Perceptions of Artificial Intelligence (AI) among College Students: A Case Study of Arusha Technical College

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Abstract: *Artificial intelligence (AI) is increasingly influencing teaching, learning, and assessment practices in higher education. Understanding students' perceptions of AI is essential for its responsible and effective integration, particularly within technical and vocational education contexts that remain underrepresented in empirical research. This study examines students' perceptions of artificial intelligence at Arusha Technical College, Tanzania, focusing on awareness, emotional responses, societal views, and perceived roles of AI in education. A quantitative cross-sectional survey design was employed using a structured questionnaire administered to students enrolled in computing-related programmes, including Cyber Security, Computer Network Design and Administration, and Computer Architecture. Descriptive statistical techniques and visual analyses were applied to examine patterns in AI knowledge, information sources, attitudes, emotional responses, and perceived educational usefulness. The findings indicate that students possess moderate self-assessed knowledge of AI, with the internet serving as the primary source of information. Curiosity emerged as the dominant emotional response toward AI, while fear and indifference were reported less frequently. Overall, students perceived AI as beneficial for addressing societal challenges and supporting educational processes, particularly through personalized learning, feedback, and instructional support. Nevertheless, concerns were expressed regarding the potential reduction of student teacher interaction. Higher AI knowledge was generally associated with more positive perceptions of AI's educational usefulness. The study provides context-specific evidence from a technical college setting and underscores the importance of structured AI education and human centered implementation strategies in technical higher education.*

Keywords: *Artificial intelligence, Student perceptions, Technical education, Higher education, Tanzania, AI in education*

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1. Introduction

Artificial intelligence (AI) has emerged as a transformative force across multiple sectors, with education experiencing particularly rapid change. Advances in machine learning, natural language processing, and generative AI systems have expanded the potential for personalized learning, automated assessment, intelligent tutoring, and academic support tools. Recent studies emphasize that AI is increasingly positioned not merely as a technological innovation, but as a structural component capable of reshaping teaching practices, curriculum design, and institutional governance in higher education contexts (Abbas, 2024; Dr. Shakeel Ahmed et al., 2025; Saddaqat Ali et al., 2025)

In higher education, the integration of AI has been associated with both opportunities and challenges. On the one hand, AI systems are reported to enhance learning efficiency, provide adaptive feedback, and support inclusive and flexible educational environments (Cheah et al., 2025; Mishra, 2024). On the other hand,

concerns related to academic integrity, data privacy, algorithmic bias, and the erosion of human-centered pedagogy have been widely documented (Al-Zahrani, 2024; Holmes et al., 2023; Zlotnikova et al., 2025).These dual narratives highlight the importance of understanding how key stakeholders particularly students perceive AI and its role in education.

Students' perceptions of AI are increasingly recognized as critical to the successful adoption and responsible use of AI-driven educational technologies. Prior research demonstrates that students' awareness, emotional responses, and ethical evaluations of AI influence their acceptance, trust, and willingness to engage with AI-based tools (Basch et al., 2025; Fošner, 2024; Otermans et al., 2025). Emotional reactions such as curiosity, fear, trust, and indifference have been shown to coexist, reflecting complex and sometimes contradictory attitudes toward AI (del Álamo Cienfuegos et al., 2024; Seikaly, 2024). These perceptions are shaped by factors including knowledge level, cultural context, academic discipline, and prior exposure to digital technologies.

Despite the growing body of international literature, empirical evidence from African technical and vocational higher education contexts remains limited. Most existing studies focus on universities in Europe, North America, the Middle East, and parts of Asia, with comparatively fewer investigations addressing student perceptions within technical colleges operating under national qualification frameworks such as the National Technical Awards (NTA). Understanding how students in such contexts perceive AI is essential, given their close alignment with applied computing, industry-oriented training, and workforce preparation.

This study addresses this gap by examining students' perceptions of artificial intelligence at Arusha Technical College, focusing on awareness, emotional responses, societal and educational perceptions, and perceived roles of AI in teaching and learning. By situating the analysis within a technical education setting in Tanzania, the study contributes context-specific evidence to the global discourse on AI in education and provides insights relevant to curriculum development, policy formulation, and responsible AI integration in technical higher education.

1.1 Statement of the Problem

The increasing use of artificial intelligence (AI) technologies in higher education has begun to reshape teaching, learning, and assessment practices, offering new opportunities for personalized learning and academic support while simultaneously raising concerns related to academic integrity, ethical use, and institutional preparedness. Although students' perceptions play a critical role in shaping how AI tools are adopted and utilized in educational settings, empirical evidence on student perceptions of AI remains limited within technical and vocational higher education institutions, particularly in developing contexts. In Tanzania, and specifically at Arusha Technical College, AI tools are becoming more accessible to students in computing-related programmes; however, there is no systematic empirical evidence documenting how students perceive the usefulness, risks, and educational role of AI across different academic levels and programmes. This lack of context specific evidence constrains informed curriculum design, assessment practices, and policy formulation related to responsible AI integration, thereby necessitating a structured investigation into students' perceptions of AI in teaching and learning at Arusha Technical College.

1.2 Objectives of the study

General Objective

To examine students' perceptions of artificial intelligence in teaching and learning at Arusha Technical College.

Specific Objectives

1. To assess students' level of awareness and sources of knowledge about artificial intelligence.
2. To examine students' emotional responses toward artificial intelligence.
3. To investigate students' perceptions of the societal implications of artificial intelligence.
4. To analyse students' perceptions of the role of artificial intelligence in the educational process.

2. Literature Review

2.1 Artificial Intelligence in Education: Opportunities and Transformations

The literature consistently characterizes AI as a catalyst for educational transformation. AI-driven systems are reported to support personalized learning pathways, automate administrative tasks, and enhance instructional decision-making (Kamalov et al., 2023; Singh & Thakur, 2024). Generative AI tools, in particular, have expanded possibilities for content creation, tutoring, and student support, prompting renewed discussions on pedagogical innovation and instructional design (Aghaee et al., 2024; Al Zaidy, 2024).

Several studies highlight that AI adoption can improve accessibility and inclusivity by addressing diverse

learning needs and reducing instructional constraints (Mekadenaumporn, 2025; Muhammad & Matilda, 2024). However, scholars caution that technological benefits are not uniformly realized and depend heavily on institutional readiness, digital competence, and governance frameworks (Al-Omari et al., 2025; Jiang et al., 2025) . As a result, AI integration is increasingly framed as a socio-technical process rather than a purely technological upgrade.

2.2 Student Awareness, Knowledge, and Attitudes toward AI

Research examining student awareness of AI reveals generally moderate knowledge levels, with substantial variation across disciplines and educational systems (Bhattarai et al., 2024a; Lee et al., 2024). While students are often familiar with AI through internet-based platforms and everyday applications, formal understanding of AI concepts remains limited (Bewersdorff et al., 2023; Hollands & Breazeal, 2024). Studies further indicate that higher AI knowledge is associated with more nuanced and balanced attitudes, whereas limited knowledge may lead to uncritical trust or exaggerated fear (Breese et al., 2025).

Attitudinal studies show that students generally view AI as beneficial for learning efficiency and future employability, yet express reservations about overreliance on technology and loss of human interaction (Dobrovská et al., 2024; O et al., 2025). These findings suggest that student attitudes toward AI are shaped by a combination of perceived utility, ethical awareness, and educational experience.

2.3 Emotional Responses and Ethical Concerns

Emotional responses toward AI have emerged as an important dimension of perception studies. Curiosity and optimism are frequently reported, reflecting students' interest in technological innovation and future career relevance (Cruz Zuniga et al., 2024; Sukarno et al., 2025). At the same time, fear related to job displacement, surveillance, and academic dishonesty remains prevalent (Gerlich, 2024; Hutson & Plate, 2024)

Ethical considerations form a central theme in the literature, with concerns about data privacy, algorithmic bias, transparency, and academic integrity dominating scholarly discussions (Khan, 2024; Triyanto & Handayani, 2025). Students have been shown to support AI use in education when ethical safeguards and human oversight are emphasized (Karran et al., 2025; Ramos, 2025). This highlights the importance of embedding ethical literacy alongside technical competence in AI-related education.

2.4 AI in Education within Developing and Technical Contexts

Studies conducted in developing regions emphasize contextual factors such as infrastructure, policy readiness, and digital literacy as key determinants of AI adoption (Dube & Setlalentoa, 2024; Tarisayi & Manhibi, 2025) . In technical and vocational education settings, AI is often perceived as directly relevant to employability and industry alignment, but concerns remain regarding equitable access and instructor preparedness (Abubakar et al., 2024; Lamrabet, 2024).

Despite increasing global interest, **research focusing specifically on technical colleges and NTA-aligned programmes remains scarce**. This gap underscores the need for localized empirical studies that reflect the realities of applied computing education in developing contexts. Addressing this gap enables more informed decision-making regarding curriculum design, institutional policy, and responsible AI integration.

3. Methodology

3.1 Research Design

This study adopted a quantitative, cross-sectional survey design to examine students' perceptions of artificial intelligence in an educational context. The design was considered appropriate for capturing attitudes, awareness, emotional responses, and perceived roles of AI at a single point in time. A structured questionnaire was used to collect self-reported data from students enrolled in computing-related programmes at Arusha Technical College.

3.2 Study Area and Population

The study was conducted at Arusha Technical College, a public technical institution offering programmes in computing and information technology. The target population comprised students enrolled in Cyber Security (CS), Computer Network Design and Administration (CNDA), and Computer Architecture (CA) programmes. Participants were drawn from Year Two (NTA Level 5) and Year Three (NTA Level 6), representing different stages of academic progression within the National Technical Awards (NTA) framework.

3.3 Sampling Technique and Sample Size

The study sample was drawn from the accessible population of students registered in computing-related

programmes at Arusha Technical College. Data were collected from students at NTA Level 5 and NTA Level 6 who met the inclusion criteria and voluntarily participated during the survey period. The resulting sample included students from different programmes and demographic backgrounds.

3.4 Data Collection Instrument

Data were collected using a self-administered structured questionnaire. The questionnaire consisted of both closed-ended and Likert-scale items and was organized into several sections: *Demographic information*, including gender, programme of study, and academic level, *AI awareness and knowledge*, measured through self-assessment scales, *Sources of AI information*, such as internet, books, discussions, and social media, *General perceptions and attitudes toward AI*, including societal and economic impact, *Emotional responses toward AI*, capturing feelings such as curiosity, fear, trust, and indifference and lastly *Perceived role of AI in education*, covering teaching, learning, evaluation, and potential disadvantages.

3.5 Data Collection Procedure

Data collection was carried out during the academic term; participants were informed of the purpose of the study and assured that participation was voluntary and anonymous. Questionnaires were distributed and completed within a controlled classroom environment to minimize non-response and ensure consistency in administration.

3.6 Data Analysis Techniques

Collected data were coded and analysed using Python-based data analysis tools. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' characteristics and perception patterns. Data visualization techniques such as bar charts, violin plots, and scatter plots were employed to illustrate distributions and relationships between key variables, including AI knowledge, emotional responses, and perceived usefulness of AI in education.

The analysis focused on identifying overall trends and patterns rather than inferential comparisons between subgroups. Where relationships were explored, these were presented descriptively to avoid overinterpretation beyond the scope of the study design.

3.7 Ethical Considerations

Ethical principles were observed throughout the study. Participants were informed about the objectives of the research, and informed consent was obtained prior to data collection. No personally identifiable information was collected, and all responses were treated with confidentiality. The study was conducted strictly for academic and research purposes.

4. Results and Discussion

4.1 Demographic characteristic

The study sample comprised students enrolled in computing-related programmes at Arusha Technical College. Year Two students were classified as NTA Level 5, while Year Three students were classified as NTA Level 6, representing different stages of academic progression. Participants were drawn from three programmes: Cyber Security (CS), Computer Network Design and Administration (CNDA), and Computer Architecture (CA). The distribution indicated a higher proportion of respondents at NTA Level 6, showing that students in the final year of study constituted the majority of the sample. Across all programmes, female students were more represented than male students. These demographic characteristics, presented in Figure 1, provide essential contextual information for interpreting students' perceptions of artificial intelligence.

Academic level and programme of study describe the learning environment in which AI awareness and perceptions were formed. Prior studies have shown that students at advanced academic levels tend to demonstrate greater exposure to emerging technologies and more informed attitudes toward artificial intelligence due to increased curricular depth and practical engagement (Almaraz-López et al., 2023; Dobrovská et al., 2024). Similarly, differences in curricular focus across programmes such as the security-oriented training in Cyber Security and system level exposure in Computer Architecture have been found to shape how students perceive AI applications and risks in educational and professional contexts (Balogh, 2024; Fošner, 2024). The demographic structure observed in this study therefore provides a necessary descriptive foundation for subsequent analyses of AI awareness, emotional responses, and perceived roles of artificial intelligence in education, as recommended in prior higher education AI perception research (Bhattarai et al., 2024a; Caucheteux et al., 2024).
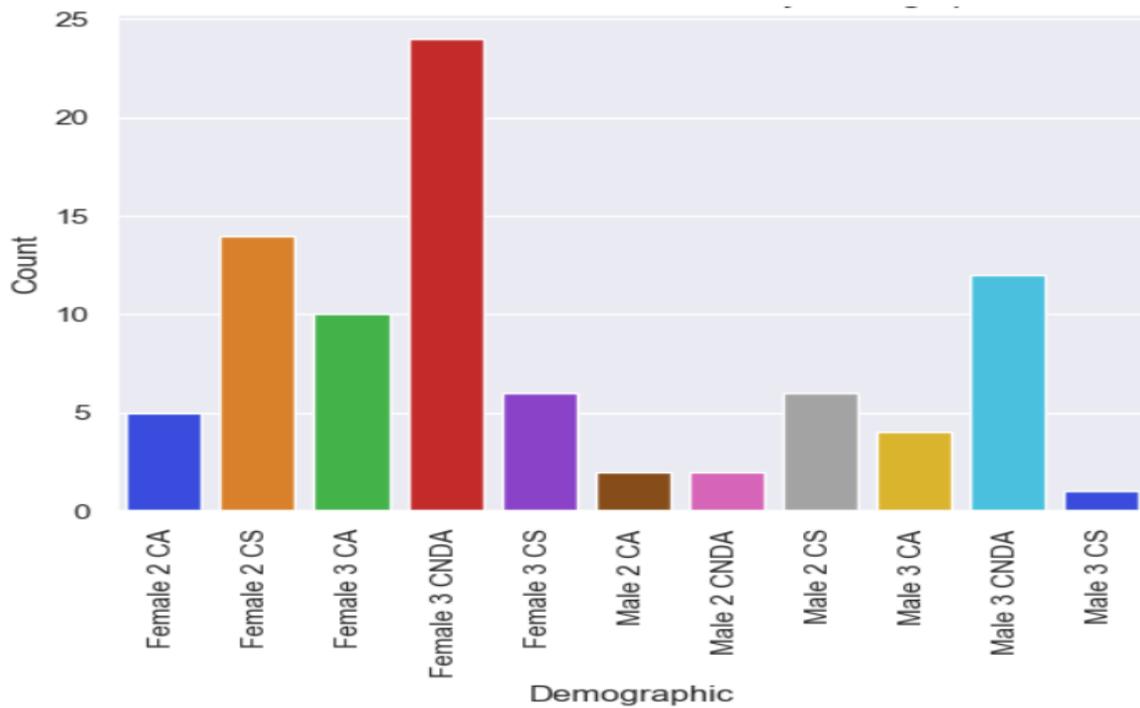
Figure 1: Demographic characteristic

4.2 AI Awareness and Information Sources

Students reported moderate levels of self-assessed AI knowledge, with most ratings concentrated around mid-scale values, as presented in Figure 2. This indicates that while artificial intelligence is widely recognized among students, in-depth mastery remains limited. Very few students rated themselves at the extremes of the scale, suggesting a relatively homogeneous perception of AI literacy across the sample. This pattern reflects general exposure rather than specialized training in AI-related technologies, a trend that has also been observed in higher education contexts where AI tools are accessible but not yet systematically embedded within curricula (Bhattarai et al., 2024b).

Analysis of information sources reveals that internet-based platforms are the dominant means through which students learn about artificial intelligence, substantially outweighing books, discussions, or social media. Similar reliance on online resources has been reported in studies examining student AI awareness in technical and university settings (Otermans et al., 2025). However, students who relied on formal sources such as books and academic materials demonstrated higher perceived knowledge levels. In contrast, students who reported being uninformed about AI consistently exhibited the lowest knowledge ratings. These findings reinforce evidence from prior research indicating that structured and academically guided learning resources are more effective in developing meaningful AI literacy than informal exposure alone (Fošner, 2024).
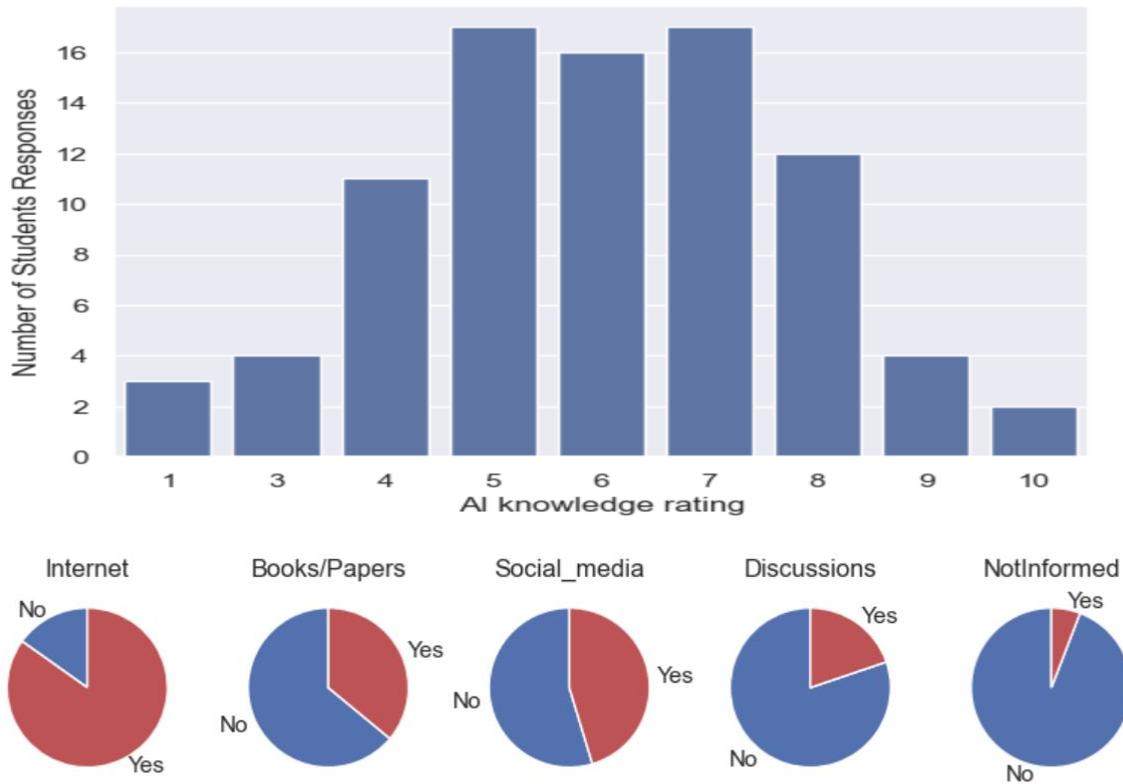
Figure 2: Distribution of self-assessed AI knowledge rating and proportionate of using different AI information sources

4.3 General Attitudes and Emotional Responses toward AI

Students' attitudes toward artificial intelligence reflect a cautiously optimistic orientation, as depicted in Figure 3. Strong agreement was observed with statements emphasizing AI's contribution to problem-solving and economic development, while concerns related to job displacement and societal restructuring were present but less pronounced. The relatively balanced spread of responses suggests that students are neither overly enthusiastic nor strongly resistant to AI, but instead maintain measured expectations about its societal role. Similar patterns of cautious optimism among university students have been reported in prior studies, where perceived benefits of AI coexist with awareness of its potential societal risks (Cruz Zuniga et al., 2024).

From an emotional perspective, curiosity emerged as the dominant response, followed by trust, with fear and indifference being comparatively limited. This emotional profile aligns with the cognitive evaluations observed and indicates openness to engagement with AI technologies. Comparable emotional orientations have been identified in studies examining student and public sentiment toward AI, where curiosity and trust tend to prevail in contexts of moderate exposure (Grassini & Ree, 2023; Seikaly, 2024). Importantly, students with higher AI knowledge levels expressed more positive attitudes and lower concern regarding dehumanization, suggesting that familiarity with AI reduces uncertainty and anxiety. This observation is consistent with earlier findings demonstrating that increased AI literacy is associated with more balanced and less fear-driven perceptions, reinforcing the role of education in shaping responsible AI engagement (Fošner, 2024).
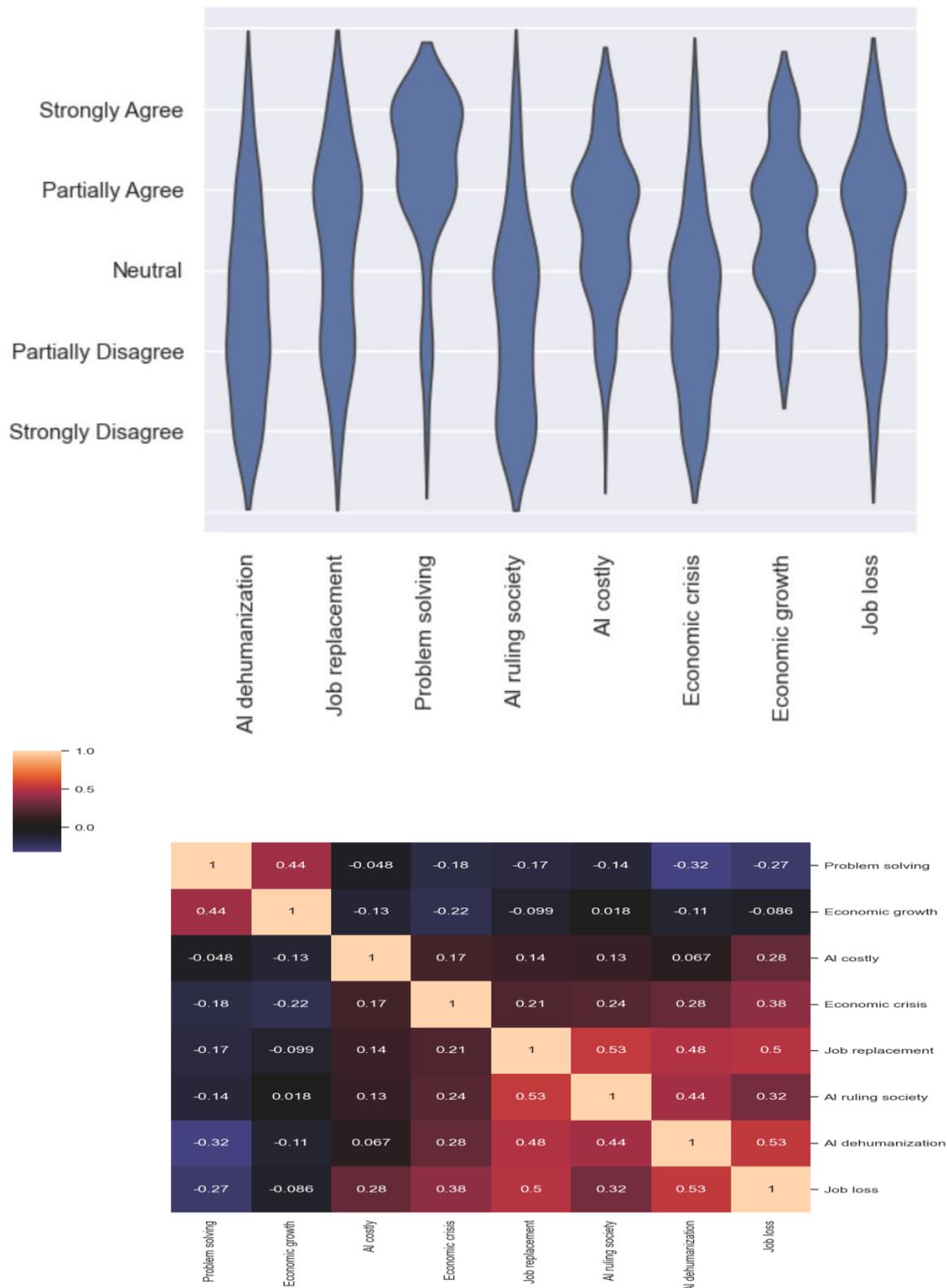
Figure 3: Violin plot of agreement levels for general AI perception and Distribution of emotional responses towards AI.

4.4 Perceived Societal and Sectoral Impact of AI

Students expect artificial intelligence to have its strongest impact in data-intensive and structured domains, particularly medicine and education. In contrast, creative domains such as art were perceived as least affected. Most respondents identified two to four sectors likely to experience significant AI-driven change, indicating realistic expectations rather than technological exaggeration. This pattern, presented in Figure 4, reflects an emerging understanding of AI's current capabilities and limitations. Similar sectoral hierarchies have been reported in prior studies, where students and the general public tend to associate AI primarily with analytical and rule-based domains rather than creative or expressive fields (Kelley et al., 2021; Lund et al., 2024).

Further analysis, presented in Table 1, shows that higher AI knowledge is associated with broader recognition of AI's sectoral influence, especially in less traditional domains such as art. Students who believed AI could affect creative fields reported substantially higher AI knowledge scores. This suggests that deeper understanding expands perceptions beyond conventional applications and highlights the role of technical literacy in shaping more comprehensive views of AI's societal reach. Comparable findings have been documented in studies demonstrating that increased AI literacy reduces rigid conceptions of AI capabilities and supports more nuanced evaluations of its potential across diverse domains (Zirenko et al., 2025).
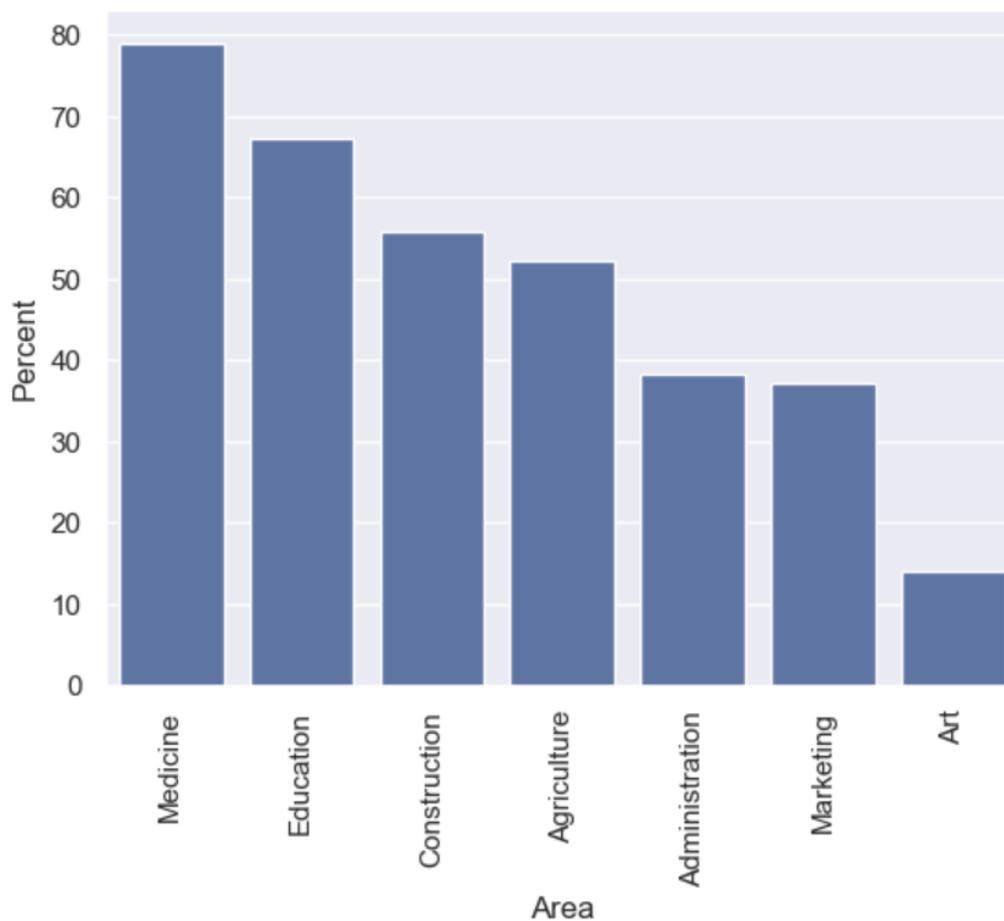

Figure 4: Percentage of students expecting significant AI impact across sectors

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Table 1: Mean AI knowledge ratings by sectoral agreement

Area	Disagree	Agree	Difference
Art	5.69	7.50	1.81
Medicine	5.22	6.13	0.91
Marketing	5.80	6.19	0.39
Administration	5.81	6.15	0.34
Agriculture	5.88	6.00	0.12
Construction	5.92	5.96	0.04
Education	5.93	5.95	0.02

4.5 Perceived Role of AI in Education

Students generally rated artificial intelligence as moderately to highly useful in the educational process, with perceived usefulness increasing alongside self-assessed AI knowledge. The most valued educational benefits included personalized learning, continuous feedback, and AI-assisted teaching support, indicating strong expectations for AI as an enhancement tool rather than a replacement for traditional pedagogy, as presented in Figure 5. Similar findings have been reported in higher education studies showing that students primarily view AI as a supportive technology capable of improving instructional efficiency and individualized learning outcomes rather than substituting human instructors (Abbas, 2024; Cheah et al., 2025).

Despite these positive evaluations, the most frequently cited concern was the potential weakening of student–teacher relationships. This suggests that students favour AI systems that support instruction while preserving human interaction. Comparable concerns regarding the erosion of pedagogical relationships have been widely documented in studies emphasizing the need for human-centred AI deployment in educational environments (Holmes et al., 2023). Students with more positive general attitudes toward AI emphasized accessibility, feedback, and interactivity, whereas those with lower usefulness ratings focused on social and relational drawbacks. This tension underscores the importance of human-centred AI integration in educational settings, aligning with existing literature advocating for balanced AI adoption that prioritizes pedagogical integrity and meaningful human engagement (Cabero-Almenara & Barroso-Osuna, 2025; Zlotnikova et al., 2025).
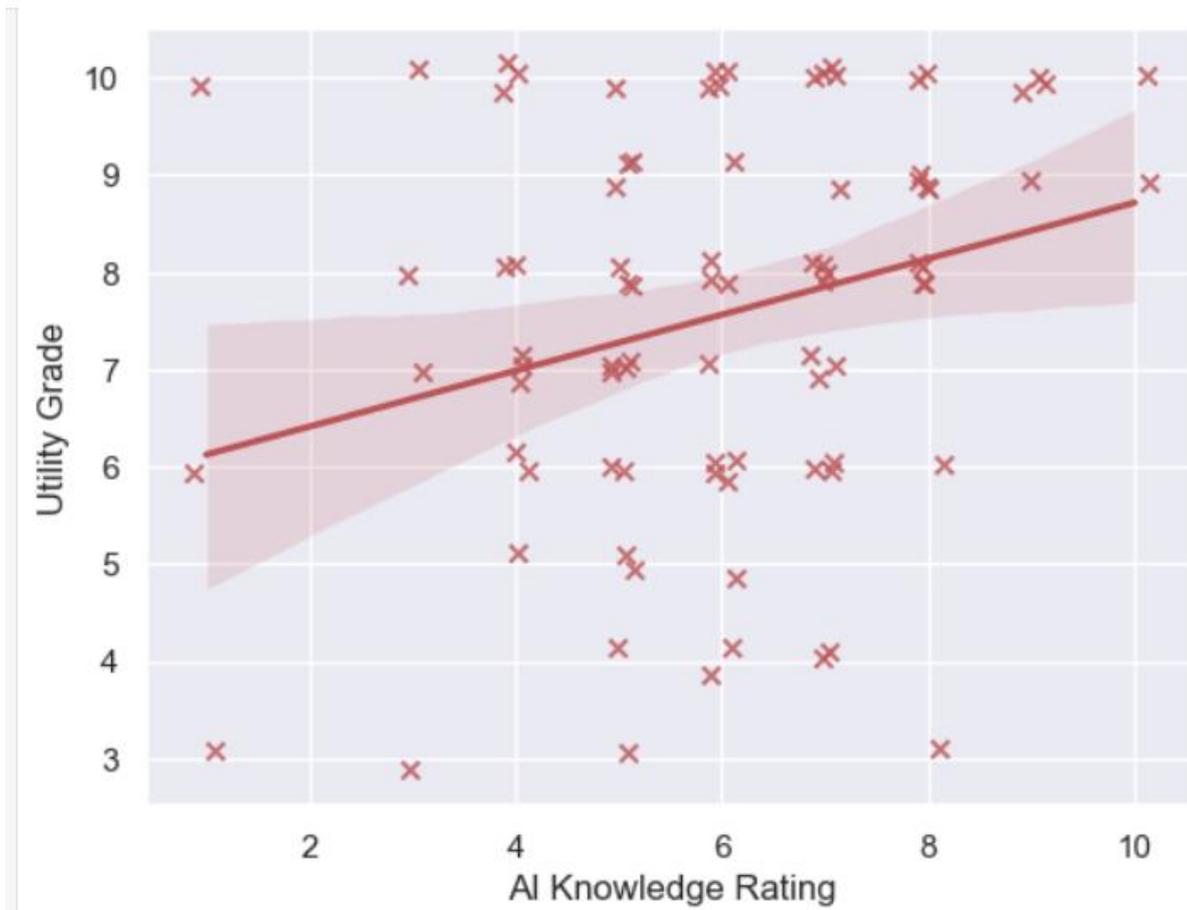
Figure 5: Distribution of perceived AI usefulness in education

4.6 Emotional Responses toward Artificial Intelligence by Gender

Figure 5 presents the distribution of students' emotional responses toward artificial intelligence by gender. Curiosity was the most frequently reported emotion among both female and male students, with a notably higher count observed among female respondents. This indicates that the prevailing emotional response toward AI within the sample was one of interest and engagement. In comparison, feelings of fear and trust were reported less frequently across both genders, while indifference was present but remained secondary to curiosity. Similar findings have been reported in studies examining emotional orientations toward AI, where curiosity often dominates initial engagement, particularly in educational contexts characterized by increasing exposure to digital technologies (Grassini & Ree, 2023; Seikaly, 2024).

Gender-based differences in emotional responses were modest. Female students reported higher levels of curiosity and indifference, whereas male students showed slightly higher frequencies of fear and trust. These patterns suggest variation in emotional engagement with AI rather than strong divergence in overall perception. Comparable gender-related trends have been observed in prior research, which indicates that while emotional expressions toward AI may differ slightly by gender, such differences do not necessarily translate into polarized attitudes or acceptance levels (Baksa et al., 2024; Kovačević & Demić, 2024). Collectively, the results indicate that students' emotional responses toward AI were largely exploratory in nature, providing a contextual background for understanding their subsequent attitudes toward AI applications in education, as emphasized in earlier studies on AI perception and emotional framing in learning environments (Cruz Zuniga et al., 2024; Sukarno et al., 2025).
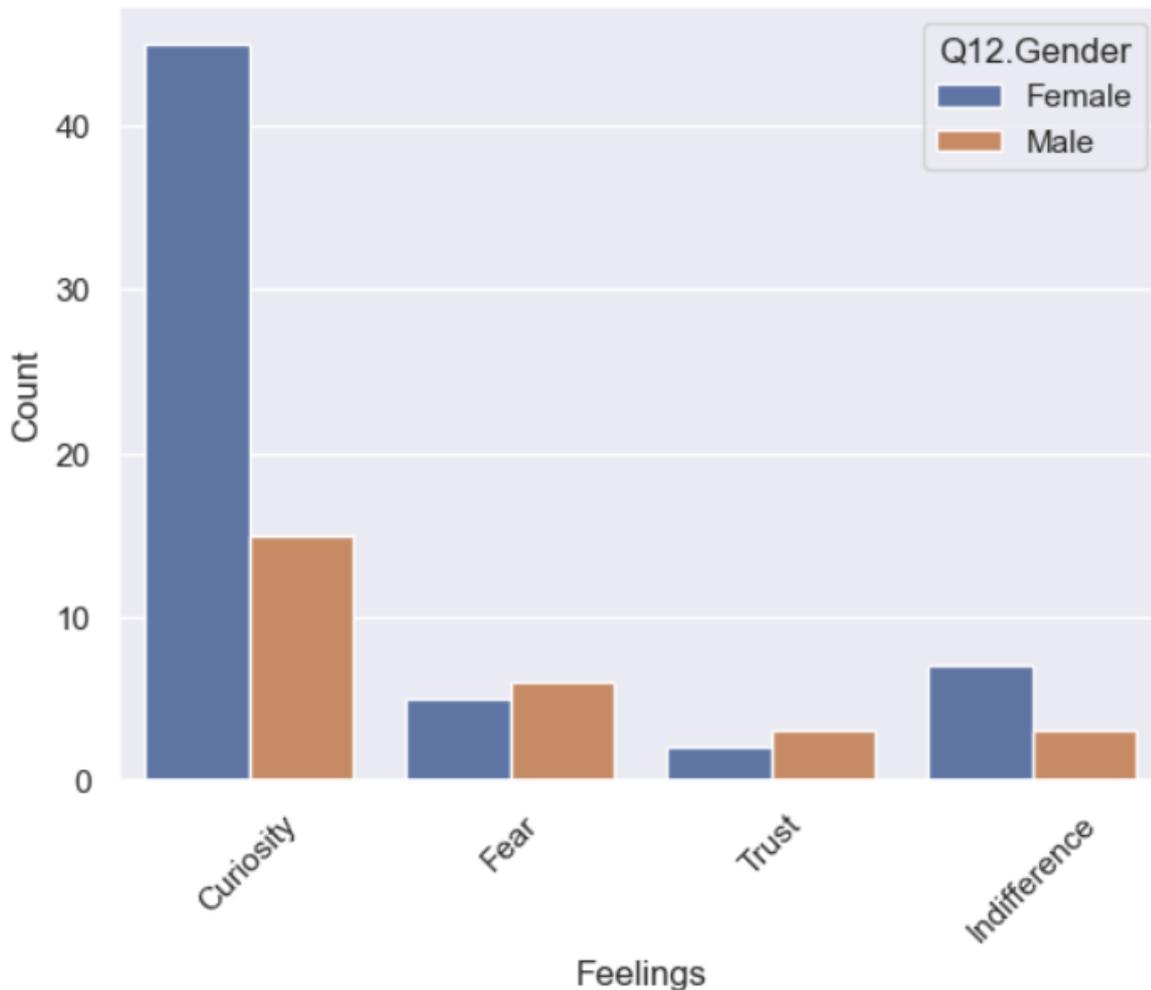
Figure 6: Emotional response towards AI by gender

5. Conclusion and Recommendations

5.1 Conclusion

This study examined students' perceptions of artificial intelligence at Arusha Technical College, with particular emphasis on awareness, emotional responses, societal views, and perceived educational roles of AI. The results show that while students generally possess moderate levels of AI knowledge, they demonstrate a strong interest in AI-related technologies, as reflected by the predominance of curiosity as an emotional response. Internet-based platforms were identified as the primary sources of AI information, while formal academic materials were associated with higher perceived understanding.

Students largely viewed AI as a beneficial tool for addressing societal challenges and enhancing educational processes. Perceived advantages included personalized learning, continuous feedback, and instructional support, indicating expectations of AI as an augmentative rather than substitutive educational

technology. At the same time, concerns related to reduced human interaction in education highlight the need for careful, human-centered integration of AI systems. These findings suggest that students hold balanced views, recognizing both the potential and limitations of AI in education.

Overall, the study underscores the importance of structured AI literacy and ethical awareness within technical higher education curricula. By providing empirical evidence from a Tanzanian technical college context, the study contributes to the limited body of research on AI perceptions in vocational and applied computing education. Future research may extend this work through inferential analyses, longitudinal designs, or comparative studies across institutions to further inform policy and practice related to AI adoption in technical higher education.

5.2 Recommendations

Based on the findings of this study, several recommendations are proposed to support the effective and responsible integration of artificial intelligence in

technical higher education institutions. First, Arusha Technical College should consider embedding structured AI literacy components within existing computing curricula, with emphasis on foundational concepts, ethical considerations, and practical applications. This would help move students from general awareness toward deeper, academically grounded understanding, particularly for those who currently rely on informal online sources for AI knowledge.

Second, the integration of AI tools in teaching and learning should follow a human-centred pedagogical approach. While students perceived AI as beneficial for personalized learning, feedback, and instructional support, concerns regarding the weakening of student–teacher relationships were evident. Institutions should therefore prioritize AI applications that enhance, rather than replace, instructor engagement, ensuring that human interaction remains central to the learning process.

Third, faculty capacity building is essential for successful AI adoption. Targeted professional development programmes should be implemented to equip instructors with the skills required to use AI tools pedagogically and ethically. Well-prepared educators are better positioned to guide students toward responsible AI use and to mitigate risks related to misuse and overreliance.

Finally, institutional leadership and policymakers should develop clear guidelines and governance frameworks for AI use in education. Such frameworks should address ethical use, academic integrity, data privacy, and transparency, while encouraging innovation. Future research is recommended to extend this study across multiple institutions and disciplines, and to incorporate qualitative approaches that capture deeper insights into students' lived experiences with AI in education.

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