

Research Article

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Exploring Omani EFL Student Teachers' Perceptions on Fostering Critical Thinking Through Ethical Use of AI

Zulaikha Al-Saadi^{id}, Hanan Khalil^{id}, Ahmed Mohamed Fahmy Yousef^{id}

Abstract

Background/purpose. This study explores the perceptions of Omani pre-service EFL teachers on promoting critical thinking through the ethical use of AI. The rationale of this study is to better understand the perceived strengths and training needs of pre-service teachers regarding the use of AI, which can improve future educational policy and practice.

Materials/methods. A mixed methods approach is employed in this research, which combines a quantitative analysis of survey data with qualitative insights from focus group discussions to examine how AI ethics affect critical thinking and teaching practices. Data was collected from 83 EFL pre-service teachers at the University of Technology and Applied Sciences, Rustaq College, Oman.

Results. The most notable finding to emerge from the analysis is a strong awareness of AI ethics among EFL pre-service teachers, with a particular emphasis on data protection, academic integrity, and the balanced use of AI to enhance critical thinking. However, challenges like integrating AI ethics into curricula, a lack of sufficient resources, and limited expertise were identified.

Conclusion. This study underlines the importance of institutional support when integrating AI ethics into education and fostering critical thinking skills, ensuring AI acts as an enabler rather than a hindrance to the educational experience.

1. Introduction

Artificial intelligence (AI) can be broadly defined as "a machine's capability to demonstrate intelligent human behavior" (Tung & Dong, 2023, p. 23). During the past decade in particular, rapid advances in AI tools have gained prominence in numerous facets of society. The widespread integration of AI tools in different fields such as health care, education, sciences, communication, media and business has without doubt increased productivity, creativity and outcomes in many aspects of these fields by expanding and automating their operations. The development of AI has become a focus for many countries worldwide to enhance their national competitiveness (Walter, 2024; Tung & Dong, 2023).

In the field of education, more recent attention has focused on how AI can enhance the learning process. The interactive nature of AI tools and their ability to understand language processing has made their applications highly beneficial to support student learning (Cerný, 2024; Fadlelmula & Qadhi, 2024; Holmes et al., 2022; Tossell et al., 2024), with positive experiences and outcomes. For example, EFL students, who encounter linguistic and academic challenges, report that AI has improved their learning process at the university level as it helps them to obtain information at speed and check their language accuracy, thereby enhancing their self-confidence (Alhalangy & AbdAlgane, 2023; Qiao & Zhao, 2023; Wei, 2023). Palmquist et al. (2025) highlight the intersection between AI literacy and social-emotional competence as 21st-century skills. In other words, education must facilitate not only competence with AI use but also promote responsible decision-making, incorporating both self-awareness and empathy for others, in order to understand the implications of its use.

Incorporating AI in education has been associated with several challenges, most importantly, AI ethics. This includes data privacy, security and accuracy, algorithmic bias, accountability, and academic integrity such as plagiarism and academic misconduct (Ifenthaler et al., 2024; Miao et al., 2024; Qadhi et al., 2024; Tung & Dong, 2023). To counter these, promoting students' awareness, autonomy, accountability, and security in dealing with and using the tools and data provided by AI is an important first step. Furthermore, it has become crucial to cultivate students who are engaged in this advanced technology and equip them with the necessary knowledge and skills to use AI in an ethical manner, navigating the ethical dilemmas of this dynamic field (Qadhi et al., 2024; Walter, 2024). Therefore, it is crucial to prioritize the development of a clear ethical framework and standards to promote academic integrity, accountability and continuous learning when using AI (Chaaban et al., 2024; Chen, 2024; Holmes et al., 2022; Miao et al., 2024; Nguye et al., 2023; Slimi & Carballido, 2023; Walter, 2024). Adopting this proactive approach will help to maximize the benefits of AI while restricting the risks associated with its unethical use.

The integration of AI into academic settings is an inevitable development; therefore, higher educational institutions and other academic services providers are increasingly paying more attention to AI tools and carefully assessing their potential use. This involves understanding their capabilities, identifying their limitations, and crucially being aware of their related ethical and social implications.

Despite the extensive emphasis and investment in using AI in teaching and learning, students' perspectives and experiences regarding AI ethics remain largely underexplored. Given that AI tools are now a significant part of many students' learning process, evaluating students' awareness of AI ethics is crucial when preparing future generations to use AI responsibly and ethically. Notwithstanding the growing importance of AI in education, there is a notable gap in research focusing on the integration of AI ethics in education. While current studies in AI often focus on the adoption and the implications of AI tools in the classroom and society, few studies have focused on the ethical aspects of AI in educational settings (Cerný, 2024; Walter, 2024). Walter (2024, p. 8) states

that "providing students with a document and hoping that they would read it and abide by its ideals" is not enough to address the ethical challenges related to AI. Indeed, this issue needs to be addressed more comprehensively by implementing a more holistic approach involving the students themselves.

This study aims to address this gap by evaluating EFL student teachers' knowledge and awareness of the ethical considerations involved in AI and their impact on enhancing their critical thinking skills and ethical development. In particular, the study seeks to achieve the following: (1) To explore EFL student teachers' perceptions of the importance of data protection and consent when using AI tools, (2) To investigate EFL student teachers' views on the ethical implications of using AI tools to consider the social impacts and enhance critical thinking in their teaching practices, (3) To identify the challenges EFL student teachers face in integrating AI ethics into their teaching strategies for promoting critical thinking. (5) To analyse opportunities identified by EFL student teachers for promoting AI ethics in education. This research can then attempt to establish a more balanced ethical and social framework that, on the one hand, meets the students' needs and achieves the balance between the AI revolution and human values in education on the other hand (Cerný, 2024; Kong et al., 2022; Kwak et al., 2022). 100 EFL student teachers completed a questionnaire, which was designed to reflect their literacy and experience in using AI and AI ethics.

This study contributes to the existing literature and pedagogy of AI ethics in education. It aims to harness the effective use of AI in the future and transform the prospects of society, arguing that teachers have an important role to play in guiding their students in how to use these tools in an efficient and ethical manner. Practitioners, curriculum developers and policymakers may find the study of interest. Regarding the setting in which the study takes place, findings will inform the design of educational programmes that raise students' awareness of the skills and ethical knowledge needed to engage thoughtfully with the evolving and emerging technologies.

2. Literature Review

The literature review aims to trace the context around student teachers' perceptions in their endeavour to promote critical thinking in AI use. In this way, important enabling factors and challenges identified in the literature can be focused on. It will look at what the literature considers important in a 21st-century landscape. It will highlight some of the contradictory perceptions of students and their teachers regarding AI and its relationship to promoting critical thinking and ethical concerns in different stages of education. It will then identify some of the perceived training needs and training solutions outlined in the literature.

Recent digital transformation and progression, particularly regarding AI technology, have made its integration in human life unavoidable. Various sectors employ artificial intelligence (AI) to expand, advance, automate, and improve their operations. For example, AI is being increasingly used in different medical disciplines, with systems developed to assist doctors in areas such as radiology and pathology (Tung & Dong, 2023). The impact of AI can be vast and motivating, especially when considering the capabilities of AI-generated language models such as ChatGPT, Bard, Bing Chat, and Claude. According to Miao et al. (2024), generative AI is a specialised field within AI that uses natural language processing to generate content, including text and images. OpenAI has developed ChatGPT, an AI chatbot that can simulate human conversations through natural language processing. This enables users to interact and engage with an AI chatbot through search queries, rather than simply typing in their requests. This approach may also offer users support in processes such as academic research and writing, which can considerably enhance efficiency (Miao et al., 2024; Qadhi et al., 2024; Walter, 2024).

The integration of AI into education represents a significant shift from traditional teaching methods, introducing more opportunities for individualized learning and support for different educational needs. However, this integration presents challenges such as the need for well-trained

educators and students, as well as curriculum adaptation to align with AI technology and its wider consequences. Walter (2024) states that the introduction of AI in education extends beyond mere technical development, fundamentally transforming the educational experience. He goes on to explain that the introduction of AI can enhance educational processes by promoting the development of essential skills such as computational and critical thinking. Ifenthaler et al. (2024) also emphasise the potential for AI to enhance personalised learning, expand educational assessment, and increase students' success and retention. Their paper also provides a comprehensive discussion of the policy implications of AI integration in education. Palmquist, Sigurdadottir, and Myhre (2025) highlight the intersection between AI literacy and social-emotional competence as 21st-century skills. In other words, education must facilitate not only competence with AI use but also promote responsible decision making with both self-awareness and empathy for others in understanding the implications of its use. Indeed, the critical need to address the educational and ethical challenges associated with AI adoption is widely acknowledged.

In addressing these challenges, AI in education requires a focus on creativity and technology competency to promote innovation and critical thinking skills. This demands a paradigm shift in the approach to education, moving beyond traditional (Walter, 2024). By analyzing student data and utilizing advanced algorithms, these models can adapt to different academic needs, student learning styles, pace, and preferences, creating an interactive, dynamic, and effective learning environment. When used appropriately, this can eliminate a number of learning challenges and promote an inclusive education atmosphere (Chaaban et al., 2024; Qadhi et al., 2024; Qiao & Zhao, 2023; Wei, 2023).

Nevertheless, it is equally vital to consider the opposing argument about the ethical dilemmas associated with AI in education. Opponents argue that the integration of AI in education might potentially impede critical thinking skills and ethical development among students (Slimi & Carballido, 2023; Walter, 2024). It is argued that the excessive reliance on AI systems for learning may result in students who are less autonomous and lack the ability to think critically and develop ethical reasoning skills. Tummalapenta et al. (2025) present a somewhat different perspective in their questionnaire study of 672 Indian HE students. They find that AI adoption generally appears to increase motivation and autonomy, as well as improve social dynamics around gaining correct understandings of its appropriate use. Student teachers, therefore, should contribute to playing a positive role in their students' use of critical thinking. As Alwaqdani (2025) finds in his study of 1101 Saudi teachers, there is a consensus among schoolteachers on the need for a nuanced approach and more teacher training to keep up with a rapidly changing AI landscape of benefits and limitations.

When considering student teachers' perceptions of AI, not only is it important to scrutinise students' use of AI, but also the scholarly output of academic settings where the learning takes place. There are several ethical concerns that accompany this change, such as bias, accuracy, and the models' capabilities of reasoning and critical thinking. The potential impact of these tools is also a key concern regarding the ability to fully engage in academic work and the authenticity of work produced, resulting in ethical and social dilemmas. Indeed, a recurrent theme throughout the literature and the present study is how the integration of AI-related technologies in academic settings requires a careful and thorough investigation and analysis to address these challenges (Holmes et al., 2022; Ifenthaler et al., 2024; Miao et al., 2024; Nguye et al., 2023; Walter, 2024; Yu & Yu, 2023; Zhang et al., 2023). Holmes et al. (2022) advocate a multi-disciplinary approach in guiding ethical AI practices in education. Such an approach necessitates the involvement of all stakeholders – including policymakers, educators and students – to ensure AI is used in a responsible and ethical manner.

Undoubtedly, academic integrity concerns linked to the incorporation of AI have intensified in recent years within higher education institutions (HEIs). For example, the difficulties in detecting and addressing plagiarism when engaging with generative AI are increasingly prevalent and knotty issues.

Rossii (2024) evaluated Russian university students' awareness of academic integrity when engaging with generative AI using an online questionnaire. The findings of his study highlighted the main challenges that students encounter when using AI to complete their academic-related tasks. In particular, the study indicated that the use of AI, namely ChatGPT, raised students' concerns about academic integrity (how to use AI tools for educational purposes without breaching academic integrity). The study emphasizes the importance of raising students' awareness of the potential drawbacks of excessive dependence on AI tools in educational contexts. The issue of privacy when using AI was also mentioned by the participants, who emphasised the need to increase their understanding of privacy while using AI. The study concluded that it is essential for both educators and students to be knowledgeable about the ethical consequences of utilizing AI in academic contexts in order to maintain academic norms and promote a culture of honesty. In Lebanon, Dakakni and Safa (2023) surveyed 46 EFL students in higher education, finding that while students recognised the benefits, roughly 85% had at some stage made unethical use of AI in their studies. On this basis, the researchers suggest revamping courses to ensure practices that raise more awareness of ethics in AI. Participants' complex relationship with AI was characterised as 'love/hate'; participants tended to emphasise how the human qualities of a teacher cannot be substituted by AI.

The issue of students and data privacy was also discussed by other researchers (e.g., Ifenthaler et al., 2024; Yu & Yu, 2023). Incorporating AI in education often entails the collection and analysis of huge amounts of students' data. This results in significant privacy concerns, as students may question the extent to which their personal information is accessible to others and how it is being used. There is a risk that this data might be easily disclosed or misused. Thus, assuring the security of the students' data while using AI remains a crucial ethical issue that needs to be addressed (Ifenthaler et al., 2024; Yu & Yu, 2023).

Ultimately, it is imperative for higher education institutions to guarantee that students are educated on ethical issues and matters associated with utilizing AI in order to prevent any unintentional wrongdoing. In line with Alwaqdani's (2025) call for increased training, Zhan et al. (2023) employed the Developing AI literacy (DAILY) workshop, which focused on the technical principles, ethical considerations and career implications of AI, to foster AI literacy among middle school students. The findings of their exploratory study indicated that students attained a general understanding of AI concepts, demonstrated the ability to identify bias, considered AI-related ethics, and identified the impact of AI on their future lives and careers. Their study concluded that integrating ethics and career futures into AI education has positive outcomes in developing AI literacy among middle school students. In a similar vein, Kong et al. (2022) – in their study to evaluate AI literacy programmes designed to develop university students' understanding of AI literacy and ethical awareness – reported that the programme significantly enhanced the participants' understanding of AI concepts regardless of the participants' digital knowledge. Moreover, participants reported feeling more empowered after completing the programme, particularly during the application phase, which improved their digital creativity and ability to apply AI knowledge to real-world problems. Participants demonstrated more ethical awareness by incorporating ethical principles, including fairness, autonomy, and transparency, which were reflected in developing their projects and self-reflective reports (Choi et al., 2024). Similar findings were also reported by Kwak et al. (2022), whose study highlights the importance of empowering students by equipping them with the skills and confidence to engage with AI in ethical and meaningful ways. It also implies the importance of introducing AI ethics through students' real project work and assignments as an effective method to reflect on and foster ethical dilemmas that arise during AI utilization.

There may be considerable variability in the knowledge base of students regarding the strengths and limitations of AI. Cerný (2024) explored university students' conceptualization of AI literacy, revealing that while students are generally aware of AI technologies, their understanding of AI literacy

varies significantly from basic awareness of AI tools to more advanced knowledge involving ethical considerations and technical skills. This empirical study suggests that considering students' varying levels of AI awareness is crucial in developing educational strategies that address both AI-related technical knowledge and ethical awareness. AI can also be an important way to overcome the linguistic challenges faced by EFL students in higher education so that they may engage with critical thinking. Diyenti Rusdin et al. (2024, p. 1), in their qualitative study, highlighted how ethical use of AI assisted Indonesian Master's students significantly in their critical thinking in English as their foreign language through "questioning norms, analysing context and evaluating evidence". In addition, students also recognised the limitations of AI, such as the inherent cultural bias of tools such as ChatGPT, the lack of personalisation (which counters OpenAI's (2023) claims of customisation), or the creation of echo chambers. Understanding how students conceptualize AI is important in informing the design of curricula that address gaps in knowledge and promote a more comprehensive understanding of the ethical dimensions of AI. These issues, along with social-emotional dimensions of AI learning, were also identified as important to the teacher education agenda according to the critical literature review of Henriksen et al. (2025).

The above literature review emphasises the need to empower students to critically analyse the impacts of AI use through a robust understanding of the ethical issues and the ability to navigate the complexities of AI landscapes. To ensure that students challenge and evaluate the ethical and social implications of AI, teaching that develops critical thinking and accountability is essential. While the literature has advocated for the establishment of unified AI ethical principles in education, it is clear that teachers and the training they receive will play a crucial role in conveying such principles. Exploring student teachers' perceptions can therefore contribute to an understanding of how to enable the implementation of AI policy in practice. Despite a growing body of literature on the general topic, there is a gap in terms of understanding student teachers' perceptions in this area. The present study aims to fill this gap, and the methodological approach taken to achieve this is outlined below.

3. Methodology

3.1. Research Design

The current study employs a mixed-methods research design that combines a descriptive approach with analytical methodologies (Creswell & Creswell, 2023). The descriptive approach was used to observe Omani EFL student teachers' perceptions of fostering critical thinking through the ethical use of AI. Additionally, the analytical approach was applied to identify patterns, connections, and discover factors critical for understanding how ethical AI integration can support critical thinking development. An explanatory design was adopted with the quantitative phase first, followed by the qualitative phase through focus group interviews to further explore the quantitative findings. This approach "reflects how the qualitative data help explain the quantitative results." (Creswell & Plano Clark, 2018, p. 77).

3.2. Participants

A purposive sample of participants was gained from the EFL programme at Rustaq College of Education, University of Technology and Applied Science, in the Sultanate of Oman. Only undergraduates enrolled in the EFL program at the college and willing to participate in the study were included. EFL foundation students and students enrolled in other programs were excluded from the current study. These participants were selected because they were consistently required to submit research-based assignments. A significant portion of their learning time was dedicated to EFL academic writing, as most of their module assessments relied heavily on grading academic writing. For instance, participants were required to submit written English assignments, such as research papers and reports, to fulfill their academic course requirements. It is assumed that these participants frequently utilize AI tools to aid in producing their written work. Ethical approval was granted by the

Research and Consultancy Department at the University. These criteria ensured that participants had sufficient experience in using AI tools to complete their tasks. Participation in the study was voluntary, and participants provided informed consent before completing the questionnaire. Participants were provided with detailed information about the study's objectives, their rights, and the assurance of confidentiality. The study sample comprises 27 female participants (32.53%) and 56 male participants (67.47%). Additionally, the breakdown of participants by year of study was as follows: 10 first-year students (12.05%), 23 students (27.71%) from the second year, 35 students (42.17%) from the third year, and 12 students (18.07%) from the fourth year.

Table 1. Demographic Information of Participants

		n	%
Gender	Male	27	32.53
	Female	56	67.47
Academic Level	Year 1	10	12.05
	Year 2	23	27.71
	Year 3	35	42.1
	Year 4	15	18.07

Note. N = 83 participants

3.3. Data Collection

Data collection was conducted in two phases. During the first phase, an online survey was developed using an online questionnaire (see Appendix 1), which is considered an effective tool for collecting data from a large or medium sample of a population (Campbell et al., 2004). The questionnaire was designed according to the following: biographical data, and then seventeen statements on five different parts related to students' beliefs and experience on AI use: the importance of data protection and consent when using AI tools, the ethical implications of using AI tools to enhance critical thinking, the social impacts of AI on critical thinking development, challenges of Integrating AI Ethics into education, opportunities for promoting AI Ethics. The items were developed based on the concepts presented in the literature review and researchers' experience with the use of AI in education. The formulation of the statements was also consolidated through consultation with AI experts in the field of education. The research tools were first piloted with a small group of EFL students. Minor amendments were made to enhance reliability and user-friendliness. The questionnaire is written in Arabic and English to maximize understanding (Mackey & Gass, 2005). The process of collecting data was run electronically via Teams by contacting the students through their instructors.

In the second phase, a focus group was used as a qualitative data collection method to investigate Omani EFL student teachers' perceptions on fostering critical thinking through the ethical use of AI. Four focus-group interviews lasting approximately 25 minutes were subsequently conducted on a voluntary basis by some EFL students who were willing and available to take part. Discussions highlighted concerns about critical issues, including plagiarism, academic honesty, bias, privacy, the impact on critical thinking, and opportunities for promoting AI ethics. This method provided valuable insights into students' attitudes toward AI ethics in education. The development of the focus-group discussion questions was guided by the quantitative data of the questionnaire. Thus, the focus-group discussions were prompted by the main themes emerging from the questionnaire's results (Creswell & Plano Clark, 2018). Friendly and flexible discussions were

conducted with the participants, and follow-up questions were asked to probe for insightful data. The interviews were audio-recorded after obtaining participants' permission.

3.4. Validity of the Tools

Content validity of the tool has been provided through rigorous double-checking from the two expert researchers who have published extensively in the integration of AI in education. The reviewers focused on clarity, coverage, and relevance; their feedback was incorporated.

For quantitative data, the internal consistency of the items was checked through the Cronbach's alpha of inter-reliability correlation coefficient. The results indicate high internal consistency reliability for the questionnaire's items with a Cronbach's alpha coefficient of 0.79, as seen in Table 2. Cronbach's alpha of 0.7 is the cut-off value for being acceptable (Pallant, 2010).

Table 2. Overall Internal Consistency for all Items

Research Questions	Items	Cronbach's Alpha
RQ1 (Data Protection)	Q1, Q7, Q8	0.75
RQ2 (Ethical Implications)	Q2, Q3, Q4, Q5	0.78
RQ3 (Social Impacts)	Q6, Q9	0.85
RQ4 (Challenges)	Q10, Q11, Q12, Q13	0.83
RQ5 (Opportunities)	Q14, Q15, Q16, Q17	0.75
Average		0.79

3.5. Data Analysis

The data collected through the e-questionnaire were analysed using SPSS software (version 22). Descriptive statistics were applied to examine the general characteristics of the students, with findings presented as percentages and frequencies or summarized using mean and standard deviation (SD).

For qualitative data, thematic analysis was performed using the Voyant tool, which provides advanced text analysis and visualization capabilities. This analysis highlighted concerns regarding the impacts of AI on learning, including risks of plagiarism, reduced critical thinking, and the promotion of uniformity in thought processes. Furthermore, guided by the key findings obtained from the questionnaire, selective coding was utilized to analyze the qualitative data. This procedure focused on identifying themes to further clarify, support, and explain questionnaire findings. Relevant quotes were identified to "explain and add insight into the quantitative results" (Creswell & Plano Clark, 2018, p. 80). Although formal inter-rater reliability checks were not used, researchers employed different strategies to ensure analytic rigor. Both peer debriefings and member checking, where participants were asked to verify the accuracy of data presented (Creswell & Creswell, 2023), were employed to increase the reliability of the findings and the quality of the data analysis process.

3.6. Research Questions

The study addresses the following research questions:

- (1) What are the EFL student teachers' perceptions of the importance of data protection and consent when using AI tools?
- (2) What are the EFL student teachers' views on the ethical implications of using AI tools to enhance critical thinking in their teaching practices?

(3) What are the EFL student teachers' perspectives on the social impacts of artificial intelligence (AI) on education, particularly in relation to students' critical thinking skills?

(4) What are the challenges EFL student teachers face in integrating AI ethics into their teaching strategies, considering the social impacts and critical thinking promotion?

(5) What are the opportunities identified by EFL student teachers for promoting AI ethics in education?

4. Results

This section examines the study's findings in two main categories: the first analyses questionnaire responses from Omani EFL student teachers, while the second describes the results of the focus groups.

4.1. Questionnaire Results

This section highlights the findings of the questionnaire, which consists of 5 parts. each part will be discussed as follows:

- The importance of data protection and consent when using AI tools (RQ1).

Table 3. EFL student teachers' perspectives on the importance of data protection and consent when using AI in education

Survey Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean	Standard Deviation
1. Ensure personal data is protected and not misused	45%	35%	15%	3%	2%	4.3	0.8
7. Stay informed about security measures in place to protect data	50%	30%	12%	6%	2%	4.2	0.9
8. Implement clear policies on data usage and sharing	38%	35%	20%	5%	2%	4.1	1.0

Table 3 shows that Omani EFL student teachers demonstrated strong awareness of the importance of protecting personal data when using AI, with mean scores above 4. Clear policies on data usage received slightly less emphasis than general concerns about privacy and security.

- The ethical implications of using AI tools to enhance critical thinking in EFL student teachers' teaching practices (RQ2)

Table 4. EFL student teachers' perspectives on the ethical implications of using AI tools to enhance critical thinking in their teaching practices

Survey Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean	Standard Deviation
2. Develop skills to critically evaluate AI tools and their impacts	38%	42%	15%	4%	1%	4.2	0.8
3. Use AI tools ethically, avoiding plagiarism and academic dishonesty	50%	30%	10%	6%	4%	4.3	0.9
4. Ensure AI complements rather than replaces meaningful interactions with teachers and peers	55%	30%	12%	2%	1%	4.4	0.7
5. Provide feedback on AI tools to help improve their fairness and effectiveness	40%	35%	15%	5%	5%	4.0	1.0

Table 4 indicates that participants strongly agreed AI should support, not replace, human interaction, and that ethical usage is crucial. Slightly lower agreement was noted regarding their role in providing feedback to improve AI fairness.

- The social impacts of AI on education, particularly in relation to critical thinking development (RQ3).

Table 5. EFL student teachers' perspectives on the social impacts of AI on education, in relation to critical thinking

Survey Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean	Standard Deviation
6. Be mindful of how AI tools impact mental well-being and seek help if necessary	33%	42%	20%	3%	2%	4.0	0.9
9. Encourage a balanced use of AI and traditional learning methods	47%	40%	8%	4%	1%	4.3	0.8

Table 5 reveals that most participants stressed the need to balance AI with traditional teaching practices. They also acknowledged the potential mental health effects of over-reliance on AI tools.

- Challenges of Integrating AI Ethics into education (RQ4)

Table 6. Challenges EFL student teachers Face in integrating AI ethics into their teaching strategies to promote critical thinking

Survey Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean	Standard Deviation
10. Insufficient faculty with expertise in AI ethics	30%	35%	25%	5%	5%	3.9	1.0
11. Need for specialized training for educators	40%	35%	15%	5%	5%	4.0	1.0
12. Difficulty in integrating AI ethics into existing curricula	45%	40%	10%	3%	2%	4.3	0.8
13. Limited funding and resources for developing AI ethics programmes	50%	30%	15%	3%	2%	4.3	0.9

Table 6 shows that the most significant barriers identified were the lack of curriculum integration and funding for AI tools. Challenges such as limited training and faculty expertise were also noted, though seen as slightly less critical.

- Opportunities for Promoting AI Ethics (RQ5)

Table 7. Opportunities identified by EFL student teachers for promoting AI ethics while fostering critical thinking in the classroom

Survey Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean	Standard Deviation
14. Embed AI ethics modules in relevant courses	45%	40%	10%	3%	2%	4.3	0.8
15. Develop dedicated courses on AI ethics	50%	35%	10%	3%	2%	4.4	0.7
16. Provide seminars, guest lectures, and workshops on emerging ethical issues in AI	42%	35%	15%	5%	3%	4.2	0.8
17. Run awareness campaigns on the importance of AI ethics	55%	30%	10%	3%	2%	4.4	0.7

Table 7 highlights that student teachers emphasized the importance of integrating AI ethics into training programs and institutional policies. Continuous faculty development and awareness efforts were also strongly recommended.

4.2. Focus Group Results

Analysis of the focus group was carried out using Voyant Tools, which is a web-based reading and analysis environment for digital texts. It is based on a comprehensive dataset with about 32,276 characters, reflecting a substantial conversation filled with insights. It engages 5856 words in a dynamic conversation, featuring 590 sentences and 8667 syllables, which makes for an in-depth exploration of these important topics in digital education as highlighted in word cloud in Figure 1.

Voyant can facilitate close reading beyond the data text “to discover patterns in a more quantifiable and less subjective manner” (Alhudithi, 2021, p. 50).



Figure 1. Word cloud of the focus group

The focus group interview conducted on the use of AI in educational settings outlined a series of critical issues, including plagiarism, academic honesty, bias, privacy, and the impact on critical thinking as depicted in Figure 2. These issues were discussed in detail by the participants in the interview, who offered a multi-faceted view of how AI is changing the educational landscape.

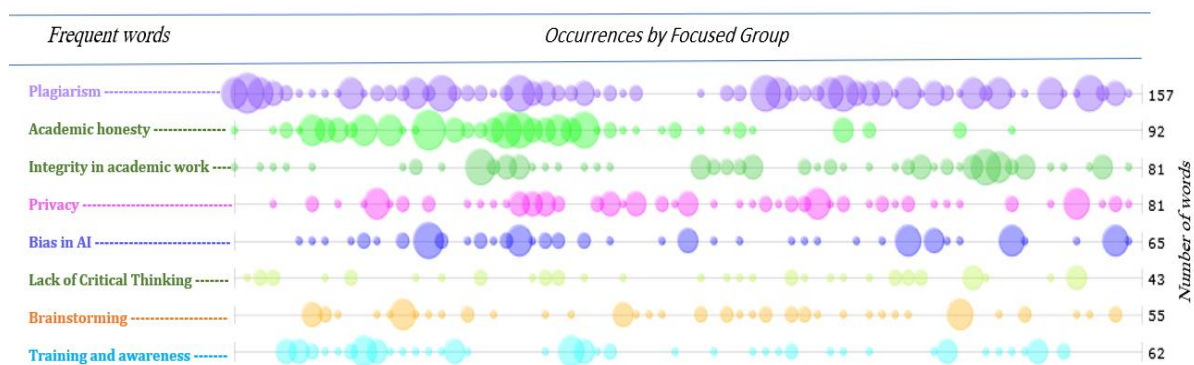


Figure 2. The most frequent phrases and frequencies of words of the focus group

5. Discussion

5.1. Discussion of Questionnaire Results

Table 1 indicates that EFL student teachers emphasize the importance of personal data protection and consent when using AI tools. This result recorded a high mean score of 4.3, which reflects a strong agreement among EFL student teachers on the importance of safeguarding personal information. This indicates the growing awareness among Omani EFL student teachers about privacy risks in AI technologies. This concern about privacy risks aligns with findings by Huang (2023), who emphasises the importance of protecting privacy, especially when AI technologies are involved. In the same way, EFL student teachers conveyed, with a high level of agreement, to be well-informed about the security measures protecting their data, with a mean score of 4.2. This result underscores the important role of transparency in building trust among users of AI tools. Bu (2022) confirmed that transparency about data protection practices is essential for users who adopt AI technologies. On the other hand, the importance of clear policies on data usage and sharing recorded a lower mean score of 4.1, which indicates that most student teachers agreed on the need for clear policies. However, there was uncertainty about the practical enforcement of these policies. As one of the Omani EFL

student teachers commented, "Having policies is good, but the problem is making sure everyone follows them in the same way." This is also highlighted by Huang (2023), who points out that ineffective policy enforcement can undermine trust in the entire system. As a result, the high mean scores across all items reflect a high level of awareness among Omani EFL student teachers of the importance of data protection, security measures, and clear policies when using AI tools. However, the slight variability regarding the implementation of data policies suggests a need for clearer communication and more consistent enforcement (Bu, 2022; Huang, 2023; Webar, 2020).

The survey results in Table 2 reveal significant insights into Omani EFL student teachers' perceptions of the ethical use of AI tools. The highest mean score (4.4) demonstrates generally strong agreement among EFL student teachers on the importance of ensuring that AI enhances, rather than replaces, interactions with teachers and peers. In this context, one of the EFL student teachers noted, "AI aids but doesn't replace teachers. But in some other jobs, like those who work in archiving files and so on, it can be replaced." This aligns with a recent study by Börekci and Çelik (2024), which emphasises that AI tools should collaborate and aid rather than replace human engagement in the classroom. In the same way, the use of AI tools ethically, including avoiding plagiarism and academic dishonesty, received a high mean of 4.3. This may suggest that EFL student teachers are aware of the ethical implications of AI integration in education. Some have expressed concerns about how easy access to AI can compromise ethical learning, emphasising the need for academic integrity awareness campaigns. One of the EFL students expressed the following concerns: "First thing is there is no honesty. Like we are taking texts and answers from AI copy-pasting. So, there is no honesty, no trust built there. AI tends to make us like copies of the same person. Like we have the same thoughts, same way of thinking and same way of dealing with things. And I think that it affects society so badly". Another student added, "The information that we get from AI, like AI, is not 100% accurate. So, there is a lot of false information there. So, if we rely on AI for extracting information and stuff, it could be like, miss. Like they are misguided, when people using AI could be misguided". In a similar vein, another EFL student teacher commented on misuse and lack of detection by teachers: "It's really easy for students to misuse AI, especially when it comes to writing assignments. I think it is important to teach them about academic integrity and how they can use AI tools responsibly without cheating. I know some students who use AI chatbots for their homework assignments, and unfortunately, they get marks more than we do."

This finding is in agreement with ethical AI guidelines suggested by Yu et al. (2024), who stressed that originality and integrity should be prioritised in AI education to foster students' critical thinking and academic development. The findings also chime with Alwaqdani (2025), who surveyed teachers who expressed generally similar concerns around the potential for misuse. In addition, the development of skills to critically evaluate AI tools recorded a mean score of 4.2. This highlights the growing understanding among EFL student teachers of the broader implications of AI in education, including its benefits and limitations. One of the EFL student teachers mentioned that "sometimes the answers provided by AI are very inaccurate or irrelevant. So, I believe that teachers or students who know how to use AI effectively will benefit from AI tools. However, those who rely on copying and pasting content without engaging with it critically will be plagiarists". This finding resonates with Qian (2024), who rightly emphasised that digital literacy and critical evaluation skills are central for teachers to effectively guide students through AI in education. Moreover, providing feedback on AI tools to improve their fairness and effectiveness, with a mean of 4.0, indicates moderate agreement among the EFL student teachers. This suggests that student teachers broadly recognise the importance of their feedback to the improvement of AI tools; however, they might feel that opportunities for meaningful feedback are limited and not explored. In line with this, Özkan and Samur (2024) stress the importance of providing feedback to improve the effectiveness and fairness of AI tools. Thus, these results highlight the importance of balancing AI use with ethical concerns and

human interaction. EFL student teachers are increasingly aware of the role of AI in education and its ethical implications, given their strong agreement on enhancing interactions, ethical practices, and critical evaluation. However, the ethical and effective implementation of AI tools in classrooms requires ongoing professional development and institutional support.

The survey responses highlight EFL student teachers' growing awareness of the social and mental well-being impacts of AI integration in education, as shown in Table 3. Striking a balance between AI use and traditional learning methods, reflected by a higher mean score of 4.3, indicates stronger agreement among EFL student teachers. This suggests a preference for blending AI with traditional methods to preserve the benefits of human interaction and AI. One of the EFL students noted, "I believe AI should complement traditional methods. For example, it's great for practicing vocabulary or grammar, but I still think face-to-face interaction is important for emotional support and deeper understanding, especially for language learners". Such findings are in line with the arguments presented by Murat (2024), who suggests that a blended learning approach maximizes the benefits of AI while maintaining important teacher-student interactions. However, one of EFL student disagrees with this point, and mentioned that it is better to use traditional ways instead: "In college and in schools instead of integrating AI, as you can see that we are now moving to trying to teach teachers how to integrate AI, how to let students use AI. I think that it has a lot of disadvantages. We shouldn't do this. We should go back to the traditional methods. It will be more effective". Moreover, the statement regarding the effects of AI tools on mental well-being and seeking help, when necessary, received a mean score of 4.0. This result suggests that EFL student teachers are aware of the potential mental health implications of using different AI tools and recognise the importance of seeking support when needed. One participant remarked: "I think that students sometimes depend too much on AI, which could lead to stress if the tool doesn't give them the right answers or if they count on it too much. I believe it is important to pay attention to how it impacts their mental health". This highlights the need for institutions to address mental health concerns related to AI usage and provide different ways for support. Zhu (2024) supports this observation, emphasizing that teachers must monitor how excessive AI usage can contribute to cognitive overload, stress, or reduced interpersonal connection, which may affect mental health. These findings highlight the importance of integrating AI into education in a balanced way, which, to some extent, mirrors Hassan (2024), who found that students benefit most when AI supplements rather than replaces traditional face-to-face learning. Liang (2023) also emphasized the need for professional guidance to manage AI-related stress and create more inclusive learning environments. In this way, teachers can help students to navigate the intersection between AI literacy and social-emotional competence (Palmquist, Sigurdadottir & Myhre 2025), promoting both differentiated cognitive growth and emotional well-being.

The survey results, as shown in Table 4, reflect challenges of integrating AI ethics into education. Difficulty in integrating AI ethics into curricula emerged as a significant challenge, with a mean score of 4.3. This indicates a strong agreement among EFL student teachers that integrating AI ethics into education is challenging, which may be attributed to strict curriculum structures or a lack of resources. One of the EFL students added, "I think the main challenge is finding ways to connect AI ethics with the rest of our lessons, like reading or writing". This aligns with Ditta and Aslam (2024), who argue that integrating AI ethics requires a flexible, interdisciplinary approach that connects technology with human values, which traditional curricula might lack. In addition, the issue of limited funding and resources for developing AI ethics programmes also received a mean score of 4.3, indicating an agreement among EFL student teachers that the lack of financial and institutional support can be a major barrier to developing AI ethics in education. This is congruent with findings by Chisega-Negrilă (2024), who argues that insufficient resources often limit innovative educational initiatives, particularly in emerging technology like AI. It is also interesting to note that the need for

specialized training for teachers to address AI ethics challenges received a mean score of 4.0. This finding indicates general agreement among EFL student teachers that teachers require professional development opportunities to keep pace with AI advancements. Aswathy and Nair (2024) emphasize the importance of continuous training to equip teachers with the competencies needed to use AI technologies. Moreover, insufficient faculty expertise in AI ethics received a mean score of 3.9, indicating that a considerable portion of EFL student teachers believe this is an important issue to address. One student remarked, "As future language teachers, we need to understand how AI can affect our teaching practices, but without proper guidance, it becomes difficult to teach these concepts to our students". This highlights a need for professional development programmes to enhance teachers' competency. Tan and Maravilla (2024) warn that the absence of qualified teachers with AI ethics will slow the adoption of ethical guidelines in classrooms, hindering effective teaching practices.

Thus, the survey results emphasize that EFL students recognize the importance of integrating AI ethics into their education but are concerned about institutional limitations. Insufficient financial resources, expertise, lack of training and curriculum integration remain perennial challenges.

The results shown in Table 5 highlight opportunities for promoting AI ethics among EFL student teachers. The mean value of 4.4 reflects that there is a high level of agreement among EFL student teachers that courses focused on AI ethics are important. One of EFL teacher students noted, "a course on AI ethics would help us understand how to use AI tools responsibly in language teaching". This result is consistent with Allahrakha and Naeem (2024), who highlight that integrating ethical components into subject-specific curricula significantly improves students' awareness and ethical reasoning. Similarly, awareness campaigns about AI ethics were highly rated by EFL teacher students, achieving a mean score of 4.4. A student teacher noted, "Media and press play an important role in encouraging people to use AI effectively, by encouraging students to join workshops and seminars, and promoting more professional teacher training". This aligns with the work of Masum and Training (2024) who highlight the role of AI ethics training programmes in promoting ethical awareness and critical engagement with AI. Moreover, the inclusion of AI ethics modules across courses scored a mean of 4.3, indicating a strong level of agreement among EFL student teachers. One participant noted, "AI tools like chatbots or grammar checkers are popular in EFL, but they might teach mistakes if used carelessly. Learning ethics can help us use them properly and avoid problems". This comment matches with a study by Salles and Farisco (2024), which highlights the importance of using AI tools properly and ethically in education. In addition, seminars and workshops on emerging ethical issues in AI, reflected by a mean score of 4.2, indicate agreement that providing seminars, lectures, and workshops is essential to promote AI ethics. Bélisle Pipon and Victor (2024) highlight the importance of seminars and workshops in AI ethics in promoting the use of AI tools effectively and fairly at a local level. However, they also point to a wider need to address the lack of accountability of AI developers in their 'ethical dumping', which leaves end users, such as teachers and learners, insufficiently supported to tackle the moral maze.

Finally, these results highlight opportunities for promoting AI ethics. Institutions should focus on embedding ethics modules and creating courses while complementing these efforts with targeted awareness campaigns. Seminars and workshops can also play a supporting to promote AI ethics.

5.2. Secondly, Focus Group Discussion

5.2.1. Plagiarism and Academic Integrity

One of the major issues that was brought forward in the discussion is, unsurprisingly, how AI tools can facilitate plagiarism. With the rise of AI-driven content generation platforms, such as OpenAI's GPT models, students can easily produce essays, reports, and even creative writing without truly engaging in the learning process (Hysaj et al., 2024). This development has created a new

challenge for educators in distinguishing between original student work and AI-generated content (Alshamy et al., 2025). The findings reported here suggest the need to strengthen academic integrity policies and integrate AI literacy in curricula so that students understand ethical ways of using technology (Chan, 2023). According to Ciampa et al. (2023), this could be addressed by promoting digital literacy among students to understand how to use AI in an ethical manner to navigate the digital world responsibly.

5.2.2. Academic Honesty

Academic honesty is directly tied to the concerns of plagiarism, but it extends to how AI can be used in assessments. Participants discussed how AI tools might enable students to cheat during exams or assignments, either by providing immediate answers or offering assistance during assessments. AI-powered tools that enable academic misconduct, such as essay generators and automated exam assistants, could have a detrimental impact on the rigor of academic evaluation (Celik, 2023). This finding was also reported by Bin-Nashwan et al. (2023) who emphasize that academic integrity is paramount, especially considering emerging technologies. Clearer guidelines on the use of AI in academic settings are vital, with a focus on transparency and fairness in assessment methods (Stoesz, 2024). The evidence from this study supports the view that institutions must devote additional resources to developing policies that encourage the ethical use of AI in learning, while promoting environments that value original thought.

5.2.3. Privacy Concerns

Another important topic discussed was privacy. Large datasets, including personal information about students, are sometimes required for AI systems to work. Concerns were raised about the security of this data and the potential risks associated with data breaches or misuse. Protecting student data will be a critical issue as more AI tools become commonplace in the classroom (Alasadi & Baiz, 2023). Participants highlighted the need for transparency of data collection that clearly showed students how their information was being collected, used and kept safe.

5.2.4. Bias in AI

AI algorithms are trained on large datasets, which may accidentally introduce bias (Ferrara, 2024). In education, this means that AI-powered tools, such as grading software or learning management systems, could perpetuate existing inequities by reinforcing stereotypes or discriminating against certain groups (Khreisat et al., 2024). The group discussed how in some instances, AI-based educational tools have been found to show racial or cultural bias that might result in the unfair treatment of students (Roshanaei, 2024). The present study raises the possibility that AI developers need to work in the development of diverse datasets and transparent algorithms that limit biases (Li et al., 2023). The focus group emphasized the use of ethical frameworks to develop AI in education so that every student is treated fairly and equitably. Moreover, AI literacy training for teachers can help teachers identify potential biases in AI tools and challenge them where appropriate.

5.2.5. Impact on Critical Thinking

One of the most common apprehensions was the effect that AI would have on the critical thinking capabilities of students (Zhai et al., 2024). Some participants believed easy access to such AI-powered tools would result in students becoming overly dependent on these technologies at the expense of internalizing knowledge for themselves. Over-reliance on AI diminishes the deep thinking and problem-solving capabilities of students, which are important features for later success, both in academics and at work (Walter, 2024). The group discussed balancing the use of AI as a support tool with encouraging critical thinking. AI should not eliminate the necessity for deep engagement with academic material but rather be an additional resource. Hence, it could be that educators are

encouraged to design assignments that integrate AI tools in a way that students would still need to analyze, synthesize and evaluate information to promote higher-order thinking skills.

5.2.6. Brainstorming

Despite concerns about critical thinking, some participants saw AI as a tool for enhancing brainstorming and creative thinking. AI can assist students in generating ideas, exploring various solutions to problems, and even discovering new concepts that they might not have encountered otherwise. In this context, AI can be an invaluable asset in fostering innovation and encouraging students to think more expansively (Habib et al., 2024). This may help students fine-tune their ideas and work toward more creative solutions, a point emphasized in recent studies into the role of AI in design thinking (Tholander & Jonsson, 2023).

5.2.7. Training and Awareness

Finally, the working group stressed that training and awareness on the ethical and effective use of AI are needed for both students and educators. Educators should be knowledgeable about AI technologies to better guide their students. As reiterated throughout the findings of this study, professional development for teachers in AI tools and their implications can help them use these technologies responsibly. Importantly, AI literacy can be conveyed through the inherently human oversight of a social-emotional learning approach (Henriksen et al., 2025). Similarly, students need to be trained in the use of AI tools by realizing their potential and limitations (Pant et al., 2024)

6. Limitation

The generalisability of these results is subject to certain limitations. For instance, the sample size was small, and the focus was on pre-service teachers in the local context of an Omani university. The focus group sample size was also relatively small.

7. Conclusion

This study has highlighted pre-service teachers' perceptions on the importance of fostering critical thinking and ethical awareness among Omani EFL students, using AI as a supportive tool rather than a replacement for teacher interaction to enrich educational experience. The study utilised a mixed-methods research design, combining both quantitative analysis of survey data with qualitative insights from focus groups. The study has five research questions. The first research question investigates teachers' perceptions of the importance of data protection and consent when using AI tools. A shared concern about the risks of data misuse and the need for consistent enforcement of data protection policies was revealed. Regarding the second question on the implications of using AI tools to enhance critical thinking in teaching practices, it was found that student teachers recognized the value of AI in enhancing learning. They emphasized avoiding plagiarism, promoting academic honesty, and ensuring AI complements rather than replaces teacher-student interaction. The third research question explored the social impacts of AI on education, particularly in relation to critical thinking development, showing considerable awareness of EFL students on the social and mental well-being impacts of integrating AI in education. The fourth question focused on challenges faced by EFL pre-service teacher in integrating AI ethics into their teaching strategies. This revealed limited professional development, curriculum constraints, and a lack of institutional resources. The participants also expressed concern over the psychological effects of AI overuse, such as decreased engagement and overdependence, which may hinder the promotion of critical thinking. The fifth research question concerns the opportunities that EFL student teachers identify for promoting AI ethics in education, revealing proposed practical strategies including embedding AI ethics into course modules, offering standalone ethics courses, conducting seminars and workshops, and launching awareness campaigns. Hence, to ensure the effective integration of AI, this study concludes that a balanced approach to AI integration is required, emphasizing the development of ethical concerns

and the fostering of digital literacy. In addition, more comprehensive research is needed to explore how AI impacts students' learning and teacher practices in different contexts. Addressing ethical issues such as bias, digital divide and accessibility, dependency, emotional and social impact, intellectual property and content ownership, and long-term impact on employment must be thoroughly investigated to establish best practices for the best use of AI in education. The study firmly argues for the need to understand student teachers as future students' outcomes will be significantly influenced by their perceptions when tailoring teacher training interventions.

8. Suggestion

The current study has contributed to exploring an emerging research agenda which remains underexplored, spotlighting Omani student teachers and utilising traditional approaches as well as innovative technological affordances such as Voyant tools. It was, however, limited in its sample size and focus on student teachers in local context of an Omani university. Future studies that incorporate the insights of policymakers, AI developers, students, and teachers on how to embed AI ethics education will be illuminating. Ensuring that HEIs can harness the benefits of AI to equitably transform and empower citizens will require a joined-up approach, ensuring that voices are not left unheard.

Declarations

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Appendix I.

Exploring Omani EFL Student Teachers' Perceptions on AI Ethics in Education

Dear Student,

Thank you for participating in this survey. The purpose of this study is to explore Omani EFL student teachers' perceptions of how ethical considerations in Artificial Intelligence (AI) impact education and critical thinking. Your responses will remain anonymous and will only be used for research purposes.

Please read each statement carefully and select the option that best reflects your opinion.

Scale:

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

Survey Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Ensure personal data is protected and not misused	☐	☐	☐	☐	☐
2. Stay informed about security measures in place to protect data	☐	☐	☐	☐	☐
3. Implement clear policies on data usage and sharing	☐	☐	☐	☐	☐
4. Develop skills to critically evaluate AI tools and their impacts	☐	☐	☐	☐	☐
5. Use AI tools ethically, avoiding plagiarism and academic dishonesty	☐	☐	☐	☐	☐
6. Ensure AI complements rather than replaces meaningful interactions with teachers and peers	☐	☐	☐	☐	☐
7. Provide feedback on AI tools to help improve their fairness and effectiveness	☐	☐	☐	☐	☐
8. Be mindful of how AI tools impact mental well-being and seek help if necessary	☐	☐	☐	☐	☐
9. Encourage a balanced use of AI and traditional learning methods	☐	☐	☐	☐	☐
10. Insufficient faculty with expertise in AI ethics	☐	☐	☐	☐	☐
11. Need for specialized training for educators	☐	☐	☐	☐	☐
12. Difficulty in integrating AI ethics into existing curricula	☐	☐	☐	☐	☐
13. Limited funding and resources for developing AI ethics programs	☐	☐	☐	☐	☐
14. Embed AI ethics modules in relevant courses	☐	☐	☐	☐	☐
15. Develop dedicated courses on AI ethics	☐	☐	☐	☐	☐
16. Provide seminars, guest lectures, and workshops on emerging ethical issues in AI	☐	☐	☐	☐	☐
17. Run awareness campaigns on the importance of AI ethics	☐	☐	☐	☐	☐