Assessing Awareness and Usage of ChatGPT among Lecturers and Students: A Case Study of the University of Science & Technology, Aden, Yemen

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Abstract:

The integration of artificial intelligence (AI) tools, particularly ChatGPT, into educational settings presents both opportunities and challenges. However, there is limited understanding of the effectiveness and impact of ChatGPT in these environments. This study focuses on the University of Science & Technology - Aden, aiming to assess the current usage of ChatGPT among its academic community. By examining the perceptions, experiences, and attitudes of both lecturers and students, this research seeks to uncover insights into how ChatGPT is being utilized and the challenges it presents. By identifying key issues, this study aims to provide valuable recommendations for educators, policymakers, and technology developers to address the obstacles in the integration of ChatGPT in academic settings. Ultimately, the goal is to contribute to a more informed and effective use of AI tools, improving the overall educational experience of Yemeni universities and potentially serving as a model for similar institutions.

Keywords: *ChatGPT, Artificial Intelligence, Educational AI Tools*

تقييم وعي الطلاب واستخدامهم لبرنامج ChatGPT:
دراسة حالة جامعة العلوم والتكنولوجيا، عدن

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الملخص:

إن دمج أدوات الذكاء الاصطناعي، وخاصة ChatGPT، في البيئات التعليمية يقدم فرصاً وتحديات على حد سواء. ومع ذلك، هناك فهم محدود لفعالية وتأثير ChatGPT في هذه البيئات. تركز هذه الدراسة على جامعة العلوم والتكنولوجيا - عدن، بهدف تقييم الاستخدام الحالي لـ ChatGPT بين مجتمعها الأكاديمي. ويسعى هذا البحث من خلال فحص تصورات وخبرات ومواقف كل من أعضاء هيئة التدريس والطلاب، إلى الكشف عن رؤى حول كيفية استخدام ChatGPT والتحديات التي يفرضها، كما تهدف هذه الدراسة من خلال تحديد القضايا والفرص الرئيسية، إلى تقديم توصيات قيمة للمعلمين وصناع السياسات ومطوري التكنولوجيا لتعزيز التكامل الناجح لـ ChatGPT في البيئات الأكاديمية، و الهدف النهائي هو المساهمة في استخدام أكثر استنارة وفعالية لأدوات الذكاء الاصطناعي، وتحسين التجربة التعليمية الشاملة في الجامعات اليمنية وربما تكون بمثابة نموذج للمؤسسات المماثلة.

الكلمات المفتاحية: *ChatGPT، أدوات الذكاء الاصطناعي التعليمية، الذكاء الاصطناعي*

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Introduction

Emerging technologies are significantly reshaping teaching and learning in education. The AI market within the US education sector is projected to grow by 48% from 2018 to 2022 (Zhang & Aslam, 2021). The study of artificial intelligence (AI) integration in education has been ongoing for several decades (Abdaljaleel et al., 2023). Over recent years, AI has rapidly evolved, impacting numerous facets of society. It is now a leading area of research in fields such as medicine, robotics, education, and autonomous driving. In essence, AI involves computers learning to replicate human cognitive processes by collecting external data and applying that knowledge to achieve specific objectives (Yahyazadeh, 2023). The swift progress of AI has sparked considerable interest in examining its potential applications and effects across various sectors. A significant advancement in AI is the launch of ChatGPT by OpenAI in November 2022 (Naher et al., n.d.).

The incorporation of ChatGPT in education has sparked significant interest due to its potential to enhance students' learning experiences. It serves as a valuable tool that encourages active student engagement and cognitive development by adapting to individual learning speeds and providing ongoing support throughout the knowledge acquisition process (Monegro et al., 2023; Von et al., 2023). However, academic viewpoints on ChatGPT have not reached a consensus, with some not viewing AI tools as a major threat to higher education. Instead, many acknowledge that while ChatGPT may present factual inaccuracies and biases, it can still contribute positively to student learning. Thus, educators should adjust their teaching and assessment methods to accommodate the reality of living, working, and studying in an AI-rich environment (Gonzalo et al., 2023; Alves, 2023). In essence, these tools offer an opportunity to shift the focus from merely producing written assignments to fostering high-order critical thinking skills among students (Hasanein et al., 2023). Additionally, they facilitate the understanding of complex concepts in simpler terms and improve accessibility for individuals with communication disabilities (Hosseini et al., 2023; Sullivan et al., 2023).

ChatGPT can serve as a useful resource for academic staff, offering a foundation for developing course syllabi, teaching materials, and assessment tasks. However, it is important to address concerns about the accuracy of the content it generates. One potential solution is to utilize ChatGPT to produce raw materials for training course-specific chatbots. Additionally, AI chatbots like ChatGPT may improve research accuracy by identifying and correcting errors in analyses or data. Thus, it is feasible to use ChatGPT to verify the validity of research findings or to identify mistakes or inconsistencies in financial data (Lo C., 2023).

Two key issues concerning ChatGPT arise. First, despite a growing user base, its implementation in higher education poses challenges related to ethical considerations, data privacy, and security. Both students and lecturers may inadvertently share personal or sensitive information while using ChatGPT. This

raises risks such as the misuse of student data for purposes outside of academia, unauthorized access to learners' information, and potential breaches of security (Kasneci et al., 2023; Ajlouni et al., 2023). Second, while ChatGPT holds considerable promise for enhancing learning processes, educational innovations, and assessment activities, its overall impact on education remains uncertain. There is a pressing need for further research to determine how this AI tool can be effectively integrated into higher education (Chen et al., 2020; Zawacki-Richter et al., 2019).

Therefore, this study aims to contribute to the educational community by assessing university students' awareness and utilization of ChatGPT, as well as identifying its potential challenges and benefits within Yemeni universities.

The main objective this study is to investigate the views and opinions of students and lecturers at Yemeni universities concerning the integration of ChatGPT into their educational experiences. The research questions are outlined as follows:

• What experiences do university students have with the use of ChatGPT?
• Are there differences in how students perceive the educational impact of ChatGPT based on demographic factors, such as academic programs?

This study was conducted at a Yemeni university located in the Aden governorate. The decision to focus on Aden was driven by its status as the capital city of the country. The research sample included 107 undergraduate students and lecturers from three distinct academic programs within the Faculty of Engineering and Computing at the University of Science and Technology.

The findings and conclusions of this research will be valuable for the senior management of Yemeni universities, enabling them to make informed decisions regarding resource allocation for the effective integration of ChatGPT as an educational tool. This, in turn, aims to enhance the overall educational experience in Yemeni universities.

The rest of the paper can be declared as follows: The next section, Section2, shows a brief definition of the ChatGPT tool. In Section 3, we describe the research methodology and explain the method of data collection and questionnaire design. The data analysis and the final results are described in Section 4. Section 5 includes our final conclusions and recommendations.

ChatGPT Definition

In November 2022, OpenAI launched ChatGPT, a versatile language model capable of generating codes, writing stories, performing machine translation, conducting semantic analysis, and more. By January 2023, the platform attracted nearly 13 million daily users. ChatGPT is a variant of the generative pre-trained transformer (GPT), which is a transformer-based large language model designed to comprehend human languages and produce human-like text, such as stories and articles (Adiguzel et al., 2023; Choi et al., 2023; Qadir J., 2023). It can generate accurate responses to a wide range of prompts and questions almost

instantaneously, producing text that is often indistinguishable from that written by humans. The literature discusses both the potential advantages of AI in education and the challenges that may arise from its integration. Future research suggestions include a deeper examination of the ethical implications of AI in education, developing strategies to address privacy concerns, and exploring how educational institutions can effectively prepare for the integration of AI technologies (Alneyadi et al., 2023; Cotton et al., 2023; Wardat et al., 2023; Sarin et al., 2024).

The use of AI-based chatbots in educational settings is a crucial area for fostering student engagement and enhancing learning processes. Chatbot technologies can facilitate student interaction, enrich learning experiences, and positively influence student success in higher education (D'Mello et al., 2014; Winkler et al., 2018; Iqbal et al., 2022), potentially boosting student motivation and learning outcomes. However, a consensus among educators regarding ChatGPT specifically has yet to be reached (Deng et al., 2023; O'Cathain et al., 2007).

Research Methodology

Research Population

This study employed a descriptive research design to gather data on the ethical considerations surrounding the use of ChatGPT at the University of Science and Technology in Aden. The primary participants included university students from various disciplines and their lecturers. A total of 107 questionnaires were distributed, of which 95 were completed, resulting in a sample size of 95 participants selected through purposive sampling. This approach ensured representation from students of different academic levels and backgrounds. Ethical considerations were addressed by obtaining permission from the heads of the relevant departments to conduct the study.

Table 1: Research Population

Population	Distributed Questionnaire	Retrieved Questionnaire	Percent %	Cumulative Percent
Information Technology department	55	51	53.68	53.68
Information Systems department	20	18	18.95	72.63
Graphic Design & Multimedia department	20	14	14.74	87.37
Academic Staff	12	12	12.63	100
Total	**107**	**95**	**100**	

Data Sampling

First, purposive sampling was used to select lecturers and students with prior experience using ChatGPT in education to participate in this study. The lecturers selected were those who had been trained and were using the ChatGPT services in

their lectures. However, there were also some lecturers who, out of personal interest, were using these services with their students and these were also included. The student's participation consists of students from three different academic programs at the faculty of engineering and computing, namely, students from the 3rd and 4th levels of the Information Technology (IT), Information Systems (IS), and Graphic Design & Multimedia Programs, with a total of 83 students and 12 lecturers across different days. Each participant's impact on AI Tools will be significant, and their feedback will be considered crucial for the study. Participants responded to a self-fill-in questionnaire. The questions required them to record their perceptions regarding the use of ChatGPT services on some aspects of their learning.

Questionnaire Design and Data Collection

The questionnaire consisted of a mix of closed-ended and open-ended questions to gather both quantitative and qualitative data. The questionnaire was designed to assess participants' opinions, attitudes, and concerns regarding the ethical considerations of using Chat GPT in university education. The questionnaire was composed of four parts, namely;

• First Part: Personal Information,
• Second Part: Type of the AI tools used for academic purposes,
• Third Part: Usage of AI tools for academic purposes, and
• Fourth Part: The challenges of using ChatGPT.

The section on opinions was particularly framed as a Likert Scale. The Likert items enabled respondents to agree or disagree with statements.

Reliability of Questionnaire

The validity of the questionnaire (tool) was ensured through two types or methods of validity: Face validity and Construct validity.

Face Validity:

Face validity refers to the extent to which the questionnaire appears to measure what it intends to measure. It includes evaluating the clarity, relevance, and understandability of the questionnaire. Face validity was determined by gathering feedback and insights from experts or judges.

Construct Validity

Also known as internal consistency, refers to the extent to which each item in a questionnaire aligns with the dimension it belongs to. The internal consistency of the questionnaire was calculated to assess the internal homogeneity of the measurement tool. The Likert items, in particular, where 30 questionnaire sheets are subjected to statistical verification to ensure that each item in the section on opinion appropriately measured the respective underlying constructs. It was found that all coefficients between the paragraphs and the dimension to which they contribute are statistically significant. The reliability of the entire set of items is also examine using

Cronbach's Alpha (refer to Table 3). A Cronbach's Alpha coefficient equal to 0.844 indicates the reliability of the entire questionnaire. Thereby, it can be said that the researcher proved that the questionnaire was valid, reliable, and ready for distribution for the population.

Table 2: List wise deletion based on all variables in the procedure

		N	**%**
Cases	Valid	30	100
	Excluded	0	0
	Total	30	100

Table 3: Reliability of questionnaire

Cronbach's α	**N of Items**
0.844	30

Statistical Analysis Tools

The data were analyzed using the Statistical Package for Social Sciences (SPSS 19). Demographic information about the students was collected, including details such as gender, age, academic level, program of study, and current role. Descriptive statistics, including frequencies and percentages, were employed to examine closed-ended questions, offering insights into participants' views on various ethical considerations. During the data mapping process, a significant issue identified was missing data, which was also detected through visual inspection. Qualitative data from open-ended questions were coded to establish several themes, and responses were reviewed to categorize them according to these themes. Additionally, bivariate correlations were conducted between key independent variables (the academic program) and dependent variables (the educational impact of ChatGPT among students) to explore their associations.

To achieve the research goal, we utilized the following statistical tools:
- Cronbach's Alpha test for reliability statistics.
- Frequency and Descriptive analysis.
- Parametric Tests (Analysis of Variance - ANOVA). It is used to examine if there is a statistically significant difference between several means among the respondents the use of ChatGPT due to different academic programs.

Results and Discussion

According to general information which is collected from the respondents of the questionnaire, the population characteristics were determined to identify the characteristics of the respondents. The repeatability distributions of some of these variables are presented in the following arrangement: Department and Level.

Part 1: personal information

Here, in this section, the personal information is characterized as the following:

- *Level and Department distribution*

Table 4 illustrates the distribution of students by department and academic level. Table 5 presents the level distribution within the population. The data indicate that the majority of respondents are at the third level, comprising 60.24% of the total population, while those at the fourth level account for 39.76%.

Table 4: Distribution of Departments and Levels

Department	Level		Total
	3rd	4th	
Information technology	35	16	51
Information systems	8	10	18
Graphic Design & Multimedia	7	7	14
Total	50	33	83

Table 5: Distribution of the Population by Students' Level

Level	Frequency	Percent	Valid Percent	Cumulative Percent
3rd	50	60.24	60.24	60.24
4th	33	39.76	39.76	100
Total	83	100.0	100.0	

- *Gender*

The results show that out of the 95 participants, 59 (62.1%) identified as male, while 36 (37.9%) identified as female (refer to Table 6). This indicates a slight gender imbalance, with a higher representation of male participants. Researchers should consider this gender distribution when interpreting the research findings, as the results may be more representative of the male population. Efforts to increase gender diversity in future studies could enhance the generalizability of the findings.

Regarding age distribution, the majority of participants fell within the age range of 18-24 years, with 75 participants (78.9%). The next most represented age group was 25-34 years, with 12 participants (12.6%), followed by 35-44 years with 5 participants (5.3%). The age groups of 45 years and above accounted for 3 (3.2%) participants (refer to Table 7).

Table 6. Gender distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	59	62.1	62.1	62.1
Female	36	37.9	37.9	100.0

	Frequency	Percent	Valid Percent
Total	95	100.0	100.0

Table 7: Age distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
18-24	75	78.9	78.9	78.9
25-34	12	12.6	12.6	91.5
35-44	5	5.3	5.3	96.8
45 and above	3	3.2	3.2	100
Total	95	100.0	100.0	

Part 2: Types of AI Tools Used

Tables 8 and 9 provide a breakdown of the respondents based on their usage of educational AI tools, along with the corresponding type of the AI tool. According to the results, out of the total 95 respondents, the majority (95.8%) reported using educational AI tools, with ChatGPT being a prominent example with (78.9%). This high adoption rate indicates a strong presence of AI tools in the educational experiences of UST university students and faculty members. Conversely, a small proportion of respondents (4.2%) indicated that they had not utilized any educational AI tools, including ChatGPT. The results suggest a positive reception of AI technology in educational settings, emphasizing its potential benefits for student learning and engagement.

Table 8: Use of Educational AI Tools

Level	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	91	95.8	95.8	95.8
NO	4	4.2	4.2	100.0
Total	95	100.0	100.0	

Table 9: Types of AI Tools Used

	Frequency	Percent	Valid Percent	Cumulative Percent
ChatGPT	75	78.9	78.9	78.9
Bard (Gemini)	8	8.4	8.4	87.4
Claude	1	1.1	1.1	88.4
Other	11	11.6	11.6	100.0
Total	95	100.0	100.0	

Part 3: The Frequency of AI Tool Usage

The results in Table 10 and Table 11, indicate that the frequency of AI tools usage for academic purposes varied among the respondents. The majority of the participants reported using AI tools on a regular basis. Specifically, 21.1% of respondents mentioned using AI tools daily, while 30.5% reported using them a few times a week. Additionally, 28.4% stated that they used AI tools once a week, and 20.0% reported using them rarely. These findings suggest that AI tools are utilized with varying degrees of frequency for academic purposes. Some individuals rely on AI tools more extensively, incorporating them into their daily or weekly academic routines, while others use them more sporadically.

Table 10: Frequency of AI Tool Usage

	Frequency	Percent	Valid Percent	Cumulative Percent
Daily	20	21.1	21.1	21.1
A few times a week	29	30.5	30.5	51.6
Once a week	27	28.4	28.4	80.0
Rarely	19	20.0	20.0	100.0
Total	95	100.0	100.0	

As shown in Table 11, more than 52% of respondents spent less than 1 hour per day using AI tools, indicating widespread but shorter engagement. Additionally, 32.6% spent 1-2 hours, demonstrating a notable level of involvement. 11.6% dedicated 2-4 hours, suggesting a subset of actively engaged students. A small proportion (3.2%) spent over 4 hours, representing highly involved users. These findings highlight diverse usage patterns among UST University students in integrating AI tools into their academic routines. Understanding these patterns aids in assessing educational impact and informing strategies for effective implementation.

Table 11: Duration of Usage of AI Tools for academic purposes

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 1 hour	50	52.6	52.6	52.6
1-2 hours	31	32.6	32.6	85.3
2-4 hours	11	11.6	11.6	96.8
More than 4 hours	3	3.2	3.2	100.0
Total	95	100.0	100.0	

Part 4: Challenges of Using ChatGPT

After studied the results of this part (The perception of Challenges of using ChatGPT) we got that the Weighted Average is 4.04 (Agree) based on five Likert Scale. (refer to Table 12).

Table 12: The mean perception of challenges of using ChatGPT

Item	SA$_5$ (%)	A$_4$ (%)	N$_3$ (%)	D$_2$ (%)	SD$_1$ (%)	Mean	SD	Decision
ChatGPT can provide unreliable information on topics with few citations	12 (12.6%)	36 (37.9%)	30 (31.6%)	16 (16.8%)	1 (1.1%)	3.44	0.95	High Perception 3.44 > 4.41
ChatGPT can produce false reference	12 (12.6%)	36 (37.9%)	30 (31.6%)	16 (16.8%)	1 (1.1%)	3.40	0.89	Moderate Perception
ChatGPT is unable to cite sources accurately	12 (12.6%)	36 (37.9%)	30 (31.6%)	16 (16.8%)	1 (1.1%)	3.31	0.79	Low Perception
ChatGPT can produce responses that weaken after several paragraphs	12 (12.6%)	36 (37.9%)	30 (31.6%)	16 (16.8%)	1 (1.1%)	3.53	0.93	High Perception
ChatGPT is unable to measure the value of difficult mathematical formulas	12 (12.6%)	36 (37.9%)	30 (31.6%)	16 (16.8%)	1 (1.1%)	3.21	0.90	Low Perception
ChatGPT can exhibit logical errors and contradictions	12 (12.6%)	36 (37.9%)	30 (31.6%)	16 (16.8%)	1 (1.1%)	4.34	.88	High Perception
TOTAL	61	203	223	75	8	3.41		
Weighted Average =							4.04	

Testing the Hypothesis

Before conducting the ANOVA test to assess the differences in means among the variables being studied, we first applied Levene's test to check for homogeneity of variances in our sample and the Kolmogorov-Smirnov test to confirm the normality of the distribution. Initially, we will state the null hypothesis as the assumption that the means of all the different groups are equal.

Null Hypothesis H0:

There is no significant difference in the perceived challenges of using ChatGPT in education among students from different academic programs.

Alternate Hypothesis H1:

There is significant difference in the perceived challenges of using ChatGPT in education among students from different academic programs.

Table 13: ANOVA Test for Challenges of Using ChatGPT with Different Academic Programs

	R	R^2	df	Mean Square	F	Sig.
Between Groups	1.55	2.419	2	1.210	3.577	.033
Within Groups	5.20	27.052	80	.338		
Total	5.43	29.471	82			

From Table 13, we found that there is significant difference in the perceived educational impact of ChatGPT among students of different academic programs, where the p-value (.033) of the independent variable (academic programs) is less than the significance level (α = 0.05), so we accept the Alternate hypothesis.

Conclusions

The aim of this research is to evaluate the current use of ChatGPT and examine the perceptions and experiences of lecturer and students regarding its implementation to enhance the overall educational experience at the University of Science & Technology - Aden. To achieve this, a survey was conducted using questionnaires to gather insights from students and faculty members across three departments. The findings indicate that a significant majority of students (80%) are familiar with ChatGPT, and most students (21%) use AI tools on a daily basis. Increasing awareness and familiarity with ChatGPT among students is essential for promoting its adoption. Therefore, there is a need to focus on raising awareness about its benefits and significance in the teaching system to address the shortcomings in computing resources.

The primary recommendation is that Yemeni universities and their faculty should prioritize teaching students how to use ChatGPT and similar tools in ethical and safe ways. This approach should promote critical thinking while mitigating risks associated with the misuse of student information for non-academic purposes, illegal access to learners' data, and potential security breaches.

References:

Abdaljaleel, et al. (2023). Factors influencing attitudes of university students towards ChatGPT and its usage: A multi-national study validating the TAME-ChatGPT survey instrument. https://doi.org/10.20944/preprints202309.1541.v1

Zhang, K., et al. (2021). AI technologies for education: Recent research and future directions. *Computers and Education: Artificial Intelligence*, *2*. Elsevier B.V. https://doi.org/10.1016/j.caeai.2021.100025

Yahyazadeh, N. (2023). The influence of ChatGPT in education: A comprehensive review. *International Journal of Recent Research Aspects*, *10*.

Naher, J., et al. (n.d.). A survey to understand the experience of ChatGPT usage among engineering university students in Bangladesh. Retrieved from www.techniumscience.com

Montenegro-Rueda, M., et al. (2023). Impact of the implementation of ChatGPT in education: A systematic review. *Computers*, *12*(8). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/computers12080153

von Garrel, J., & Mayer, J. (2023). Artificial intelligence in studies—Use of ChatGPT and AI-based tools among students in Germany. *Humanities and Social Sciences Communications*, *10*(1). https://doi.org/10.1057/s41599-023-02304-7

Gonzalo Acosta Enriquez, B., et al. (2023). Analysis of college students' attitude towards the use of ChatGPT in their academic activities: Effect of intent to use, verify information, and responsible use. https://doi.org/10.21203/rs.3.rs-3563928/v1

Alves de Castro, C. (2023). A discussion about the impact of ChatGPT in education: Benefits and concerns. *Journal of Business Theory and Practice*, *11*(2), 28. https://doi.org/10.22158/jbtp.v11n2p28

Hasanein, A. M., & Sobaih, A. E. E. (2023). Drivers and consequences of ChatGPT use in higher education: Key stakeholder perspectives. *European Journal of Investigation in Health, Psychology and Education*, *13*(11), 2599–2614. https://doi.org/10.3390/ejihpe13110181

Hosseini, M., et al. (2023). An exploratory survey about using ChatGPT in education, healthcare, and research. *PLoS ONE*, *18*(10). https://doi.org/10.1371/journal.pone.0292216

Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning and Teaching*, *6*(1), 31–40. https://doi.org/10.37074/jalt.2023.6.1.17

Lo, C. K. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences*, *13*(4). MDPI. https://doi.org/10.3390/educsci13040410

Chen, X., Xie, H., & Hwang, G. J. (2020). A multi-perspective study on artificial intelligence in education: Grants, conferences, journals, software tools, institutions, and researchers. *Computers and Education: Artificial Intelligence*, *1*, Article 100005. https://doi.org/10.1016/j.caeai.2020.100005

Zawacki-Richter. (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*, Article 39. https://doi.org/10.1186/s41239-019-0171-0

Kasneci, E., et al. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, *103*. https://doi.org/10.1016/j.lindif.2023.102274

Ajlouni, A. O., et al. (2023). Students' attitudes towards using ChatGPT as a learning tool: The case of the University of Jordan. *International Journal of Interactive Mobile Technologies*, *17*(18), 99–117. https://doi.org/10.3991/ijim.v17i18.41753

Adiguzel, T., et al. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. *Contemporary Educational Technology*, *15*(3), ep429. https://doi.org/1030935/cedtech/13152

Choi, E. P. H., et al. (2023). Chatting or cheating? The impacts of ChatGPT and other artificial intelligence language models on nurse education. *Nurse Education Today*, *125*. https://doi.org/10.1016/j.nedt.2023.105796

Qadir, J. (2023). Engineering education in the era of ChatGPT: Promise and pitfalls of generative AI for education. In *Proceedings of the 2023 IEEE Global Engineering Education Conference* (pp. 1–9). IEEE. https://doi.org/10.1109/EDUCON54358.2023.10125121

Alneyadi, S., & Wardat, Y. (2023). ChatGPT: Revolutionizing student achievement in the electronic magnetism unit for eleventh-grade students in Emirates schools. *Contemporary Educational Technology*, *15*(4), ep448. https://doi.org/10.30935/cedtech/13417

Cotton, D. R. E., Cotton, P. A., et al. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*. https://doi.org/10.1080/14703297.2023.2190148

Wardat, Y., et al. (2023). ChatGPT: A revolutionary tool for teaching and learning mathematics. *EURASIA Journal of Mathematics, Science and Technology Education*, *19*(7), em2286. https://doi.org/10.29333/ejmste/13272

Sarin, S., & Kimkong, H. (2024). Opportunities, challenges, and strategies for using ChatGPT in higher education: A literature review. *Journal of Digital Educational Technology*, *4*(1), ep2401. https://doi.org/10.30935/jdet/14027

D'Mello, S., et al. (2014). Gaze tutor: A gaze-reactive intelligent tutoring system. *International Journal of Human-Computer Studies*, *70*(5), 377–398. https://doi.org/10.1016/j.ijhcs.2012.01.004

Winkler, R., & Söllner, M. (2018). Unleashing the potential of chatbots in education: A state-of-the-art analysis. In *Academy of Management Annual Meeting (AOM)*. https://doi.org/10.5465/AMBPP.2018.15903

Iqbal, N., Ahmed, H., & Azhar, K. A. (2022). Exploring teachers' attitudes towards using ChatGPT. *Global Journal for Management and Administrative Sciences*, *3*(4), 97–111.

Deng, X., & Yu, Z. (2023). A meta-analysis and systematic review of the effect of chatbot technology use in sustainable education. *Sustainability*, *15*(4), 2940. https://doi.org/10.3390/su15042940

O'Cathain, et al. (2007). Why, and how, mixed methods research is undertaken in health services research in England: A mixed methods study. *BMC Health Services Research*, *7*(85).