

Navigating AI and chatbot applications in education and research: a holistic approach

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Received 2 October 2023
Revised 25 July 2024
Accepted 7 September 2024

Abstract

Purpose – This study aimed to identify factors influencing AI/chatbot usage in education and research, and to evaluate the extent of the impact of these factors.

Design/methodology/approach – This study used a mixed approach of qualitative and quantitative methods. It is based on both primary and secondary data. The primary data were collected through an online survey. In total, 177 responses from teachers were included in this study. The collected data were analyzed using a statistical package for the social sciences.

Findings – The study revealed that the significant factors influencing the perception of the academic and research community toward the adoption of AI/interactive tools, such as Chatbots/ChatGpt for education and research, are challenges, benefits, awareness, opportunities, risks, sustainability and ethical considerations.

Practical implications – This study highlighted the importance of resolving challenges and enhancing awareness and benefits while carefully mitigating risks and ethical concerns in the integration of technology

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Swamy koragajja in his blessings the work has been completed and the authors also thankful to the “Quality Education for All” journal’s editorial team and reviewers. The authors also grateful to note the support of master likhesh in completing this research work.



Quality Education for All
Vol. 1 No. 1, 2024
pp. 277-300
Emerald Publishing Limited
2976-9310
DOI 10.1108/QEA-10-2023-0005

within the educational and research environment. These insights can assist policymakers in making decisions and developing strategies for the efficient adoption of AI/interactive tools in academia and research to enhance the overall quality of learning experiences.

Originality/value – The present study adds value to the existing literature on AI/interactive tool adoption in academia and research by offering a quantitative analysis of the factors impacting teachers' perception of the usage of such tools. Furthermore, it also indirectly helps achieve various UNSDGs, such as 4, 9, 10 and 17.

Keywords Education, Research, AI, Interactive tools, ChatGPT, Chatbots, UNSDG-4, 9, 10, 17

Paper type Research paper

1. Introduction

In the technology-based environment and ever-changing landscape of education and research, the inculcation of artificial intelligence (AI) and conversational tools such as ChatGpt/Chatbots has become increasingly prominent (Eguchi *et al.*, 2021). These tools offer many potential benefits, ranging from revolutionizing teaching and learning experiences to advancing and streamlining research processes. However, their employment is not free from complexities, challenges and ethical considerations (Baidoo-Anu and Ansah, 2023). The potential benefits of adopting these tools are a key factor in encouraging academics and researchers to improve their efficiency in their roles (Abbas *et al.*, 2023). Furthermore, these tools also assist them in performing their roles in confirmation of real-world practices (Owan *et al.*, 2023). In addition, it also helps to enhance their abilities with increased research efficiency and analyzes a wider range of data sets for value-added outcomes. These tools have also motivated educational institutions to reap the benefits of AI solutions (Chounta *et al.*, 2022; Rahman and Watanobe, 2023). In another context, these tools offer opportunities for academic and research staff to create and implement innovative teaching methods, support collaborative research and automate routine administrative functions. This, in turn, produces more time spent on meaningful work (Grassini, 2023). However, many academic and research staff members are not fully aware of the capabilities, benefits and limitations of these tools. Therefore, institute initiatives are necessary to increase awareness to implement AI-based tools to enhance academic and research efficiency (Lindner *et al.*, 2019; Chounta *et al.*, 2022; Lee and Perret, 2022). Further, it is also necessary to ensure the long-term sustainability of these technological initiatives in academic and research environments to gain the trust of the various stakeholders involved (Gupta *et al.*, 2020; Abad-Segura *et al.*, 2020). Aspects of scalability, adaptability, maintenance and monitoring of these tools over time are an unanswered question (Sok and Heng, 2023).

There are some challenges in initiating AI in academia and research, including technical challenges in the implementation of such tools, additional financial burdens and potential resistance to change among academic and research staff. Resolving these issues requires more time, effort and support from staff to bridge the gap during the transition (Opara *et al.*, 2023; Shidiq, 2023). The employment of AI-based tools in academics and research poses some risks that may be associated with data privacy, security breaches, algorithmic biasedness and replacing teachers and researchers (Peres *et al.*, 2023; Rahman and Watanobe, 2023). Most importantly, there are many ethical considerations behind the adoption of AI-based tools in education and research, such as transparency, fairness, accountability and the responsible use of such tools without violating legal and ethical norms (Halaweh, 2023). Analyzing and evaluating these factors before the implementation of AI tools in education and research is essential. Therefore, the present study helps various stakeholders and regulatory authorities frame policies and implement AI tools for education and research. This study analyzed various factors influencing the adoption of AI/interactive

tools in education and research. The remainder of this paper is organized as a literature review, theoretical framework, hypotheses development, methodology, results, discussion and conclusion.

2. Background literature review

As the concept of the study is emerging and needs of the hour, it is essential to analyze the research trend to identify the specific gap to be filled by the current study. This section discusses trends in the literature on the current topic.

AI/chatbots offer many opportunities to the stakeholders of educational institutions, such as Teachers, Researchers, Administrators and others. However, the application of such technologies in education and research remains limited (Yang and Evans, 2019). In addition, Zheng *et al.* (2022) also highlighted the opportunities of these technologies in terms of personalized learning experience, 24/7 learning support, enhanced learning experience, expanded diversity in learning opportunities and career counseling and guidance. On the other hand, they also highlighted the challenges of such technologies in terms of local language processing, low speed of response, accuracy and reliability, interaction and customization and information security.

The use of AI/chatbot technologies offers a platform for interactive teaching, learning and research, which could be a major influencing factor in the application of such technologies for education and research (Sandu and Gide, 2019). Furthermore, these technologies help establish a worldwide trustworthy and sustainable ecosystem of knowledge, skills and values by collating all stakeholders in a single platform (Sandu and Gide, 2019; Karyotaki *et al.*, 2022; Rossetini *et al.*, 2023). On the other hand, Wang *et al.* (2023) noted that AI/Chatbots certainly ease the teaching-learning process and also enhance the efficiency of the educational administrative process. These technologies are essential and beneficial for designing and offering a blended educational model (Ilieva *et al.*, 2023). Furthermore, AI/chatbots reduce many technical tasks, such as the translation of learning content from one language to another, more specifically, in the class border learning environment (Han, 2020; Aleedy *et al.*, 2022). Furthermore, these technologies also assist and help to smooth the learning of different cultures and languages with minimal effort and resources. Hence, the speed and efficiency of learners will improve significantly (BOZDOĞAN and EKMEKÇİ, 2023; Zhai and Wibowo, 2022).

The use of AI/chatbots in education and research requires a change in the academic rules and evaluation procedures used in educational institutions (Gill *et al.*, 2024; Al-Emran *et al.*, 2023) highlighted that the performance expectancy, effort expectancy, habits of learners and perceived threats are the most influential factors for the use of AI/Chatbots in education and research. Kelly *et al.* (2022) pointed out that not all applications of AI/chatbots can be generalized to account for the influence of their adoption in a particular field. Technological proficiency in teachers and learners is a significant factor that influences the adoption of AI/chatbots in education and research (Min *et al.*, 2021; Zhang *et al.*, 2023). Technology-based education enhances learners' learning experiences and potentiality (Gallina, 2023). More importantly, the functional aspects of any technology, perceived ease of use and social influence factors significantly affect its adoption, as in the case of AI/chatbots (Malik *et al.*, 2021; Nicolescu and Tudorache, 2022; Bilquise *et al.*, 2023). However, ethical issues involved in the use of AI/chatbots in education and research are also a prominent aspect to be considered before and after their adoption (Mvondo *et al.*, 2023).

2.1 Artificial intelligence tools in teaching, learning and research

The integration of technology into education has gained prominence because of the COVID-19 outbreak (Fergus *et al.*, 2023). The transformation of education is directly linked to the

application of technologies, such as artificial intelligence. These technologies have opened up new possibilities and pitfalls for teaching and research (Popenici and Kerr, 2017). A recent advancement in AI applications is the newly invented assistive tool ChatGPT, which is a chatbot with extraordinary human abilities. In a study by Susnjak (2022), ChatGPT was shown to be capable of exhibiting critical thinking skills and generating highly realistic texts with minimal input. Further, there are concerns about cheating during online sessions that need to be prioritized by taking proper measures to maintain ethics and integrity in education. In another study by Sullivan *et al.* (2023), assistive tools such as ChatGPT can positively help students in numerous ways by enhancing the academic success of students from different equity groups, helping students with disabilities, reducing stigma around seeking help and helping students translate content from one language to another. Qadir (2022) also highlighted that these technologies help enhance the learning experiences of learners by supporting them in obtaining customized feedback, explanations and assisting in developing realistic virtual simulations for hands-on learning. Further, the researcher also highlighted that negative aspects, such as the use of generative AI in education, raise ethical concerns, such as the potential for unethical or dishonest use by students and the potential unemployment of humans who are made redundant by technology. Furthermore, it is suggested that students take advantage of the benefits offered by Generative AI technologies while avoiding negative consequences.

Borenstein and Howard (2021) in their study pointed out that AI-based technologies are becoming pervasive and reshaping the world unimaginably, which though beneficial can also sometimes be harmful. Cotton *et al.* (2023) noted that Chatbot/Chat GPTs, ChatGPT offer many benefits such as increased student engagement, collaboration and accessibility, it also raise concerns about risks to academic integrity and ethics. A similar concern was raised by many authors; for instance, (Sullivan *et al.* (2023) and Mijwil *et al.* (2023) argued that the application of AI in academic research raises concerns about ethics and integrity. Further, they stressed that there is a lack of technologies that can detect such violations, which creates a significant challenge for academic writing. Furthermore, Peres *et al.* (2023) and King and ChatGPT (2023) in their study they opined that students can use ChatGPT to cheat in writing assignments, which can have serious consequences, such as failing grades and academic integrity. In addition, they stressed that it would negatively impact their critical thinking abilities. Cribben and Zeinali (2023) also expressed concern that greater reliance on AI/Conversational tools may also affect critical thinking and problem-solving skills among learners and educators.

Chen *et al.* (2020), AlAfnan *et al.* (2023) in their study, it is highlighted that ChatGPT has the potential to replace the existing search engines as it is capable of producing accurate and reliable ideas to answer descriptive and application questions. Furthermore, it is also noted that ChatGPT provides an effective platform for educational institutions to set up technology-integrated classrooms, organize workshops, have discussions and evaluate generated responses. They also pointed out that these technologies can be beneficial in designing courses, creating content, grading and assessments to evaluate students' performance.

In contrast, Farrokhnia *et al.* (2023) in their study it is noted that ChatGPT can threaten the education system by causing a lack of understanding of the context, threatening academic integrity, causing discrimination to continue in education, democratizing plagiarism and declining high-order cognitive skills. In addition, it is also pointed out that due to concerns related to academic ethics and integrity, many publishers do not consider the work generated by generative AI as the work of submitting authors and demand appropriate clarifications, where necessary.

2.2 Artificial intelligence/chatbots and academic research writing

Artificial Intelligence tools are increasingly being used by researchers for writing research reports and analyses, and ChatGPT has recently been cited as a co-author in some research

articles (Burger *et al.*, 2023; Somasundaram, 2023) observed that technological tools, such as ChatGPT, can serve as powerful tools to expedite the process of writing and publishing research reports. However, the author also stressed issues of academic integrity and ethics. However, it is equally important to note that not all publishers allow ChatGPT to be listed as a co-author and many publishers are prohibited from listing ChatGPT as a co-author (Peres *et al.*, 2023).

Mijwil *et al.* (2023) pointed out that the users of AI tools must be careful about ethical considerations, transparency and accountability of their contents. In support of this, Lund and Wang (2023) opined that AI tools pose serious concerns about the unethical use of technology in academia and research; therefore, monitoring this issue is a big challenge. Academic institutions are responsible for framing strategies to monitor such issues to ensure ethics and integrity. Crust (2023) also highlighted the potential loss of demand for skilled labor because of ChatGPT. Most studies have thus noted the implication of ChatGPT and other AI tools for jobs, specifically in academic and research environments.

2.3 Prevention of dishonest use of artificial intelligence tools in academics and research

AI interactive tools can prove to be useful for students and educators in numerous ways and are subject to various ethical considerations. Educational institutions and publishers must use many strategies and serious measures to mitigate the risk of academic dishonesty (Halaweh, 2023). Cotton *et al.* (2023) have recommended that educational institutions adopt strategies, policies and procedures to design, train and support and other ways to detect and prevent misuse and cheating in the learning process.

AlAfnan *et al.* (2023) in their study noted that AI tools skilfully paraphrase the regenerated responses in a way that cannot be detected by similarity detection tools. They also opined that similarity detection software providers must upgrade their software to avoid such incidents from slipping. To overcome the dishonest use of AI tools by learners, King and ChatGPT (2023) suggested that universities and educational institutions should implement alternative methods such as oral presentations, group projects and hands-on activities that involve more interaction and engagement of students. Borenstein and Howard (2021) suggested that there is a need for support from the government and other research institutions to resolve these issues. Sullivan *et al.* (2023) opined that to eliminate cheating and misuse of AI tools by teachers' researchers and academicians, there is a need to rethink and redesign the assignments in ways that can limit the capabilities of AI tools.

2.4 Artificial intelligence/conversational tools versus changing role of academic staff

AI/Conversational tools can also be expected to have implications for teachers. This is due to the growing application and use of AI tools in education. Studies by many authors, such as Qadir (2022), Sullivan *et al.* (2023) and Cotton *et al.* (2023), suggested that interactive tools effectively help learners understand complex concepts with minimal time and effort. It also assists students in writing their academic assignments, projects and materials. However, this can pose a potential threat or raise questions regarding the need for teachers in the future or partially reduce the number of teachers in an academic environment. Furthermore, it also creates difficulties in the assessment and evaluation process. Selwyn (2019) noted that, although most teachers are confident about the unlikelihood of being pushed aside by AI/Chatbots anytime soon, the extent to which human teachers might be displaced by robots in the near future is worth exploring and cannot be neglected.

Conversely, Popenici and Kerr (2017) argued that AI is not ready to replace teachers; however, it can aid in modifying the services and nature of teachers' functions. Celik *et al.* (2022) noted that the evolution of AI-based digital education does not imply that universities

are education institutes will need fewer teachers in the future. [Bosede and Cheok \(2018\)](#) in their study noted the opinion of educational stakeholders, stating that AI/robots are neither about nor capable of occupying the role of teachers. However, the authors also noted the many advantages of robot teachers over human teachers, such as the scarcity of qualified teachers and their cost-effectiveness. They also suggested that the role of the teacher could be better performed using AI tools in the future. Conversely, they also pointed out that the need for skills such as emotional intelligence, creativity and communication, which are naturally endowed by human teachers, good teachers continue to remain a need in future classrooms.

Thus, the employment of technological advancements, such as AI/interactive tools in the area of education, specifically teaching-learning and research, poses several opportunities and challenges to various stakeholders. Although previous studies have pointed toward the visible advantages and potential threats of AI/interactive tools such as ChatGpt to education, there is a need for further exploration in this emerging area. Therefore, the present study is an attempt is been made to determine the factors influencing the use of AI/interactive tools such as chatbots in education and research. Based on these aspects, the following research questions were framed:

RQ1. What factors influence the use of AI/conversational tools in education and research?

RQ2. What is the level of influence of factors on the usage of AI/conversational tools in education and research?

To address the above research questions, the present study aimed to analyze the perceptions of academicians who are teachers and researchers regarding various aspects of the use of AI/chatbots-based technologies in education and research.

3. Methodology

The primary objective of the present investigation is to assess academics' perspectives on the utilization of AI and chatbot-based technologies in the realms of education and research. Many studies ([Hider and Pymm, 2008](#); [Connaway and Powell, 2010](#); [Blumberg et al., 2014](#)) have recommended a survey method to evaluate the user's perception of any products, services and technology. The present study was based on both primary and secondary data. The primary data were collected through an online survey. To achieve this objective, the study adheres to a specific methodology comprising the following steps:

- (1) Identification and selection of the domain to be studied.
- (2) Generation of items through literature review and focus group discussions with experts.
- (3) Classification of items into separate categories.
- (4) Initial pilot survey to test feasibility of the instrument.
 - Validation of the instrument by subject matter experts.
 - Pilot testing of the instrument to ensure its effectiveness.
 - Finalization of the instrument through modification and refinement.
 - Collection of data related to the research instrument developed to evaluate the use of AI tools in education and research.
 - Exploratory factor analysis was used to determine the structure of the instrument.

- Assessment of the instrument's internal consistency and validity through reliability and validity.
- Data analysis and interpretation.

3.1 Item generation

Following the finalization of the domain AI tools in education and research, the next procedure followed in the study was the development of items that could assess the construct based on the objective of the study. There are many scientific procedures to follow in the process of item development (Mumford *et al.*, 1996). This study used earlier literature and focus group discussions with a diverse group of experts in the fields of education and research (Nyumba *et al.*, 2018). Academicians and researchers are considered primary respondents because they are well versed with the ground reality of environmental education development. Therefore, focus group discussions consist of academics and researchers from different domains such as humanities, science and commerce streams.

Focus group discussions began by highlighting the aim of the study and the significance of the discussions. The discussion guidelines used during the discussions were shared with experts. Insights from the discussions were systematically recorded with the help of a moderator. After the conclusion of the focus group discussions, the recorded insights through notes were examined to identify the concept to which insight is related. After classifying the notes, academic experts were consulted to verify the relevance and accuracy of the classifications. Upon completion of this process, statements concerning the factors influencing the adoption of AI tools for academics and research were developed.

Initially, 33 items were constructed and grouped into various categories (awareness, benefits, opportunities, challenges, risks, sustainability and the ethical aspects of AI tools in education and research). The items and their sources are listed in Table 1. for the questionnaire, but after the focus group discussion, 7 items were deleted and finally, 26 items were included in the survey instrument. In the next stage, an additional set of discussions with experts was conducted to re-verify whether any of the items were repeated on the same theme, after which they finalized to retain all 26 items among the said categories. Finally, there were two parts to the questionnaire. The first part consisted of the demographic and educational background of the respondents. The second part consisted of the 26 statements discussed above, for which respondents were asked to rate their insights for each dimension pertaining to the use of AI tools for education and research purposes on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

3.1.1 Initial pilot survey. After developing the questionnaire, a pilot survey was conducted with 33 respondents. A draft questionnaire was finalized and included questions pertaining to demographic aspects related to the use of AI tools in education and research. In the next stage, three experts were consulted for their feedback. The experts recommended continuing the questionnaire with minor modifications related to sentence formation and interchange of items between the said dimensions; subsequently, the questionnaire was modified accordingly.

3.1.2 Data collection procedure. Since the topic of this study is new and emerging, data cannot be gathered through secondary sources. Hence, the survey method was used to collect primary data. The survey questionnaire was included in Google forms and distributed among academics and researchers using a convenience sampling method. Convenience sampling was used because of the difficulty in accessing the respondents under consideration for the study (Emerson, 2015). Various platforms such as LinkedIn, University websites and websites of professional associations, such as the Indian Commerce Association and Indian Accounting Association, were used to mobilize the list of respondents and their e-mail ids. A

Table 1. Items and their sources

Dimensions	Items	Code	Source
Awareness of AI-based technology usage in education	Q4) Are you aware of AI/Conversational tools (ChatGPT) usage in the context of education?	AW1	Wang <i>et al.</i> , 2023
	Q5) Have you ever experienced AI/Conversational tools (ChatGPT) usage in teaching and learning in education?	AW2	Chounta <i>et al.</i> , 2022
	Q9)What is your perceived level of satisfaction from the experience of using AI/Conversational tools (ChatGPT) for education?	AW3	Yu <i>et al.</i> , 2024
	Q1) With the help of AI/Conversational tools (ChatGPT) designing and integrating of technology and digital skills in education is easy. (Functional and decision-making)	BEN1	Mijwil <i>et al.</i> , 2023
	Q2) AI/Conversational tools (ChatGPT) for education is more beneficial to those teachers and learners who are in remote learning environments than a classroom learning environment	BEN2	Sok and Heng, 2023
Benefits of AI/conversational tools (ChatGPT) usage in education	Q6) In AI/Conversational tools (ChatGPT) based education teachers and learners will get access to more customized study materials/cases/illustrations/practical issues	BEN3	Al-Obaydi <i>et al.</i> , 2023
	Q8) AI/Conversational tools (ChatGPT) are more beneficial in solving students' queries on academic and non-academic (administrative aspects) in education	BEN4	Bilquise <i>et al.</i> , 2023
	Q10) It is more useful to both learners and instructors to get academic resources that are not available in libraries or educational institutions in an efficient and timely way	BEN5	Hider and Pymm, 2008
	Q7) Preparation of customized study materials/assignments can be smoother with the help of the AI/Conversational tools (ChatGPT)	OP1	Bahrami <i>et al.</i> , 2023
	Q18) AI/Conversational tools (ChatGPT) help to ensure 24x7 hours tutor in the execution/completion of projects as part of education	OP2	Wang <i>et al.</i> , 2024
Opportunities of AI/conversational tools (ChatGPT) usage in education	Q23) AI/Conversational tools (ChatGPT) become transformational platforms than Google to acquire required resources for both teachers and students	OP3	AlAfnan <i>et al.</i> , 2023
	Q24) The use of these technologies in education and research is more beneficial to educators who are facing a workload burden due to lack of time	OP4	Tütübaş <i>et al.</i> , 2023
	Q26) The translation by AI/Conversational tools (ChatGPT) helps both teachers and students to focus more on content/subject matter rather than technical aspects such as translating, searching dictionaries etc.,	OP5	Baidoo-Anu and Ansah, 2023

(continued)

Table 1. Continued

Dimensions	Items	Code	Source
Challenges of AI/conversational tools (ChatGPT) usage in education	Q3) AI/Conversational tools (ChatGPT) impacting more negatively than the pandemic on the education and research environment	CH1	Borenstein and Howard, 2021
	Q4) Both teachers and students may become lazy/less creative due to the existence of AI/Conversational tools (ChatGPT) while preparing to perform their jobs	CH2	Celik <i>et al.</i> , 2022
	Q20) As AI/Conversational tools (ChatGPT) are more interactive and responsive in less time or zero time both learners and instructors may run away from real knowledge resources like reference books	CH3	Adeshola and Adepoju, 2023
	Q21) AI/Conversational tools (ChatGPT) technologies to be employed in education need to be trained on diverse data sets such as from different nations and in different languages otherwise irrelevant output will be generated	CH4	Aleedy <i>et al.</i> , 2022
Risks AI/conversational tools (ChatGPT) usage in education	Q11) Banning AI/Conversational tools (ChatGPT) in education at the institutional level makes the institutional position will be irrelevant	RI1	Dai <i>et al.</i> , 2023
	Q12) Regulators are required to monitor the developers of AI/Conversational tools (ChatGPT) in the context of education and research to protect integrity in education	RI2	Cotton <i>et al.</i> , 2023
	Q17) There is a need for collaboration between the government and B'schools to determine the appropriate use of AI/Conversational tools (ChatGPT) in education otherwise misuse will be more	RI3	Casheekar <i>et al.</i> , 2024
	Q13) Duplication of research work in different languages may increase due to AI/Conversational tools (ChatGPT)	SUS1	Mageira <i>et al.</i> , 2022
Sustainability of AI/conversational tools (ChatGPT) usage in education	Q14) Unethical paraphrasing cannot be traced unless otherwise, these technologies are more advanced in this context	SUS2	King, 2023
	Q22) Defining the scope of use of AI/Conversational tools (ChatGPT) in research is difficult and it needs a global framework like COPE guidelines	SUS3	Aleedy <i>et al.</i> , 2022
	Q25) The importance, integrity and sanctity are questioned when researchers prepare and publish for number's sake through AI/Conversational tools (ChatGPT) and other technologies	ETH1	Broyde, 2023
	Q28) Protection of the interest of original researchers is also a question in the AI/Conversational tools (ChatGPT) research environment	ETH2	Casheekar <i>et al.</i> , 2024
	Q29) Creativity, cognitive skills and researcher involvement in the research may deteriorate if the researchers rely more on AI/Conversational tools (ChatGPT)	ETH3	Fiialka <i>et al.</i> , 2023

Source: Authors' creation

total of 226 e-mail ids from academics and researchers were gathered. Google forms were distributed to the respondents through e-mail ids obtained. Real-time collection of responses was performed through a pre-established timeline.

The e-forms were distributed on July 15, 2023, and opened until August 31, 2023. Periodic reminders were sent weekly to enhance the response rates. After gathering the responses, a detailed and careful examination and curation of the data were performed to eliminate issues of completeness, accuracy and reliability. Duplicate and incomplete responses were excluded from the database. The final database on the use of AI in education and research was transported to a compatible format for further analysis and interpretation in relation to the objective of the study.

3.2 Demographic profile of respondents

Using Google Forms, a questionnaire was circulated among 430 academicians in various domains teaching at the UG and PG levels. Of the circulated questionnaires, 193 responses were received, of which 177 completed responses at a rate of 41.16%, all of which were considered for further analysis.

The profile of the respondents (Table 2) was diversified. Eighty-five respondents were male (%) and 92 respondents were female (5), with 43 respondents belonging to the age category of below 25 years (24.29%), 113 respondents between the ages of 25 and 35 years (26.27%), 15 respondents between the ages of 35 and 40 years (8.47%), 3 respondents between the age category of 45 and 55 years (1.69%) and 3 respondents were under the age of 55 and above (1.69%).

Furthermore, 46 respondents were PhD holders (25.98%), 110 respondents were Post Graduates (62.14%) and 21 respondents were Professional Graduates (11.86%). In terms of experience, 77 respondents had less than 5 years of experience (43.50%), 68 respondents are under the experience category of 5 to 10 years (38.41%) and 32 respondents are under the experience category of 10 to 15 years of experience (18.07%).

In terms of roles, 93 respondents were teachers (52.54%), 34 respondents were researchers (19.20%) and 50 respondents were working in both the teaching and research categories (28.24%).

In terms of the Teaching Domain, 74 respondents belonged to Social Sciences (41.80%), 30 respondents belonged to Commerce and Business (16.94%) and 73 respondents belonged to the science domain (41.2%).

3.3 Research instrument and its reliability and validity

The research instrument included a 26-item questionnaire designed with the help of focus group interviews with experts in the field of artificial intelligence (AI) and education for validation. The designed questionnaire was first administered as a pre-test to 33 respondents, and the questionnaire was incorporated with the feedback, distributed and the data were gathered. To assess the item reliability, 33 questionnaires were completed and Cronbach's alpha coefficient was considered equal to 0.813, suggesting that the research instrument is acceptable for use in data collection.

3.4 Data analysis tools

This study attempted to use scientific tools to analyze the collected data in relation to the objectives of the study. To find the underlying variables of the summarized data set, the factor analysis method was adopted. The initial data for the factor analysis was a variable matrix. The factor analysis has no predetermined dependent variables, and the goal of the exploratory analysis is to sum up the data. Principal components analysis was used, in which

Table 2. Demographic profile of respondentsQuality Education
for All

Demographic details	No. of respondents	%
<i>Gender</i>		
Male	85	48.3
Female	92	51.7
<i>Total</i>	<i>177</i>	<i>100</i>
<i>Age (years)</i>		
Below 25	43	24.3
25 to 35	113	63.8
35 to 45	15	8.5
45 to 55	3	1.7
Above 55 years	3	1.7
<i>Total</i>	<i>177</i>	<i>100</i>
<i>Education</i>		
Ph.D	46	26
Post graduate	110	62.1
Professional studies	21	11.9
<i>Total</i>	<i>177</i>	<i>100</i>
<i>Age of service (years)</i>		
Less than 5	77	43.5
5–10	68	38.42
10–15	32	18.08
<i>Total</i>	<i>177</i>	<i>100</i>
<i>Role in education</i>		
Teaching	93	52.5
Research	34	19.3
Both	50	28.2
<i>Total</i>	<i>177</i>	<i>100</i>
<i>Teaching domain</i>		
Social sciences	74	41.8
Commerce and business	30	16.9
Science	73	41.2
<i>Total</i>	<i>177</i>	<i>100</i>

Source: Authors' calculations

the total variance of the observed variables was analyzed. The significance of the chi-square statistic and Bartlett's test is an essential condition for moving forward with factor analysis (Kokoska *et al.*, 1989). The KMO test assesses overall sampling adequacy, while Bartlett's test examines the null hypothesis of no correlation among the variables (Pallant, 2011). The researchers have used these tests in combination to make a decision about proceeding with factor analysis.

A principal component analysis and extraction method with a Varimax with Kaiser Normalization rotation was used to determine the factor loading and commonalities. From the results of the EFA, a multivariate regression model was developed to identify the key factors influencing the use of AI/ChatGPT/Chatbot technologies in education and research.

The study also used multiple regression and ANOVA techniques to assess the influence of independent variables on the dependent variables and their variances.

4. Results

Results of the Kaiser-Meyer-Olkin measure of sampling adequacy (Pallant, 2011). Furthermore, Bartlett’s test of sphericity was conducted to check whether the correlation matrix fits an identity matrix and results showed (Table 3) a chi-square value that was significant (chi square = 4398.843, $p < 0.001$), meaning that the correlation matrix is significantly different from the identity matrix and is suitable for conducting factor analysis.

Factor analysis yielded seven factors, accounting for 76.83% of the cumulative variance. This indicates that the factors extracted from the data captured nearly 79% of the variability observed in the original variables. This percentage is often considered substantial, indicating that the factors identified are meaningful in explaining the underlying patterns in the data (Ananda and Devesh, 2018).

The results of the factor analysis are shown in Table 3 and interpreted as follows: the first factor, “Awareness of AI-based Technology Usage in Education,” consists of items 4, 5 and 9. This factor accounted for 16.461% of the total variance. Students appear to believe that their awareness of AI-based technology influences their education. The second factor, “Benefits of AI/Conversational tools (ChatGPT) Usage in Education,” contained items 1, 2, 6, 8 and 10, accounting for 14.973% of the total variance. The third factor, “Opportunities of AI/Conversational tools (ChatGPT) Usage in Education,” consisted of items 7, 18, 23, 24 and 26, accounting for 12.871%. The fourth factor, “Challenges of AI/Conversational Tools (ChatGPT) Usage in Education,” consisted of item 3, 4 20 and 21 and accounted for 9.554% of the total variance. The fifth factor, “Sustainability of AI/Conversational tools (ChatGPT) Usage in Education,” consisted of items 11, 12 and 17 and accounted for 9.201% of the total variance. The sixth factor, “Ethical aspects of AI/Conversational tools (ChatGPT) usage in Education” consists of item 13,14 and 22 and accounts for 8.137% of the total variance. The seventh factor, ethical aspects of AI/conversational tools (ChatGPT) usage in Education includes 25, 28 and 29 accounting for a variance of 5.635%.

The factor loadings (Table 4) show the strength and direction of the relationship between each variable and the factors, and all values were above 0.5. Communalities refer to the proportion of variance in an observed variable that is accounted for by the underlying factors. Therefore, each observed variable has a corresponding communality value that represents the shared variance between the variable and extracted factors, and most of the communalities are indicated to be strong as they are closer to 1 instead of 0.

The scree plot shows (Figure 1) a bend in the curve at a factor of 8. Consequently, seven factors were extracted. These seven factors explained most of the variance (also see Table 5).

The factors derived using exploratory factor analysis were used to derive their influence on AI/ChatGPT/Chatbot technologies in education and research. Hence, multiple regression analysis was applied. Prior to using multiple regression analysis and ANOVA, the Shapiro-Wilk test was used to test the normality of the data and the p -value from the Shapiro-Wilk test (0.073) proved that the data were normal.

Table 3. KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy	0.685
Bartlett's test of sphericity approx. Chi-Square	4398.843
Degrees of freedom	351
Significant	0.000

Source: Authors' compiled

Table 4. Factor analysisQuality Education
for All

Dimensions	Items	Factor loadings	Commonalities
Awareness of AI-based technology usage in education	AW1	0.814	0.706
	AW2	0.784	0.641
	AW3	0.710	0.716
Benefits of AI/conversational tools (ChatGPT) usage in education	BEN1	0.686	0.681
	BEN2	0.556	0.672
	BEN3	0.636	0.689
	BEN4	0.573	0.671
	BEN5	0.580	0.646
Opportunities of AI/conversational tools (ChatGPT) usage in education	OP1	0.814	0.858
	OP2	0.769	0.712
	OP3	0.572	0.845
	OP4	0.771	0.733
	OP5	0.520	0.764
Challenges of AI/conversational tools (ChatGPT) usage in education	CH1	0.559	0.814
	CH2	0.645	0.843
	CH3	-0.563	0.851
	CH4	0.814	0.689
Risks AI/conversational tools (ChatGPT) usage in education	RI1	0.830	0.682
	RI2	0.892	0.882
	RI3	0.837	0.853
Sustainability of AI/conversational tools (ChatGPT) usage in education	SUS1	0.853	0.787
	SUS2	0.699	0.789
	SUS3	0.807	0.833
Ethical aspects of AI/conversational tools (ChatGPT) usage in education	ETH1	0.804	0.786
	ETH2	0.831	0.791
	ETH3	0.508	0.559

Source: Authors' compiled

The R Square in a multiple regression analysis (Table 6) represents the explained variance that can be attributed to all predictors in a progression. The predictors of the level of use of AI/ChatGPT/chatbot technologies are awareness, benefits, challenges, opportunities, sustainability, risks and ethical aspects. R-squared gives explanatory power. In Table 6 The model summary shows an R-squared value of 0.518. This indicates that 51.8% of the variance in the dependent variable (level of usage) was explained by awareness, benefits, challenges, opportunities, sustainability, risk and ethical aspects.

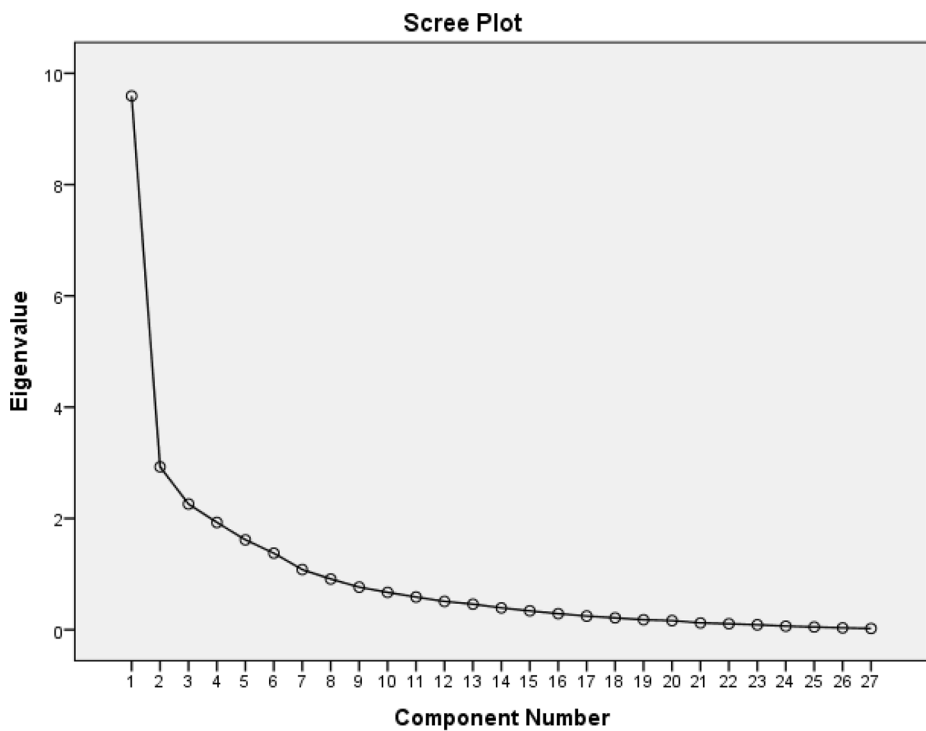
Table 7 reveals the results of multiple regression analysis were statistically significant (F-statistic = 25.955; degrees of freedom = 7, 169; $p = .000$ or $p < 0.001$). Hence, this indicates that the independent variables explain the model well, considering the model to be a good fit.

4.1 Factors influencing the use of artificial intelligence/ChatGPT/chatbots technologies in education and research

A linear multiple regression model was formulated to assess the factors influencing the use of AI/ChatGPT/Chatbot technologies in education and research.

Level of usage of AI/ChatGPT/Chabot = Constant + β_1 Awareness + β_2 Benefits + β_3 Opportunities + β_4 Challenges + β_5 Risks + β_6 Ethical aspects + β_7 Sustainability + β error.

Examination of the regression coefficient reveals that awareness of AI/ChatGPT/chatbot technology significantly impacts the level of usage in education and research ($\beta = 0.612$, $t = 8.186$, $p < 0.001$). The regression coefficients for benefits ($\beta = 0.556$, $t = 7.022$, $p < 0.001$)



Source: Authors' creation

Figure 1. Scree plot

and opportunities ($\beta = 0.525, t = 4.084, p < 0.001$) both have a positive impact on the level of usage of such technologies in education and research. In contrast, the regression coefficients are negative for challenges ($\beta = -0.399, t = -3.295, p < 0.001$) and sustainability ($\beta = -0.502, t = -3.947, p < 0.001$) factors that convey a negative significant impact on the perceived level of usage of AI/ChatGPT/Chatbot for education and research. However, risk and ethical factors did not have any significant impact on the perceived level of usage of AI/ChatGPT/Chatbot for education and research. Overall, multiple regression analysis has proved that awareness, benefits, opportunities, challenges and sustainability are influential factors for the perceived level of usage of AI/ChatGPT/Chatbot for education and research in the modern academic environment.

When predictors are correlated, the standard errors of their coefficients tend to increase, thereby inflating their variance. VIF serves as a tool to quantify the extent to which variance inflation occurs. The VIF values in Table 8 are all less than five, indicating the nonexistence of multicollinearity (Debbie and Victoria-Feser, 2023).

5. Discussion

The primary purpose of this study was to determine the factors that influence the adoption of AI/ChatGPT in education and research. The study was conducted using a survey method and

Table 5. Total variance explained

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	9.031	34.733	34.733	9.031	34.733	34.733	4.280	16.461	16.461
2	2.920	11.230	45.962	2.920	11.230	45.962	3.893	14.973	31.435
3	2.187	8.411	54.373	2.187	8.411	54.373	3.346	12.871	44.305
4	1.812	6.971	61.343	1.812	6.971	61.343	2.484	9.554	53.859
5	1.603	6.167	67.510	1.603	6.167	67.510	2.392	9.201	63.060
6	1.367	5.256	72.766	1.367	5.256	72.766	2.116	8.137	71.196
7	1.057	4.065	76.832	1.057	4.065	76.832	1.465	5.635	76.832
8	0.906	3.485	80.317						
9	0.765	2.943	83.260						
10	0.668	2.569	85.828						
11	0.588	2.261	88.089						
12	0.507	1.948	90.037						
13	0.448	1.724	91.761						
14	0.339	1.304	93.065						
15	0.325	1.249	94.315						
16	0.277	1.065	95.380						
17	0.241	0.926	96.306						
18	0.214	0.822	97.128						
19	0.166	0.639	97.767						
20	0.142	0.545	98.312						
21	0.121	0.464	98.776						
22	0.107	0.412	99.188						
23	0.081	0.311	99.499						
24	0.059	0.227	99.727						
25	0.047	0.183	99.910						
26	0.024	0.090	100.000						

Note: Extraction Method = principal component analysis
Source: Authors' Compiled

Table 6. Results of multiple regression analysis

Model	R	R square	Adjusted R square	Std. Error of the estimate
1	0.720 ^a	0.518	0.498	0.531

Notes: ^aPredictors: (Constant), awareness, benefits, challenges, opportunities, sustainability, risk, ethical aspects

Source: Authors' compiled

Table 7. Results of ANOVA test

	Model	Sum of squares	df	Mean square	F	Sig.
1	Regression	51.147	7	7.307	25.955	0.000 ^b
	Residual	47.576	169	0.282		
	Total	98.723	176			

Notes: ^aDependent Variable = perceived level of usage of AI/ChatGPT/Chatbot technologies in education and research. ^bPredictors = (Constant), awareness, benefits, challenges, opportunities, sustainability, risk, ethical aspects

Source: Authors' compiled

Table 8. Multiple regression results

Model	Unstandardized coefficients		Standardized coefficients		p-value	VIF (variance inflation factor)
	B	Std. Error	β	t-value		
(Constant)	-6.246	1.021		-6.120	0.000	
Awareness	0.175	0.021	0.612	8.186	0.000	1.00
Benefits	0.082	0.012	0.556	7.022	0.000	1.05
Opportunities	0.166	0.041	0.525	4.084	0.000	2.00
Challenges	-0.045	0.014	-0.399	-3.295	0.001	1.50
Risks	-0.032	0.024	-0.118	-1.337	0.183	4.00
Ethical aspects	-0.059	0.047	-0.156	-1.261	0.209	2.58
Sustainability	-0.161	0.041	-0.502	-3.947	0.000	3.40

Note: The dependent variable is the perceived level of usage of AI/ChatGPT/Chatbots in education and research

Source: Authors' compiled

used scientific procedures with the help of factor analysis, multiple regression analysis and ANOVA.

In relation to the first research question, the factors influencing the perception of academic staff regarding the use of AI/ChatGPT/Chatbot were identified using principal component analysis (PCA) with varimax rotation. The rule of minimum eigenvalue (1.0) was applied, and only those items whose factor loadings were at least 0.30 in PCA were selected. Seven factors—Challenges, Benefits, Awareness, Opportunities, Risks, Sustainability and Ethical considerations—were identified. The justification is provided by the seven pertinent dimensions extracted using the principal component method of factor analysis. The study

revealed seven factors (Challenges, Benefits, Awareness, Opportunities, Risks, Sustainability and ethical consideration) that significantly influence the adoption of AI/ChatGPT/Chatbot in education and research. The total variance of 76.8% for an eigenvalue greater than one sufficiently proves the significance of the dimensions, and the remaining 19.1% of the variance is explained by other variables. Among all these factors, challenges account for 16.461%, which is considered to be the most important factor influencing the adoption of such technologies in education and research, followed by benefits (14.973%), awareness (12.871%), opportunities (9.554%), risks (9.201%), sustainability (8.137%) and ethical consideration (5.635%). The success or failure to adopt such technologies depends on the level of awareness among the academic and research communities (Yu *et al.*, 2024). The use of AI/ChatGPT/Chatbot in education and research poses many challenges, such as reduced creativity among both learners and instructors, making them obsolete because of their non-dependence on real knowledge resources such as reference books. Therefore, challenges in the use of such technologies in education and research are considered a prominent factor (Adeshola and Adepoju, 2023). Even though there are many challenges, such technology offers many benefits for academia and research, such as ease of adoption of technology and digital skills in education (Mijwil *et al.*, 2023). They also assist in offering simulated learning platforms in a remote learning environment; such technologies help both learners and instructors access more customized resources (Sok and Heng, 2023; Al-Obaydi *et al.*, 2023). Hence, the benefits of using such technologies are one of the factors under consideration in this study. The results of the study also confirmed that the opportunities and risks created by the use of AI/ChatGPT/Chatbots are motivating factors in inculcating such tools in academic and research environments (Dai *et al.*, 2023; Bahrami *et al.*, 2023; Wang *et al.*, 2024). Another factor identified in this study that influences the use of AI and allied tools in education and research is that the sustainability of such tools in education and research because such tools may negatively influence the duplication of research work, unethical paraphrasing and defining the scope of its usage matters to its sustainability (Mageira *et al.*, 2022; King, 2023). Ethical aspects are another prominent, debatable and researchable factor identified by the study. The use of AI/ChatGPT/Chatbots in academics and research matters of integrity, sanctity and protection of the interest of original researchers. Therefore, before implementing such tools these aspects have to be taken into consideration (Broyde, 2023; Casheekar *et al.*, 2024).

In relation to the second research question, the study performed a multiple regression analysis, which proved that awareness, benefits, opportunities, challenges and sustainability have a significant positive influence on the perceived level of usage of chatbot/AI or Chat GPT for education. This observation reinforces the findings of studies such as Borenstein and Howard (2021), Qadir (2022), Sullivan *et al.* (2023), Cotton *et al.* (2023) and Rahman and Watanobe (2023). The other two factors—risk and ethical considerations—had a negative impact on the perceived level of usage of AI/ChatGPT/Chatbot in education and research in an academic environment. This observation was consistent with the findings of Lindner *et al.* (2019), Chounta *et al.* (2022), Lee and Perret (2022), Halaweh (2023).

In summary, the study suggests that regulatory authorities, educational institutions and academic communities should consider these factors before the adoption of AI and allied tools in education and research.

6. Implications of the study

This study has the following significant practical implications:

6.1 Strategies for overcoming the challenges of artificial intelligence tools

Educational institutions and regulatory authorities should develop strategies to overcome the challenges highlighted in this study associated with the use of AI tools in education and research. These strategies should help reduce creativity and overreliance on AI tools. These strategies may consist of creating guidelines for the appropriate use of such tools as complements rather than replacing traditional methods of learning.

6.2 Awareness and training

The outcome of this study suggests that prospective promoters and adopters of such tools are involved in increasing awareness and training for both educators and researchers on the proper use of AI tools. This will maximize the benefits of using such tools, while minimizing the risks and ethical concerns highlighted in the study.

6.3 Need for the development of ethical frameworks

Educational institutions and regulatory bodies should establish comprehensive ethical guidelines for the use of AI tools in the academic environment. Such guidelines should address the issues highlighted in the study, such as academic integrity, proper citation and scope of usage.

6.4 Need for sustainable integration

The implications of the study also suggest that educational institutions should consider long-term sustainability aspects, such as regularly assessing the impact of learning outcomes, updating curricula to inculcate AI literacy and maintaining a balance between technological advancement and traditional educational values.

7. Conclusion

AI/interactive tools such as ChatGpt/Chatbots are part of the ever-evolving landscape of education and research. The adoption of this in the academic and research environments is influenced by many factors, as discussed above. The significant factors influencing the perception of the academic and research community toward the adoption of AI/interactive tools, such as Chatbots/ChatGpt for education and research, are challenges, benefits, awareness, opportunities, risks, sustainability and ethical considerations. Among these factors, the challenges involved in the use of AI tools emerged as the most influential, highlighting the need to address the obstacles and difficulties associated with these tools in education and research contexts. Other factors, such as benefits, awareness, opportunities and sustainability of such tools in the education and research domain, also positively impacted the perceived usage of such tools by emphasizing the potential advantages and opportunities they bring to academia and research. However, risks and ethical considerations related to the use of AI tools in education and research have a negative influence on the perceived usage of such technologies. This assists in addressing issues concerning risks and ethical aspects, which is essential for fostering a friendly environment for the implementation of these technologies in academics and research.

The major limitations of this study are that it used only academics, and a more diverse sample could provide a broader perspective on the issue involved. Furthermore, the findings may not be entirely generalizable to all education and research institutes because the factors influencing the use of these tools can vary accordingly. Future studies may focus on undertaking longitudinal studies to evaluate how these factors emerge over time and analyze whether there are any changes in perception that lead to varied adoption patterns of AI/interactive tools for education and research. In addition, researchers may also study how

these factors vary across different academic and research environments across the globe, which could provide fruitful insights into the global adoption of these tools in academia and research. As the application of AI/interactive tools is new to the academic and research environments, future researchers may also focus on undertaking qualitative research to validate the findings of the present study, which could offer an in-depth understanding of specific aspects concerning the factors identified by the present study.

The major contribution of the present study is that it adds value to the existing literature on AI/Interactive tools adoption in academia and research by offering a quantitative analysis of the factors impacting teachers' perception of the usage of such tools. Furthermore, the outcome of the study has practical implications in that it stressed the importance of resolving challenges and enhancing awareness and benefits while carefully mitigating risks and ethical concerns in the integration of technology within the educational and research environment. These insights can assist policymakers in making decisions and strategies to efficiently adopt AI tools in academia and research to enhance the overall quality of learning experiences.

More importantly, the outcome of the study also indirectly contributes to achieving the UNSDGs in terms of UNSDG-4 (quality education), and educational institutes can make informed decisions to improve the quality of education and promote lifelong learning opportunities by considering the factors identified by the study. Further, the study also indirectly helps achieve UNSDG-9 by providing insights into the challenges, benefits and opportunities of AI tools for education and research to foster innovation and technological advancements in the education environment. By considering the factors identified in this study, educational institutions can address inequalities by providing a more equitable distribution of academic resources to promote high-quality education. This supports the UNSDG-10(reduced inequalities). By studying the outcomes of the study, educational institutes, government agencies and technology developers can collaborate for responsible implementation of such technologies in education and research. This outcome is in line with UNSDG-17, that is, partnership of sustainable development.

References

- Abad-Segura, E., González-Zamar, M.D., Infante-Moro, J.C. and Ruipérez García, G. (2020), "Sustainable management of digital transformation in higher education: global research trends", *Sustainability*, Vol. 12 No. 5, p. 2107.
- Abbas, N., Ali, I., Manzoor, R., Hussain, T. and Hussaini, M.H.A. (2023), "Role of artificial intelligence tools in enhancing students' educational performance at higher levels", *Journal of Artificial Intelligence, Machine Learning and Neural Network*, Vol. 3 No. 35, pp. 36-49.
- Adeshola, I. and Adepoju, A.P. (2023), "The opportunities and challenges of ChatGPT in education", *Interactive Learning Environments*, pp. 1-14.
- AlAfnan, M.A., Dishari, S., Marina, J. and Koba, L. (2023), "ChatGPT as an educational tool: opportunities, challenges, and recommendations for communication, business writing, and composition courses", *Journal of Artificial Intelligence and Technology*, Vol. 3 No. 2, pp. 60-68, doi: [10.37965/jait.2023.0184](https://doi.org/10.37965/jait.2023.0184).
- Aleedy, M., Atwell, E. and Meshoul, S. (2022), "Using AI chatbots in education: recent advances challenges and use case", *Artificial Intelligence and Sustainable Computing: Proceedings of ICSISCT 2021*, pp. 661-675.
- Al-Emran, M., AlQudah, A.A., Abbasi, G.A., Al-Sharafi, M.A. and Iranmanesh, M. (2023), "Determinants of using AI-based chatbots for knowledge sharing: evidence from PLS-SEM and fuzzy sets (fsQCA)", *IEEE Transactions on Engineering Management*, Vol. 71.

- Al-Obaydi, L.H., Pikhart, M. and Klimova, B. (2023), "ChatGPT and the general concepts of education: can artificial intelligence-driven chatbots support the process of language learning?", *International Journal of Emerging Technologies in Learning (iJET)*, Vol. 18 No. 21, pp. 39-50.
- Ananda, S. and Devesh, S. (2018), "Factors leading to customer satisfaction: an empirical study of retail banking in Oman", *International Journal of Economics and Business Research*, Vol. 16 No. 4, pp. 502-516.
- Bahrami, M.R., Bahrami, B., Behboodi, F. and Pourrafie, S. (2023), "Teaching the future: the vision of AI/ChatGPT in education", *KES International Symposium on Agent and Multi-Agent Systems: Technologies and Applications*, pp. 393-402. Springer Nature Singapore, Singapore.
- Baidoo-Anu, D. and Ansah, L.O. (2023), "Education in the era of generative artificial intelligence (AI): understanding the potential benefits of ChatGPT in promoting teaching and learning", *Journal of AI*, Vol. 7 No. 1, pp. 52-62.
- Bilquise, G., Ibrahim, S. and Salhie, S.E.M. (2023), "Investigating student acceptance of an academic advising chatbot in higher education institutions", *Education and Information Technologies*, Vol. 29 No. 5, pp. 1-26.
- Blumberg, B., Cooper, D. and Schindler, P. (2014), *EBOOK: Business Research Methods*, McGraw Hill, pp. 446-478.
- Borenstein, J. and Howard, A. (2021), "Emerging challenges in AI and the need for AI ethics education", *AI and Ethics*, Vol. 1 No. 1, pp. 61-65, doi: [10.1007/s43681-020-00002-7](https://doi.org/10.1007/s43681-020-00002-7).
- Bosede, I.E. and Cheok, A.D. (2018), "Why not robot teachers: artificial intelligence for addressing teacher shortage", *Applied Artificial Intelligence*, Vol. 32 No. 4, pp. 345-360, doi: [10.1080/08839514.2018.1464286](https://doi.org/10.1080/08839514.2018.1464286).
- BOZDOĞAN, H.N. and EKMEKÇİ, E. (2023), "Modern technologies in teaching English", *The Art of Teaching English in the 21st Century Settings*, p. 104.
- Broyde, M.J. (2023), "AI and Jewish law: seeing how ChatGPT 4.0 looks at a novel issue", This article has been accepted for publication in a future issue of BDD-Bekhol Derakheha Daehu of Bar Ilan University., CSLR Research Paper, (12.2023-AFF).
- Burger, B., Kanbach, D.K., Kraus, S., Breier, M. and Corvello, V. (2023), "On the use of AI-based tools like ChatGPT to support management research", *European Journal of Innovation Management*, Vol. 26 No. 7, pp. 233-241, doi: [10.1108/EJIM-02-2023-0156](https://doi.org/10.1108/EJIM-02-2023-0156).
- Casheekar, A., Lahiri, A., Rath, K., Prabhakar, K.S. and Srinivasan, K. (2024), "A contemporary review on chatbots, AI-powered virtual conversational agents, ChatGPT: applications, open challenges and future research directions", *Computer Science Review*, Vol. 52, p. 100632.
- Celik, I., Dindar, M., Muukkonen, H., et al (2022), "The promises and challenges of artificial intelligence for teachers: a systematic review of research", *TechTrends*, Vol. 66 No. 4, pp. 616-630, doi: [10.1007/s11528-022-00715-y](https://doi.org/10.1007/s11528-022-00715-y).
- Chen, X., Xie, H., Zou, D. and Hwang, G.-J. (2020), "Application and theory gaps during the rise of artificial intelligence in education", *Computers and Education: Artificial Intelligence*, Vol. 1, p. 100002, doi: [10.1016/j.caeai.2020.100002](https://doi.org/10.1016/j.caeai.2020.100002).
- Chounta, I.A., Bardone, E., Raudsep, A. and Pedaste, M. (2022), "Exploring teachers' perceptions of artificial intelligence as a tool to support their practice in Estonian K-12 education", *International Journal of Artificial Intelligence in Education*, Vol. 32 No. 3, pp. 725-755.
- Connaway, L.S. and Powell, R.R. (2010), *Basic Research Methods for Librarians*, ABC-CLIO, pp. 107-142.
- Cotton, D.R., Cotton, P.A. and Shipway, J.R. (2023), "Chatting and cheating: ensuring academic integrity in the era of ChatGPT", *Innovations in Education and Teaching International*, pp. 1-12, doi: [10.1080/14703297.2023.2190148](https://doi.org/10.1080/14703297.2023.2190148).
- Cribben, I. and Zeinali, Y. (2023), "The benefits and limitations of ChatGPT in business education and research: a focus on management science, operations management and data analytics", *SSRN Electronic Journal*, doi: [10.2139/ssrn.4404276](https://doi.org/10.2139/ssrn.4404276).

- Crust, G. (2023), *ChatGPT Employability Study Skills and Curriculum Development*, doi: [10.13140/RG.2.2.35643.28960](https://doi.org/10.13140/RG.2.2.35643.28960).
- Dai, Y., Liu, A. and Lim, C.P. (2023), "Reconceptualizing ChatGPT and generative AI as a student-driven innovation in higher education", *Procedia CIRP*, Vol. 119, pp. 84-90.
- Debbie, J.D. and Victoria-Feser, M.-P. (2013), "Robust VIF regression with application to variable selection in large data sets", *The Annals of Applied Statistics*, Vol. 7 No. 1, pp. 319-341.
- Eguchi, A., Okada, H. and Muto, Y. (2021), "Contextualizing AI education for K-12 students to enhance their learning of AI literacy through culturally responsive approaches", *KI - Künstliche Intelligenz*, Vol. 35 No. 2, pp. 153-161.
- Emerson, R.W. (2015), "Convenience sampling, random sampling, and snowball sampling: how does sampling affect the validity of research?", *Journal of Visual Impairment and Blindness*, Vol. 109 No. 2, pp. 164-168.
- Farrokhnia, M., Banihashem, S.K., Noroozi, O. and Wals, A. (2023), "A SWOT analysis of ChatGPT: implications for educational practice and research", *Innovations in Education and Teaching International*, Vol. 61 No. 3, pp. 1-15, doi: [10.1080/14703297.2023.2195846](https://doi.org/10.1080/14703297.2023.2195846).
- Fergus, S., Botha, M. and Ostovar, M. (2023), "Evaluating academic answers generated using ChatGPT", *Journal of Chemical Education*, Vol. 100 No. 4, pp. 1672-1675.
- Fiialka, S., Kornieva, Z. and Honchar, T. (2023), "ChatGPT in Ukrainian education: problems and prospects", *International Journal of Emerging Technologies in Learning*, Vol. 18 No. 17.
- Gallina, M.A. (2023), "Artificial intelligence and new perspectives for teaching/learning processes", in *School Children and the Challenge of Managing AI Technologies*, Routledge, pp. 28-36.
- Gill, S.S., Xu, M., Patros, P., Wu, H., Kaur, R., Kaur, K., Fuller, S., Singh, M., Arora, P., Parlikad, A.K. and Stankovski, V. (2024), "Transformative effects of ChatGPT on modern education: emerging era of AI Chatbots", *Internet of Things and Cyber-Physical Systems*, Vol. 4, pp. 19-23.
- Grassini, S. (2023), "Shaping the future of education: exploring the potential and consequences of AI and ChatGPT in educational settings", *Education Sciences*, Vol. 13 No. 7, p. 692.
- Gupta, S., Motlagh, M. and Rhyner, J. (2020), "The digitalization sustainability matrix: a participatory research tool for investigating digitainability", *Sustainability*, Vol. 12 No. 21, p. 9283.
- Halaweh, M. (2023), "ChatGPT in education: Strategies for responsible implementation", *Contemporary Educational Technology*, Vol. 15 No. 2, p. ep421, doi: [10.30935/cedtech/13036](https://doi.org/10.30935/cedtech/13036).
- Han, D.E. (2020), "The effects of voice-based AI chatbots on Korean EFL Middle school students' speaking competence and affective domains", *Asia-Pacific Journal of Convergent Research Interchange*, Vol. 6 No. 7, pp. 71-80.
- Hider, P. and Pymm, B. (2008), "Empirical research methods reported in high-profile LIS journal literature", *Library and Information Science Research*, Vol. 30 No. 2, pp. 108-114, doi: [10.5772/intechopen.68749](https://doi.org/10.5772/intechopen.68749).
- Ilieva, G., Yankova, T., Klisarova-Belcheva, S., Dimitrov, A., Bratkov, M. and Angelov, D. (2023), "Effects of generative chatbots in higher education", *Information*, Vol. 14 No. 9, p. 492.
- Karyotaki, M., Drigas, A. and Skianis, C. (2022), "Chatbots as cognitive, educational, advisory and coaching systems", *Technium Social Sciences Journal*, Vol. 30, pp. 109-126.
- Kelly, S., Kaye, S.A. and Oviedo-Trespalacios, O. (2022), "A multi-industry analysis of the future use of AI chatbots", *Human Behavior and Emerging Technologies*, Vol. 2022.
- King, M.R. (2023), "ChatGPT. A conversation on artificial intelligence, chatbots, and plagiarism in higher education", *Cellular and Molecular Bioengineering*, Vol. 16 No. 1, pp. 1-2, doi: [10.1007/s12195-022-00754-8](https://doi.org/10.1007/s12195-022-00754-8).
- King, M.R. and ChatGPT (2023), "A conversation on artificial intelligence, chatbots, and plagiarism in higher education", *Cellular and Molecular Bioengineering*, Vol. 61 No. 1, pp. 1-2.

- Kokoska, S., Nevison, C., Kokoska, S. and Nevison, C. (1989), *Critical Values For Bartlett's Test, Statistical Tables and Formulae*, pp. 72-73.
- Lee, I. and Perret, B. (2022), "Preparing high school teachers to integrate AI methods into STEM classrooms", *Proceedings of the AAAI Conference on Artificial Intelligence*, Vol. 36 No. 11, pp. 12783-12791.
- Lindner, A., Romeike, R., Jasute, E. and Pozdniakov, S. (2019), "Teachers' perspectives on artificial intelligence", *12th International conference on informatics in schools, "Situation, evaluation and perspectives"*, *ISSEP*.
- Lund, B.D. and Wang, T. (2023), "Chatting about ChatGPT: how may AI and GPT impact academia and libraries?", *Library Hi Tech News*, Vol. 40 No. 3, pp. 26-29, doi: [10.1108/LHTN-01-2023-0009](https://doi.org/10.1108/LHTN-01-2023-0009).
- Magiera, K., Pittou, D., Papasalouros, A., Kotis, K., Zangogianni, P. and Daradoumis, A. (2022), "Educational AI chatbots for content and language integrated learning", *Applied Sciences*, Vol. 12 No. 7, p. 3239.
- Malik, R., Shrama, A., Trivedi, S. and Mishra, R. (2021), "Adoption of chatbots for learning among university students: role of perceived convenience and enhanced performance", *International Journal of Emerging Technologies in Learning (iJET)*, Vol. 16 No. 18, pp. 200-212.
- Mijwil, M.M., Hiran, K.K., Doshi, R., Dadhich, M., Al-Mistarehi, A.H. and Bala, I. (2023), "ChatGPT and the future of academic integrity in the artificial intelligence era: a new frontier", *Al-Salam Journal for Engineering and Technology*, Vol. 2 No. 2, pp. 116-127, available at: www.researchgate.net/profile/Maad-Mijwil/publication/369977556_ChatGPT_and_the_Future_of_Academic_Integrity_in_the_Artificial_Intelligence_Era_A_New_Frontier/links/6437be1f20f25554da2a5b15/ChatGPT-and-the-Future-of-Academic-Integrity-in-the-Artificial-Intelligence-Era-A-New-Frontier.pdf
- Min, F.A.N., Fang, Z.O.U., He, Y. and Xuan, J. (2021), "Research on users' trust of chatbots driven by AI: an empirical analysis based on system factors and user characteristics", *2021 IEEE International Conference on Consumer Electronics and Computer Engineering (ICCECE)*, IEEE, pp. 55-58.
- Mumford, M.D., Costanza, D.P., Connelly, M.S. and Johnson, J.F. (1996), "Item generation procedures and background data scales: implications for construct and criterion-related validity", *Personnel Psychology*, Vol. 49 No. 2, pp. 361-398.
- Mvondo, G.F.N., Niu, B. and Eivazinezhad, S. (2023), "Generative conversational AI and academic integrity: a mixed method investigation to understand the ethical use of LLM chatbots in higher education", available at, available at: [SSRN 4548263](https://ssrn.com/abstract=4548263)
- Niculescu, L. and Tudorache, M.T. (2022), "Human-computer interaction in customer service: the experience with AI chatbots—a systematic literature review", *Electronics*, Vol. 11 No. 10, p. 1579.
- Nyumba, O.T., Wilson, K., Derrick, C.J. and Mukherjee, N. (2018), "The use of focus group discussion methodology: insights from two decades of application in conservation", *Methods in Ecology and Evolution*, Vol. 9 No. 1, pp. 20-32.
- Opara, E., Mfon-Ette Theresa, A. and Aduke, T.C. (2023), "ChatGPT for teaching, learning and research: Prospects and challenges", *Glob Acad J Humanit Soc Sci*, Vol. 5.
- Owan, V.J., Abang, K.B., Idika, D.O., Etta, E.O. and Bassey, B.A. (2023), "Exploring the potential of artificial intelligence tools in educational measurement and assessment", *Eurasia Journal of Mathematics, Science and Technology Education*, Vol. 19 No. 8, p. em2307.
- Pallant, J. (2011), *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*, Routledge, New York, NY.
- Peres, R., Schreier, M., Schweidel, D. and Sorescu, A. (2023), "On ChatGPT and beyond: how generative artificial intelligence may affect research, teaching, and practice", *International Journal of Research in Marketing*, Vol. 40 No. 2, doi: [10.1016/j.ijresmar.2023.03.001](https://doi.org/10.1016/j.ijresmar.2023.03.001).

- Popenici, S.A. and Kerr, S. (2017), "Exploring the impact of artificial intelligence on teaching and learning in higher education", *Research and Practice in Technology Enhanced Learning*, Vol. 12 No. 1, pp. 1-13.
- Qadir, J. (2022), "Engineering education in the era of ChatGPT: promise and pitfalls of generative AI for education", *TechRxiv. Preprint*, doi: [10.36227/techrxiv.21789434.v1](https://doi.org/10.36227/techrxiv.21789434.v1).
- Rahman, M.M. and Watanobe, Y. (2023), "ChatGPT for education and research: opportunities, threats, and strategies", *Applied Sciences*, Vol. 13 No. 9, p. 5783.
- Rossetini, G., Cook, C., Palese, A., Pillastrini, P. and Turolla, A. (2023), "Pros and cons of using artificial intelligence chatbots for musculoskeletal rehabilitation management", *Journal of Orthopaedic and Sports Physical Therapy*, Vol. 53 No. 12, pp. 1-17.
- Sandu, N. and Gide, E. (2019), "Adoption of AI-Chatbots to enhance student learning experience in higher education in India", 2019 18th International Conference on Information Technology Based Higher Education and Training (ITHET), IEEE, September, pp. 1-5.
- Selwyn, N. (2019), *Should Robots Replace Teachers?: AI and the Future of Education*, John Wiley and Sons.
- Shidiq, M. (2023), "The use of artificial intelligence-based chat-gpt and its challenges for the world of education; from the viewpoint of the development of creative writing skills", *Proceeding of International Conference on Education, Society and Humanity*, Vol. 1 No. 1, pp. 353-357.
- Sok, S. and Heng, K. (2023), "ChatGPT for education and research: a review of benefits and risks", available at: [SSRN 4378735](https://ssrn.com/abstract=4378735)
- Somasundaram, R. (2023), "Quickly write and journal publish research article with ChatGPT", available at: www.ilovephd.com/10-tips-to-quickly-publish-research-article-with-chatgpt/
- Sullivan, M., Kelly, A. and McLaughlan, P. (2023), "ChatGPT in higher education: considerations for academic integrity and student learning", *Journal of Applied Learning and Teaching*, Vol. 6 No. 1, doi: [10.37074/jalt.2023.6.1.17](https://doi.org/10.37074/jalt.2023.6.1.17).
- Susnjak, T. (2022), "ChatGPT: the end of online exam integrity?", arXiv preprint arXiv:2212.09292, doi: [10.48550/arXiv.2212.09292](https://doi.org/10.48550/arXiv.2212.09292).
- Tülübaş, T., Demirkol, M., Ozdemir, T.Y., Polat, H., Karakose, T. and Yirci, R. (2023), "An interview with ChatGPT on emergency remote teaching: a comparative analysis based on human-AI collaboration", *Educational Process: International Journal*, Vol. 12 No. 2, pp. 93-110.
- Wang, T., Lund, B.D., Marengo, A., Pagano, A., Mannuru, N.R., Teel, Z.A. and Pange, J. (2023), "Exploring the potential impact of artificial intelligence (AI) on international students in higher education: generative AI, chatbots, analytics, and international student success", *Applied Sciences*, Vol. 13 No. 11, p. 6716.
- Wang, Y., Huang, Z., Wei, Z. and Zhao, J. (2024), "MADDPG-based offloading strategy for timing-dependent tasks in edge computing", *Future Internet*, Vol. 16 No. 6, p. 181.
- Yang, S. and Evans, C. (2019), "Opportunities and challenges in using AI chatbots in higher education", *Proceedings of the 2019 3rd International Conference on Education and E-Learning*, November, pp. 79-83.
- Yu, C., Yan, J. and Cai, N. (2024), "ChatGPT in higher education: factors influencing ChatGPT user satisfaction and continued use intention", *Frontiers in Education*, Vol. 9, p. 1354929.
- Zhai, C. and Wibowo, S. (2022), "A systematic review on cross-culture, humor and empathy dimensions in conversational chatbots: the case of second language acquisition", *Heliyon*, Vol. 8 No. 12.
- Zhang, Y., Viriyavejakul, C. and Sumettikoon, P. (2023), "Integrating chatbots in educational administration for improved language learning outcomes", *Eurasian Journal of Educational Research*, Vol. 104 No. 104, pp. 142-163.
- Zheng, L., Long, M., Zhong, L. and Gyasi, J.F. (2022), "The effectiveness of technology-facilitated personalized learning on learning achievements and learning perceptions: a meta-analysis", *Education and Information Technologies*, Vol. 27 No. 8, pp. 11807-11830.

Further reading

Korzynski, P., Mazurek, G., Altmann, A., Ejdys, J., Kazlauskaitė, R., Paliszewicz, J., Wach, K. and Ziemba, E. (2023), "Generative artificial intelligence as a new context for management theories: analysis of ChatGPT", *Central European Management Journal*, Vol. 31 No. 1, pp. 3-13, doi: [10.1108/CEMJ-02-2023-0091](https://doi.org/10.1108/CEMJ-02-2023-0091).

Thu, C.H., Bang, H.C. and Cao, L. (2023), "Integrating ChatGPT into online education system in Vietnam: opportunities and challenges", pp. 1-3.

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