutoring (PT), also identified as shadow education, has been globally expanding in recent decades. The enrollment rate of students in shadow education is increasing rapidly at all levels even in some countries exceeding up to 80% (Bray, 2024).Private supplementary tutoring is practiced worldwide, mostly common in those countries that focus on high-stakes examinations and have greatly competitive education systems. PT is often considered by those families who focus more on their children's education or may want to address learning gaps. Yet, the financial aspect also needs to be considered for availing of private tutors. However, whether private tutoring increases academic success is still a subject of debate (Zhang et al., 2024).Online mediums of learning are gaining acceptance in the mainstream education system and shadow education due to technological advancements. In this new scenario, it is important to prepare learners as self-regulated students who must take charge of their learning instead of only relying on following conventional learning styles in a face-to-face classroom environment (Yung & Wong, 2024).The private tutoring phenomenon needs to be understood from a global viewpoint. Tutoring besides the formal education system has been expanding globally. More than half of the cohorts of students avail private teachers. It also has wide spread consequences for social disparities, burdens on learners, inadequacies in learning processes, family finances, innovation, and occupation (Zhang,2023).

The advent of the World Wide Web and modern technologies open new openings for efficient learning making education more flexible and accessible. Digitalization has transformed the education system from traditional mass education to quality individual training. Quality education is important in today's competitive world and is the priority of

every country. Private tutoring can be provided by using technologies and e-learning tools. Private tutoring demand is high due to various factors. One of the reasons is the inadequate education received in institutions. Another factor is the discrepancy between the knowledge acquired and the demands of markets. Private tutors benefit from various online learning tools and educational platforms. Teachers considered online private tutoring as an additional activity (Glotova, et al., 2023).

Recent advancements in technologies are artificial intelligence (AI) and have an influence on various disciplines including research and education. ChatGPT is one such technology that offers opportunities for both scholars and teachers such as increased accessibility, personalized feedback, interactive conversations, evaluation, lesson preparation, and teaching complex concepts in new ways (Rahman &Watanobe, 2023). Artificial Intelligence (AI) applications have been spread across various sectors e.g., science, business, education, art, etc., and continuously working on improving users' experiences, work efficiency, and creating future employment opportunities. Yet, knowledge of AI technologies and AI literacy areas are still unexplored (Ng, et al., 2021). AI as an educational tool has become a popular area of research among researchers and academics (Su, Zhong, & Ng, 2022). AI generative tools e.g. ChatGPT in education offer interactive and highly personalized learning experiences for students but this demands responsible and ethical integration of it in educational systems. Educational institutions need to benefit from new developments to keep in step with the continuously changing education landscape. There are numerous prospects, challenges, and limitations of applying ChatGPT to enhance learning. Integrating ChatGPT in the teaching-learning process has key advantages such as personalized learning for scholars and enhanced support for educators in various ways i.e. help in writing papers and answering questions of students. However, future research studies in the field of AI may work on the development and evaluation of AI tools for educational purposes in addition to investigating the usefulness, efficiency, challenges and ethical considerations in various contexts including education (Su& Yang, 2023). Rytr, ChatGPT, Copy AI and Jasper are recent developments in deep learning and machine learning that mimic text like human beings writing. Several content writers are accessible with AI expertise. However, currently, ChatGPT hasthe most user-friendly interface and has many users in comparison to others in a short span (Gleason, 2022).

Meta-review study conducted by Suet al., (2022) on educational methods necessary for teaching AI to map AI-based curriculum design, AI activities, AI tools, and educational principles/models. Research work about AI curriculum revealed a significant change in the learning of students due to the use of various AI tools for example machine learning, neural networks, and deep learning improve the interest of students in AI courses and advance AI skills. ChatGPT can assist researchers in writing a coherent informative, systematic, and accurate paper in less time of 2-3 hours with limited knowledge of the author. ChatGPT and other AI tools have substantial influences on education. Students may enhance critical thinking and creativity in addition to general skills. AI enhances students' engagement in outsourcing assessment tasks (Zhai, 2022).

ChatGPT is a significant tool for teachers and helps in designing programs, teaching resources and assessment-related tasks. ChatGPT can also create materials for training course-based chat bots. ChatGPT can generate discussions to help students in learning the English language (Topsakal & Topsakal, 2022).ChatGPT helps in promoting active learning strategies among students e.g. Rudolph et al. (2023)applied the concept of flipped learning through ChatGPT for perusing pre-class materials. This approach helps students to utilize more time on other practical and interactive activities. Whereas in traditional style flipped classes, students face problems in pre-class studying(Lo&Hew, 2017). ChatGPT as a virtual tutor can aid learners by answering their questions which helps to make them independent learners (Nisar & Aslam, 2023). ChatGPT also boosts group dynamics by giving quick feedback to students (Kasneci, et al., 2023).

ChatGPT usage as a personalized tutor provides individualized instruction to students. Advanced technological use like ChatGPT makes it easier for students to get answers to their questions without any wait. Students can have access to personalized tutors whenever they need them (Khan et al., 2023).One-on-one tutoring is one of the significant features of ChatGPT where students get immediate feedback on their efforts (Limo et al., 2023). ChatGPT can perform differently across various subjects such as finance, mathematics, coding and public queries. ChatGPT has created teaching content and acts as an online tutor (Gill et al., 2024). Furthermore, private tutoring areas need the attention of researchers as research studies on shadow education/private tutoring are slow to get closer to reality and still lagging. It has been recognized as a subfield of education (Zhang & Bray, 2020). Recent developments in the field of artificial intelligence have changed the scenario of the education system where ChatGPT and other AI tools are facilitating learners like personalized tutors which even overcome the limitations of human tutors such as time and space. ChatGPT can work as a private tutor due to its various supportive functions for students. ChatGPT has tailored the learning and transformed the landscape of private tutoring. Therefore, current research explored the role of ChatGPT as a private tutor.

Literature Review

The literature review section will investigate the research studies related to private tutoring, ChatGPT, and its usage, importance, and challenges. Present study was envisioned to explore the role of ChatGPT as a private tutor.

Private Tutoring

Supplementary tutoring in addition to regular class learning positively contributes to academic success (Herath, 2024). Shadow education supports students in their academic achievement in many subjects including mathematics. However, the long-term impact of shadow education on the creative thinking of students is negative (Han & Suh, 2023). The private tutoring system has become a globally recognized education system with a variety of tutoring forms that come under the domain of shadow education. Zhang and Bray (2020) discussed shadow education in the context of formal schooling, socioeconomic progress and parenting. Social processes that nurture and support private tutoring are privatization of in education sector, commercialization and parental agency.

Most parents are availing the services of tutors to ensure the academic success of their children and to meet the parameters of the government (Doherty & Dooley, 2018).Tutoring has become a marketplace that acts as a continuous experimental laboratory for educational innovations. It has both positive and darker sides. However, there is still a need to explore innovative ways in this sector as the private tutoring sector is gaining popularity throughout the world. There is also a need to explore ways to tackle the negative risks of tutoring (Zhang& Bray, 2020). Technological integration has also embraced shadow education on a larger scale. Technological developments have not only changed the scenario of formal schooling, but it has also modified the private tutoring system. Conventional tutoring has now taken another form i.e. online tutoring (Zhang& Bray, 2020). This progression has another form due to the introduction of AI tools in the educational landscape. ChatGPT AI tools are mostly used by the students (Limo, et al., 2023).

ChatGPT as a Tutor

Technological innovations have changed the approach of the educational system. ChatGPT an AI is one of the interventions which is facilitating learners in many ways. Although it has certain limitations and confrontations these can be overcome with advancement in coming years. Considering the importance and use of ChatGPT in educational settings, the present research is considered one of the rapidly growing concepts of private tutoring which is gaining popularity throughout the world in the context of ChatGPT. ChatGPT offers opportunities to students in their learning. Teachers and students

are also facing certain challenges due to its application in education. However, people's views about ChatGPT are more optimistic and they think that its uses will increase in the coming years. Thus, higher education institutions should identify the positive of integrating ChatGPT in the curriculum which is going to facilitate learners instead of threatening or lowering the intellectual abilities of students. However, further research studies may be conducted on various aspects of ChatGPT in different contexts of sample, methodology, and phenomenon (Adeshola& Adepoju, 2023).

ChatGPT is a helpful tool for researchers to write coherent, informative, systematic, and accurate research papers. Students can accomplish their educational tasks through AI tools. It is also a supportive tool to enhance critical thinking and creativity among students in addition to the development of general skills (Zhai, 2022). ChatGPT is also a supportive tool for designing course-related activities. However, the issue of content authenticity needs to be addressed (Ghazali, 2023).ChatGPT may build course-specific bots for designing training materials to fix it. Perchance, ChatGPT can also be operated as a native speaker to teach language such as English to students (Yaacoub, et al., 2023). ChatGPT can also support improving active learning techniques. In the flipped learning technique students study learning material to support and perform additional activities in classes such as group discussions etc. Students face difficulty in understanding pre-class learning material in conventional flipped classrooms (Sanderson, 2023). This issue has been addressed in the COVID-19 (Gill, et al., 2022). One of the virtual instructors ChatGPT helps learners in their work by immediately replying and providing feedback to their inquiries. Still, there is a need to understand the potential and limitations of machine intelligence in the context of education. However, AI cannot take possession of teachers (Cope, et al., 2021). ChatGPT benefits education in the form of an effective and personalized learning experience with quicker feedback. However, limitations and challenges must be considered while using AI tools for educational purposes (Su & Yang, 2023).ChatGPT provides personalized learning practices to learners with effective virtual personal and practical learning experiences. However, it has certain limitations and ethical concerns (Qadir, 2023).Satisfaction, interest, tutoring preference, and self-confidence in using ChatGPT all are dependent on individualized instruction duration. ChatGPT can be used to develop individualized curricula by both instructors and scholars. ChatGPT can be used by teachers to facilitate an interactive learning environment. In addition to this, students can become self-regulated learners through interaction with ChatGPT (Limo et al., 2023).ChatGPT aids students and boosts the analytical and critical abilities of students (Zhai,2022). It provides ideas for improving grammatical structures to bring clarity to an essay. It supports students by providing personalized experiences anytime (French et al., 2023).

Hypotheses

H1: ChatGPT as a private tutor has a substantial effect on students' satisfaction with its usage.

H2: Indicators of ChatGPT as a private tutor have a substantial effect on students' satisfaction with its usage.

H3: Usage frequency of ChatGPT as a private tutor significantly differs across the academic performance.

Material and Methods

The present research employed a quantitative paradigm of research through a descriptive research method to analyze the significance of ChatGPT as a private tutor and investigate the effect of ChatGPT as a private tutor on students' satisfaction and academic performance. A questionnaire based on ChatGPT as a private tutor was developed to achieve the objectives of the present research.

Population and Sample Size

The population of research comprised undergraduate students at the public University of Islamabad. A sample of 151 undergraduate students was chosen randomly to contribute to the research study. 65 (43%) male students and 86 (57%) female students partook in the survey.

Research Instrument

The researchers developed a questionnaire containing two segments. The first segment contained information about the participants e.g. gender, academic performance (marks in percentage),AI tools used by students for private supplementary tutoring, usage frequency of ChatGPT as a private tutor, and students' satisfaction with ChatGPT as a private tutor. Students' satisfaction with ChatGPT as a private tutor was rated on a scale of 1 to 10 ranging from 'very dissatisfied' to 'completely satisfied'. The second section is about the questionnaire of ChatGPT as a private tutor containing 18 statements based on indicators of effectiveness, active engagement, personalized guidance, positive interaction, constructive feedback, integration, recommendation, user interface, and challenges. Every indicator contained two items. The questionnaire followed the five-point Likert scale ranging from 'Strongly Agree' to 'strongly disagree'.

Reliability and Validity

Internal consistency was measured through McDonald's ω, and Cronbach's α-reliability. The validity of the instrument was assessed through average variance extracted (AVE) and compositive reliability (CR) was calculated in addition to factor loading.

Table 1
Reliability and Validity Analysis of Scale ChatGPT as a Private Tutor

Scale	Estimate	McDonald's ω	Cronbach's α	AVE	CR	Factor Loading
ChatGPT as a Private Tutor	Point estimate	.981	.980	.753	.982	.719 to .908
	95% CI lower bound	.976	.975			
	95% CI upper bound	.985	.985			

Results indicated that coefficient values are high in both McDonald's ω (.981) and Cronbach's α (.980). Moreover, AVE value (.753) and CR value (.982) also showed good acceptance. Factor loading ranged from .719 to .908, which showed acceptable values.

Data Analysis

The data analysis techniques include descriptive statistics (mean & standard deviation), and inferential statistics such as ANOVA, simple linear regression and multiple regression.

Results and Discussion

Table2
Analysis of ChatGPT as a Private Tutor

Indicators of ChatGPT as a Private Tutor	Mean	Std. Deviation	Remarks
Effectiveness	3.56	.912	Agree
Active Engagement	3.61	.917	Agree
Personalized Guidance	3.67	.929	Agree
Positive Interaction	3.62	.973	Agree
Constructive Feedback	3.55	.917	Agree
Integration	3.64	.902	Agree

Recommendation	3.60	.893	Agree
User Interface	3.56	.943	Agree
Challenges	3.41	.886	Neutral
ChatGPT as Private Tutor	3.60	.863	Agree

Results of table 2 clarified that students answered 'Agree' regarding indicators of ChatGPT as a private tutor i.e. effectiveness, active engagement, personalized guidance, positive interaction, constructive feedback, integration, recommendation and user interface. Moreover, students answered Neutral' about the challenges of ChatGPT as a Private Tutor. The highest mean score was found in the indicator of personalized guidance (M=3.67) and the lowest mean score was found in challenges (M=3.41).

Table 3
Effect of ChatGPT as a Private Tutor on Students' Satisfaction

Variable	Unstandardized Coefficients beta (B).		Standardized Coefficients beta (β).	t	Sig.	R.	R^2	Hypotheses.
	B	SE	Beta					
ChatGPT as a Private Tutor	2.403	.046	.974	52.0	.000	0.97	0.94	H1: Supported

Results showed that ChatGPT as a private tutor has a substantial effect on students' satisfaction with the use of ChatGPT as a private tutor. ChatGPT as a private tutor can bring a 2.403 unit increase in students' satisfaction with its usage. Moreover, an effective positive relationship was found between ChatGPT as a private tutor with students' satisfaction with its usage. ChatGPT as a private tutor can be a cause of 94% variation in students' satisfaction with its usage.

Table 4
Effect of Indicators of ChatGPT as a Private Tutor on Students' Satisfaction

Indicators of ChatGPT as a Private Tutor	Unstandardized Coefficients beta (B)		Standardized Coefficients beta (β)	T	Sig.	Hypotheses
	B	Std. Error	Beta			
Effectiveness	.241	.111	.103	2.171	.032	H2: Partially Supported
Personalized Guidance	.296	.129	.129	2.290	.023	
Positive Interaction	.326	.110	.149	2.958	.004	
Constructive Feedback	.355	.123	.153	2.886	.005	
Recommendation	.340	.129	.142	2.628	.010	
User Interface	.488	.120	.216	4.079	.000	
Active Engagement	.206	.116	.088	1.770	.079	H2: Partially Not Supported
Challenges	-.079	.070	-.033	-1.138	.257	
Integration	.201	.133	.085	1.511	.133	

R= 0.975, R Square= 0.950, F= 302.25, p =.000

Table 4 is about the effect of the usage of ChatGPT as a private tutor on students' satisfaction. Results revealed that indicators of ChatGPT as a private tutor i.e. effectiveness, personalized guidance, positive interaction, constructive feedback, recommendation and user interface have a positive effect on students' satisfaction thus partially accepting the H2. Furthermore, active engagement, challenges and integration do not significantly affect the students' satisfaction thus partially rejecting the H2.

Table 5
Usage Frequency of ChatGPT as a Private Tutor and Academic Performance

Academic Performance (Marks of Students)				F	Sig.	Hypothesis
50-59.99%	60-69.99%	70-79.99%	80-90% and above	15.49	.000	H3: Supported
M/SD	M/SD	M/SD	M/SD			
2.5/1.00)	3.00/.973	3.67/.719	4.16/.442			

Results portrayed that the usage frequency of ChatGPT as a private tutor significantly differs across academic performance thus accepting hypothesis H3. Additionally, the usage frequency of ChatGPT as a private tutor increases the marks of students. The mean value displayed those students having marks range of 80-90% and above have higher mean score value about usage frequency of ChatGPT as a private tutor.

Conclusion

The present research was intended to assess how ChatGPT tailored learning to transform the private tutoring landscape for optimized performance. ChatGPT is an advanced chatbot that can generate inspiring text that is difficult to differentiate from human-written text and can seemingly conversate naturally and intuitively (Rudolph et al., 2023). The present study results about the significance of ChatGPT as a private tutor showed that most students agreed about the effectiveness of ChatGPT as a private tutor. Likewise, students showed satisfaction with ChatGPT as a private tutor and frequently use ChatGPT as a private tutor. Ng et al. (2021) supported the results of the current study that ChatGPT as virtual tutors helps students to answer their questions and offer personalized learning.

Limo et al. (2023) research study also favored the results of the present study that most students used ChatGPT as personalized tutoring. A research study by Nisar and Aslam (2023) also described the significance of ChatGPT. According to them, artificial intelligence has gained importance in education; however, its potential applications are still unexplored. One of the AI platforms is ChatGPT recognized as Open AI. Users may produce text answers quickly to their submitted text wherein ChatGPT gathered information by using machine learning with internet interaction. Students may boost their understanding and knowledge through ChatGPT by gaining accurate and relevant answers, however, it does not provide sources or references for responses.

Additionally, present research concluded that ChatGPT as a private tutor has a substantial effect on students' satisfaction with its usage. Indicators of ChatGPT as a private tutor i.e. effectiveness, personalized guidance, positive interaction, constructive feedback, recommended to others, and user interface have a positive effect on students' satisfaction with its usage. AI application usage provides scaffolding and support to students in personalized and adaptive ways (Zawacki et al., 2019). Peng et al. (2019) also provided arguments that match the results of present research that intelligent tutoring has transformed the education system and is a useful tool for providing personalized education. It offers tutoring / personalized assistance to students. ChatGPT enhances educational accessibility and efficacy for learners by addressing learning styles, and individualized pacing (Limo et al., 2023).

According to the outcomes of the present study, the usage frequency of ChatGPT as a private tutor significantly differs across academic performance. A higher frequency of usage of ChatGPT as a private tutor increases the chances of improvement in the academic performance of students. George and George (2023) supported the results of the present study that AI Chatbots immediately provide feedback and further guidance to learners which is an important aspect of personalized learning. It is also helpful in strengthening the weak areas of students through custom-tailored questions for practice. Furthermore, individualized tutoring also facilitates the performance of students at various grade levels in a variety of subject areas. Personalized learning ensures academic success and increases

the participation of students in learning.AI tools provide resources to assist teachers in with lesson planning, Course content development, personalized teaching, assessment activities and professional development (Kasneci, et al., 2023). Personalized learning enhances the learning engagement of students by modifying course resources and assessment activities. Personalized learning setting improves academic success, retention and satisfaction of students. ChatGPT helps students to learn at their own pace (Khan et al., 2023).

Research Implications and Limitations

Current research is significant as it has practical implications. Conventional human tutoring is beneficial, but all do not have access to it due to cost and time limitations. The introduction of AI tools makes things easier for users due to their human-like interaction, quick replies, and feedback. One of the features of ChatGPT, an AI tool, is personalized learning experiences for students. ChatGPT application as a private tutor may variously help students. Another dynamic characteristic of AI is cost-effective usefulness. ChatGPT helps generate learning content and unique assessment activities which disrupted the paid assistance models for homework (Gill, et al., 2024).

User satisfaction with ChatGPT may be enhanced through more effective and efficient individualized tutoring. Student engagement can be increased through integrating interactive teaching aids and utilizing various multimedia (Limo, et al., 2023). Program developers of AI may address potential biases, challenges, and misuse of AI applications in education. Kasneci et al. (2023) provide suggestions to address the challenges of AI applications in education to ensure ethical and responsible use in education. AI tools may be utilized to support students in their private supplementary tutoring. Students may be provided training to inform the use of AI tools like ChatGPT for more effective usage for educational purposes. Ng (2021) said that lessons, workshops and practical units are usually applied to design learning activities through AI platforms. Awareness about various platforms of AI tools may be provided to students to enhance student learning such as Chiu et al. (2021) in their research study discussed that AI tools like Anki Cozmo, Edmodo and CUHKiCar may facilitate students to improve their knowledge achievement, critical thinking and interaction. Moreover, Xiao et al. (2018) favored that other learning platforms including iSTREAM, Scratch, Cozmo and educational broadcasting may be used to support course organizations. Wong et al. (2020) suggested steps for the implementation of AI programs into education. Integration of AI into the curriculum requires analysis. Adjusted and modified AI programs are required to complement the learning objectives of the curriculum. Moreover, also identifies AI tools that are given specific grades to accomplish the learning objectives. In addition to this, also ensure that necessary training through information sessions and workshops has been provided to instructors who design and teach AI curriculum. Additionally, learning applications of AI tools in education is important. Self-efficacy, AI usage for social good, readiness, behavioral intention, and AI literacy are all important for that contribute to encouraging AI education among students (Chai et al., 2021). ChatGPT and the development of problem-solving skills and critical thinking is an important aspect. Although ChatGPT can generate correct responses to complex questions across various areas and topics. However, there is a need to consider its limitations. Those students who simply use ChatGPT to get responses and code can face a barrier to improving skills such as problem-solving. One of the bigger challenges for teachers is that in most situations, it is difficult to identify codes generated by AI models as in some cases even tools can't recognize the similarity or plagiarism (Rahman& Watanobe, 2023). The present research used a quantitative research design with a self-reported survey which has the limitation of closed-ended responses. Future researchers may contribute to the present research area by conducting studies at various levels by applying various research approaches with diverse sample sizes.

References

Adeshola, I., & Adepoju, A. P. (2023). The opportunities and challenges of ChatGPT in education. *Interactive Learning Environments,* 1-14 https://doi.org/10.1080/10494820.2023.2253858

Bray, M. (2024). Still in need of confronting: Shadow education and its implications in the sustainable development goals. *International Journal of Educational Development*, 104, 102967.

Chai, C. S., Lin, P. Y., Jong, M. S. Y., Dai, Y., Chiu, T. K., & Qin, J. (2021). Perceptions of and behavioral intentions towards learning artificial intelligence in primary school students. *Educational Technology & Society*, *24*(3), 89-101.

Cope, B., Kalantzis, M., &Searsmith, D. (2021). Artificial intelligence for education: Knowledge and its assessment in AI-enabled learning ecologies. *Educational Philosophy and Theory*, *53*(12), 1229-1245.

Doherty, C., & Dooley, K. (2018). Responsibilising parents: The nudge towards shadow tutoring. British Journal of Sociology of Education, 39(4), 551–566.

French, F., Levi, D., Maczo, C., Simonaityte, A., Triantafyllidis, S., & Varda, G. (2023). Creative use of OpenAI in education: case studies from game development. *Multimodal Technologies and Interaction*, *7*(8), 81.

George, A. S., & George, A. H. (2023). A review of ChatGPT AI's impact on several business sectors. *Partners Universal International Innovation Journal*, *1*(1), 9-23.

Ghazali, B. B. (2023). Utilising ChatGPT. BDJ student. Nature, 30(2), 5-5

Gill, S. S., Naeem, U., Fuller, S., Chen, Y., & Uhlig, S. (2022). How Covid-19 changed computer science education. *Itnow, 64*(2), 60-61.

Gill, S. S., Xu, M., Patros, P., Wu, H., Kaur, R., Kaur, K., ... &Buyya, R. (2024). Transformative effects of ChatGPT on modern education: Emerging Era of AI Chatbots. *Internet of Things and Cyber-Physical Systems, 4*, 19-23.

Gleason, N. (2022). *ChatGPT and the rise of AI writers: How should higher education respond?* Campus Learn Share Connect.

Glotova, A., Samoylenko, N., Zharko, L., Georgiadi, A., & Shevchenko, M. (2023). Shadow education: Shapes of private tutoring in e-learning environment. *E-Learning and Digital Media*, *20*(4), 314-330.

Han, S., & Suh, H. (2023). The effects of shadow education on high school students' creative thinking and academic achievement in mathematics: The case of the Republic of Korea. *Educational Studies, 49*(2), 314-333.

Herath, T. N. (2024). Contribution of shadow education to the performance of students in public schools: the case of Sri Lanka*. Journal of Education, 204*(1), 118-130.

Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., ... &Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and individual differences*, *103*, 102274.

Khan, R. A., Jawaid, M., Khan, A. R., & Sajjad, M. (2023). ChatGPT-Reshaping medical education and clinical management. *Pakistan Journal of Medical Sciences, 39*(2), 605.

Limo, F. A. F., Tiza, D. R. H., Roque, M. M., Herrera, E. E., Murillo, J. P. M., Huallpa, J. J., ... & Gonzáles, J. L. A. (2023). Personalized tutoring: ChatGPT as a virtual tutor for personalized learning experiences. *Social Space*, *23*(1), 293-312.

Lo, C. K., & Hew, K. F. (2017). A critical review of flipped classroom challenges in K-12 education: Possible solutions and recommendations for future research. *Research and practice in technology enhanced learning*, *12*, 1-22.

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, *2*, 100041.

Ng, T. K. (2020). New interpretation of extracurricular activities via social networking sites: A case study of artificial intelligence learning at a secondary school in Hong Kong. *Journal of Education and Training Studies*. 9(1), 49-60

Nisar, S., & Aslam, M. S. (2023). Is ChatGPT a Good Tool for T&CM Students in Studying Pharmacology?. *Available at SSRN 4324310*.

Peng, H., Ma, S., & Spector, J. M. (2019). Personalized adaptive learning: An emerging pedagogical approach enabled by a smart learning environment. Smart Learning Environments, 6(1), 1-14.

Qadir, J. (2023, May). Engineering education in the era of ChatGPT: Promise and pitfalls of generative AI for education. In *2023 IEEE Global Engineering Education Conference (EDUCON)* (pp. 1-9). IEEE.

Rahman, M. M., &Watanobe, Y. (2023). ChatGPT for education and research: Opportunities, threats, and strategies. *Applied Sciences*, *13*(9), 5783.

Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?. *Journal of Applied Learning and Teaching*, *6*(1), 342-263

Sanderson, K. (2023). GPT-4 is here: what scientists think. Nature, 615(7954), 773.

Su, J., & Yang, W. (2023). Unlocking the power of ChatGPT: A framework for applying generative AI in education. *ECNU Review of Education*, 20965311231168423.

Su, J., Zhong, Y., & Ng, D. T. K. (2022). A meta-review of literature on educational approaches for teaching AI at the K-12 levels in the Asia-Pacific region. *Computers and Education: Artificial Intelligence*, *3*, 100065.

Topsakal, O., &Topsakal, E. (2022). Framework for a foreign language teaching software for children utilizing AR, voicebots and ChatGPT (Large Language Models). *The Journal of Cognitive Systems*, *7*(2), 33-38.

Wong, G. K., Ma, X., Dillenbourg, P., & Huan, J. (2020). Broadening artificial intelligence education in K-12: where to start?. *ACM Inroads*, *11*(1), 20-29.

Yaacoub, J. P. A., Noura, H. N., Salman, O., & Chehab, A. (2023). Ethical hacking for IoT: Security issues, challenges, solutions and recommendations. Internet of Things and Cyber-Physical Systems, 3, 280-308.

Yung, K. W. H., & Wong, S. F. P. (2024). L2 motivation in shadow education: analysing students' L2 learning experience in online English private tutoring. *Language Learning Journal*, 1-15. https://doi.org/10.1080/09571736.2024.2305409

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the

educators?. *International Journal of Educational Technology in Higher Education, 16*(1), 1-27.

Zhai, X. (2022). *ChatGPT user experience: Implications for education.* SSRN 4312418.

Zhang, W. (2023). *Taming the wild horse of shadow education: The global expansion of private tutoring and regulatory responses* (p. 171). Taylor & Francis.

Zhang, W., & Bray, M. (2020). Comparative research on shadow education: Achievements, challenges, and the agenda ahead. *European Journal of Education, 55*(3), 322-341.

Zhang, Y., Wu, X., Chen, S., Cui, C., He, Y., & Wang, L. (2024). Differential effects of private tutoring on groups of students' mathematics achievements: a longitudinal study. *Educational Studies in Mathematics*, 115, 197–222. https://doi.org/10.1007/s10649-023-10282-5