

Engineering the Future: Student Perspectives on Integrating AI into Civil Engineering Education: A Case Study of Hormuud University, Somalia

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Abstract

The rapid advancement of Artificial Intelligence (AI) is fundamentally transforming the landscape of professional engineering, yet the integration of these tools into academic curricula remains a subject of ongoing debate. This research investigates the attitudes and perspectives of Civil Engineering students toward the use of AI-driven tools for academic learning support. As the industry moves toward "Construction 4.0," understanding student readiness and ethical perceptions is critical for reshaping engineering pedagogy. Using a quantitative survey-based approach, this study evaluates 100 civil engineering students' awareness and familiarity with AI tools, their perceived benefits for learning, productivity and problem-solving, and their attitudes toward institutional guidelines. Most respondents (79%) used AI tools daily or weekly, and all four scales were moderately positive (awareness $M = 3.43$, perceived benefits $M = 3.46$, institutional guidelines $M = 3.42$, general support $M = 3.55$). However, students were least confident about having enough knowledge to use AI tools effectively ($M = 3.20$), indicating a gap between personal tool adoption and formal institutional guidance. The results highlight a demand for structured AI integration that balances computational efficiency with the rigorous analytical thinking required in civil engineering. This paper provides valuable insights for educators and policymakers aiming to modernize civil engineering programs. By aligning academic frameworks with student attitudes, institutions can better prepare the next generation of engineers to leverage AI responsibly and effectively in a digitizing global infrastructure sector.

Keywords: Civil Engineering Education, Artificial Intelligence, Student Perspectives, Academic Support, Engineering Pedagogy

Introduction

Higher education is experiencing significant changes because of the way AI technology is transforming the means of accessing information, receiving feedback, interacting with course materials, and completing academic tasks. The explosive growth of generative AI tools that enable advanced capabilities like generating explanations, summarizing information, and answering questions in real-time only contributes to the process. A systematic review of 155 empirical studies revealed an increase in AI in education research in the past year and discovered potential benefits associated with enhanced learning, personalized learning, and greater motivation along with potential risks including ethical concerns, dependence on technologies, and implementation [1]. Moreover, the introduction of new forms of teaching, learning, and assessment brought on by generative AI tools is influencing traditional practices

in higher education, causing universities to rethink the current state of affairs in regard to academic work organization [2]. At the same time, the educational use of AI cannot be taken for granted as it depends on its integration into the learning process.

As AI becomes more significant and relevant, especially in engineering fields, there arises the need to solve complex problems through the use of data analysis, forecasting, optimization, modeling, and decision-making. The use of AI in the civil engineering discipline has long been known through the application of expert systems, neural networks, fuzzy systems, evolutionary computation, and intelligent optimization [3]. The development of machine learning, big data analytics, and deep learning has brought additional use of AI in areas such as structural maintenance and management, design optimization, monitoring, predicting, and engineering systems analysis [4]. Present applications range across environmental, construction, geotechnical, structural, transportation, and water resources engineering. Although AI is gaining more professional relevance in the field, incorporation of AI in civil engineering education is less widespread, thus raising the question of whether future engineers will be adequately prepared in terms of their professional abilities [5].

The increased availability of the technology does not imply that students have equal awareness and experience with it. While students might know well-known platforms, they can have little knowledge of the functions and capabilities of these platforms and how they should be utilized academically. According to Jereb and Urh [6], students at universities have some awareness of AI but lack the competence to explain it in detail. For example, commonly used programs such as ChatGPT and Grammarly were used by students mostly for searching information and generating ideas. There are similar findings in the context of engineering education. In particular, Camarillo et al. [5] showed that despite the high level of confidence in understanding AI, the usage of it in academic work was much lower. In addition, Kamali and Samsami [7] found some inconsistency in students' formal acquaintance with AI methods in engineering.

Despite the different levels of familiarity with the technology, students see several benefits of using it in the academic process. The advantages of using AI include fast searching of information, clarification of difficult concepts, getting instant feedback, researching, brainstorming, getting help with writing, and increased efficiency in academic work. Engineering students have stated that the most common application of AI is research and information searching, conceptual understanding, brainstorming, and getting writing help [8]. Likewise, civil engineering students consider that the use of AI allows improving their comprehension of the topic, solving problems, getting fast access to information, and checking the correctness of equations and answers [9]. Besides that, there are claims that the use of AI allows personalizing the educational process and increasing motivation [1]. Also, according to experimental studies, AI can help improve student performance [10]. At the same time, usefulness should be considered separately from effectiveness since the opinion of the student alone does not prove the positive effect on academic performance.

These issues have raised the need for institutional direction on the use of AI within academic settings. Students can decide to use AI independently while universities and individual lecturers maintain inconsistent expectations on tasks, projects, research, disclosure, and acceptable form of help. This confusion might make it hard for students to differentiate between responsible use of AI and academic dishonesty. Saúde et al. [2] indicate that the successful use of generative AI would require pedagogical assistance and the development of critical, ethical, and digital skills. Similarly, Kamali and Samsami [7] point out the need for frameworks where AI can serve to augment the value of education without causing any harm, whereas Ivanashko et al. [11] suggest that training, transparency, privacy, security, and responsibility are necessary conditions for the adoption of AI. Furthermore, in the context of civil engineering, students have shown some confusion about fairness, safety, and

responsibility issues. Consequently, there is a need for greater exposure to AI tools and ethics [5]. The existing literature has investigated AI usage, educational advantages, students' attitudes, ethical issues, and curricula integration. However, these issues have been studied independently or in a general context of the higher education population. With regard to the literature identified for the current study, there are very few studies investigating the perception of civil engineering students about their awareness and familiarity, the benefits of AI in education, and the need for institutional guidelines on the matter, especially within the Somali higher-education context.

Against this backdrop, the study investigates the perceptions, attitudes, and use of AI tools in the academic learning process of civil engineering students. Specifically, the study investigates students' level of awareness and familiarity with AI tools for academic learning, analyzes their perception of the benefits of AI in facilitating learning, productivity, and problem-solving, and finally analyzes their attitude towards the need for institutional guidelines for AI usage in civil engineering education.

Literature Review

Artificial Intelligence in Civil Engineering Education

The topic of Artificial Intelligence has grown in relevance for the civil engineering profession with respect to the increasingly data-driven and predictive approach to analysis, engineering calculations, and modeling. Applications of AI to civil engineering in the past have included expert systems, artificial neural networks, fuzzy systems, evolutionary computation, reasoning, classification, and optimization. AI was proposed as an alternative to conventional techniques and analysis, which cannot always efficiently address complex engineering problems [3]. In recent years, the use of AI has expanded beyond problem-solving to include evaluation, decision-making, construction management, building design, structural evaluation, road and bridge monitoring, and engineering optimization.

Machine learning, big data, and deep learning are some of the latest developments in AI that have found their applications in the field of civil engineering. According to Huang et al. [4], current research has been focused on structural maintenance and management, design optimization, damage detection, infrastructure monitoring, and predictive modeling. This shows that AI is not just a set of experimental techniques anymore; rather, it is becoming increasingly relevant to modern analysis and decision-making in engineering. AI technology has relevance in structural, construction, geotechnical, transportation, environmental, and water resources engineering fields, thus necessitating civil engineering graduates familiar with both the potentialities and limitations of AI.

However, while the above-mentioned professional relevance of AI in civil engineering can be seen in terms of applications and research, integration of AI into civil engineering education seems to lag behind. Camarillo et al. [5] noted that future engineers may not have enough training and experience in AI while machine learning and optimization have become increasingly associated with infrastructure design, evaluation, maintenance, and operation. In addition, the authors stressed the importance of transparency, verification, and professionalism in the field of civil engineering due to possible implications of design and infrastructure decisions to health and safety. Similar results were obtained by Vidalis et al. [9], who showed that students have access to AI tools when learning, and educators continue to discuss how to integrate AI in engineering curricula. The literature therefore suggests a growing imbalance between the technical relevance of AI in civil engineering and the level of formal educational preparation provided to students.

Students' Awareness, Familiarity, and Use of AI Tools

Exposure to AI among students has been increasing significantly owing to the increased accessibility of generative AI applications. Yet, there is a distinct difference between awareness, familiarity, use, and competency, which means that a student might know about AI applications and be aware of their uses without understanding their possibilities and limitations. Moreover, one can use AI tools on a regular basis without being formally trained in them. The latter issue becomes especially crucial when it comes to engineering education as using AI effectively requires more than mere familiarity with the tool itself; it requires the ability to evaluate its appropriateness and reliability.

In their work, Jereb and Urh [6] noted that university students felt relatively well acquainted with the concept of AI but faced problems with defining their understanding of it. Furthermore, in the course of their study, they discovered that various AI applications, such as ChatGPT and Grammarly, were actively used by students to retrieve information and generate ideas. This implies that students can become users of AI before gaining any significant theoretical knowledge about it. Fošner [12] also discovered that engineering students used AI applications on a more frequent basis, yet the frequency of their use depended on the academic level of the student as well as the area of studies.

A similar trend was observed in engineering education. Thus, Camarillo et al. [5] discovered that the majority of civil engineering students were confident about their general knowledge of AI applications, whereas far fewer students had used AI applications for learning purposes. Even fewer instructors used AI applications in class, which implied that formal instruction in the topic was rather rare. Kamali and Samsami [7] also discovered that many engineering students did not have courses related to AI applications or methodology. The survey conducted by those authors included the questions about the frequency of using AI applications, using ChatGPT, areas in which AI applications were used, and the AI applications students had come across.

As far as academic application of AI is concerned, its uses vary depending on the purpose. Thus, Sakib et al. [8] discovered that engineering students used AI for researching and retrieving information, forming a general understanding of AI, brainstorming, and writing assistance; at the same time, fewer students used AI for solving problems and preparing for tests. This finding suggests that students may feel more comfortable using AI for exploratory or supportive tasks than for complex technical reasoning. Overall, the literature indicates that AI awareness is increasingly widespread, but meaningful familiarity, formal training, and effective discipline-specific use remain uneven.

Perceived Benefits of AI in Academic Learning

The usefulness of AI in education is usually discussed through the prism of its contribution into three main areas, including learning, productivity, and problem solving. There can be immediate access to information and explanations, tutoring and assistance, feedback, research, organization of academic activities, etc. The systematic review of 155 empirical studies revealed such frequently mentioned benefits of AI as improved learning process, personal tutoring, problem-solving, motivation, autonomy, engagement, and memory of knowledge [1]. These data show that AI can assist students in getting help right away and adapting support to different learners.

Productivity-related aspects have been found as well. According to Sakib et al. [8], there has been wide usage of AI in research and information gathering, understanding of concepts, brainstorming and writing. Quick access to information and immediate feedback were also among highly valued advantages. In turn, Jereb and Urh [6] found that information seeking and ideas generating were among the most common purposes of using AI tools by

university students. Thus, one should say that students may find the use of AI not only in providing answers but also in saving time on searching and organizing.

More specific data have been obtained when the experience of civil engineering students was taken into account. Thus, Vidalis et al. [9] mentioned the following advantages of using AI: explanations of complicated concepts, fast access to information, problem-solving, writing assistance, and checking equations and answers. The students also expected future applications of AI in such spheres as complicated calculations, design optimization, 3D modeling, scheduling, reporting, and integration with engineering software. However, the students also mentioned some limitations of AI in comprehensive design and engineering problem-solving.

The research about broader higher education comes to similar conclusions. According to Saúde et al. [2], there may be an opportunity of using generative AI in the processes of learning and gaining feedback; however, the benefits of AI in such fields depend on proper pedagogical context and development of necessary literacy. Also, according to Ivanashko et al. [11], personalized and adaptive learning, engagement, intelligent tutoring, gamification, and assessment become valuable opportunities for education. Moreover, Balaquiao [10] showed an increase in student performance in a quasi-experimental mathematics study due to the use of AI-assisted instruction, but it still depends on the context and technological facilities. Grájeda et al. [13] also noted that AI-assisted classes are positively evaluated emotionally and become more useful.

Thus, AI can significantly help in learning and productive activities. Nevertheless, one should not confuse the perception of usefulness with actual improvement in educational environment. Surveys of students provide subjective evaluation of the experience, while experimental research shows the effect in certain circumstances. Therefore, the literature proves the following careful conclusion: AI is perceived as useful in supporting learning and increasing efficiency of academic work, while its assistance in solving complex engineering problems requires verification and human evaluation.

Institutional Guidelines and Responsible AI Use

The fast-growing application of AI technology has also raised questions about the limits of proper academic use of AI. Students can use AI for some small help, including explaining concepts and improving writing, or for more advanced purposes of creating various content. In the absence of guidelines, the line dividing proper and improper use of AI can be difficult to draw. The main problems identified in the literature include issues of plagiarism, unauthorized assistance, lack of citation, unreliable data provided by AI, overuse, privacy, bias, unequal access, and lessened independent thinking.

According to Sakib et al. [8], engineering students worry about overuse, academic honesty, and the potential effect of regular use of AI on developing independent critical thinking skills. Garzón et al. [1] also mention ethical use and overuse as the most critical problems that arise when incorporating AI in education. Holmes and Tuomi [14] believe that AI use in education cannot be solely estimated in terms of the capabilities of the technology or its efficiency because education is also concerned with more abstract aspects like independence and judgment.

In the field of engineering, this problem seems to be particularly relevant. According to Camarillo et al. [5], civil engineering students show their confusion concerning issues of justice, safety, and professional responsibility. It was pointed out that civil engineers have to be able to estimate reliability, accountability, transparency, and ethics because mistakes made in a professional environment can have severe consequences. This implies that responsible use of AI in civil engineering does not consist exclusively of preventing plagiarism; it also includes verification of the output.

There has been growing demand for an institutional approach in higher education research rather than piecemeal, varying from instructor to instructor. According to Saúde et al. [2], the introduction of AI technology will require pedagogical assistance and the development of critical, ethical, and digital literacies. Besides, this research draws attention to transparency, training, data protection, and institutional adaptation. Similarly, Kamali and Samsami [7] claim that institutions will need strict frameworks to ensure the enhancement of education through AI technology. Among institutional concerns mentioned by Ivanashko et al. [11], there were training, privacy, security, bias, transparency, and responsible implementation. The same researchers state that it is necessary for universities to give students an opportunity to receive training for their academic work using AI technology.

Thus, the main issue under discussion is not the possibility of using AI technology. The key question is when AI use may become both academically acceptable and educationally useful. The establishment of rules, training, lecturer guidance, verification expectations, and ethical frameworks may allow students to know how to use AI properly without substituting the process of independent learning.

Many previous studies have addressed the issues of AI use in engineering, students' awareness and use of AI technology, the educational benefits derived from its use, and the ethical issues. However, many of these studies are devoted to the general population of university students or engineering students in particular. Only a few studies have investigated civil engineering students specifically. Moreover, usually, awareness and familiarity, the educational benefits of using AI, and perceptions of institutional guidance were researched separately. There is a lack of evidence on all three aspects among civil engineering students, especially those studying at Somali universities. The present study addresses this gap by examining these issues together within the context of civil engineering education in Somalia.

Methodology

Research Design

A quantitative survey research design was employed to explore civil engineering students' perception, attitude, and use of AI tools in their academic studies. This design was deemed appropriate, as the study intended to gather numerical standardized data from the selected students during a single time period. Through this design, the study was able to measure awareness and familiarity, perceived academic benefits, and attitudes towards institutional guidance on AI tools. The survey research design was also appropriate, considering that this study intends to investigate self-reported perception rather than experimenting with the effect of AI on academic performance.

Study Area and Population

This study was undertaken among civil engineering students studying at Hormuud University in Somalia. The targeted population for this study is the civil engineering students studying at the university. Civil engineering students of different academic years were considered as respondents to include diversity of opinions depending on their level of academic experience and familiarity with AI tools.

Sampling Technique and Sample Size

A non-probability convenience sampling technique was applied to select respondents. Convenience sampling was appropriate since the distribution of the questionnaire was carried out to the accessible civil engineering students at Hormuud University. The questionnaire was distributed to all the civil engineering students who were convenient to reach and willing to respond. In total, 120 responses were gathered. After data cleaning, 100 valid responses were retained for analysis.

Questionnaire Development and Data Collection

The development of the questionnaire was conducted in an objective and literature-driven way. The objectives of the study were set first, and then the items of the questionnaire were formulated to measure the different aspects of the study: awareness and familiarity, academic benefits, and attitude toward institutional guidelines. In total, there were 22 questions in the questionnaire, grouped into five sections: (A) respondent characteristics and AI use (4 items), (B) awareness and familiarity (5), (C) perceived benefits (5), (D) institutional guidelines (5), and (E) general opinion (3). Sections B, C, and D corresponded to the three specified goals of the research, and Section E provided support for the overall interpretation of the attitudes of students towards the use of AI in their civil engineering studies. Questions in sections B, C, D, and E were answered using a five-point Likert scale from 1 = Strongly Disagree to 5 = Strongly Agree.

The data were collected using an online questionnaire through the Google Forms platform. Survey participants were contacted by sending them a link to the online questionnaire in civil engineering student groups in Hormuud University. Participation in the survey was voluntary, and participants were assured of the confidentiality of the information provided.

Data Analysis

The collected data were analyzed using descriptive statistical methods. Frequencies and percentages were used to summarize respondents' background characteristics and AI usage patterns. For the Likert-scale items, mean scores and standard deviations were calculated to determine the level of agreement and variation in responses. Items within each section were ranked according to their mean scores, where higher mean values indicated stronger agreement among respondents. In addition, Cronbach's alpha was used to assess the internal consistency of the multi-item scales before interpreting the final results.

Results and Discussion

This part of the paper highlights the results of the study based on the data obtained from 100 responses of civil engineering students at Hormuud University, Somalia. The research is aimed at explaining how the gathered data help achieve the objectives of the research. It will highlight how the results obtained from the respondents answer the objectives set for the research in regards to students' perceptions towards AI in their academic studies. The paper starts with the analysis of reliability of the questionnaire to ensure that there is internal consistency of the measurement items.

The results have been analyzed based on the respondent's demographics, use of AI, awareness of AI tools, benefits of AI tools in academic learning, institutional policies, and overall opinion on integrating AI tools. Descriptive statistics were used to analyze the data obtained from the respondents. Frequencies and percentages were used to describe demographic information of the respondents, while the mean scores, standard deviation, and ranks were used to interpret the Likert scale response.

Reliability of the Questionnaire

Table 0.1 Reliability analysis of the questionnaire

Cronbach's alpha is a measure of the internal consistency of the multi-item scale used in the

Scale	Items	Cronbach's alpha (α)	Interpretation
Section B: Awareness and Familiarity	5	0.918	Excellent
Section C: Perceived Benefits	5	0.945	Excellent
Section D: Institutional Guidelines	5	0.941	Excellent
Section E: General Opinion	3	0.935	Excellent
All Likert Items	18	0.973	Excellent

questionnaire. According to Table 4.1, all the sections yielded Cronbach's alpha scores greater than 0.90, which shows a high level of internal consistency. Section C on the perceived benefits of using AI technologies showed the highest value ($\alpha = 0.945$), followed by Section D on the institution's guidelines ($\alpha = 0.941$), Section E on the opinion ($\alpha = 0.935$), and Section B on the awareness and knowledge ($\alpha = 0.918$). The overall score of reliability for the 18 items of the Likert scale was extremely high ($\alpha = 0.973$).

These findings mean that the items in the sections consistently measured the variables that they were designed to measure. Consequently, the questionnaire was deemed reliable for understanding students' awareness, perceived benefits, opinion on institutional guidelines, and general opinion about AI integration in civil engineering education.

Respondent Characteristics and AI Usage Profile

Table 0.2 Respondent characteristics and AI usage profile

Characteristic	Category	Frequency	Percentage
Gender	Male	90	90.0%
	Female	10	10.0%
Age Group	18–20	24	24.0%
	21–23	50	50.0%
	24–27	21	21.0%
	28 and above	5	5.0%
Year of Study	Year 1 (Foundation)	8	8.0%
	Year 2	10	10.0%
	Year 3	36	36.0%
	Year 4	35	35.0%
	Year 5	11	11.0%
Frequency of AI Use	Daily	59	59.0%
	Weekly	20	20.0%
	Monthly	11	11.0%
	Less than once a month / Rarely	4	4.0%
	Never	6	6.0%

The demographic characteristics of the respondents, along with their AI usage behavior, are presented in Table 4.2. The sample was mostly comprised of male students – 90% were males, and only 10% females. This is because civil engineering programs are usually heavily dominated by males. As far as the age of the respondents goes, 50% of the sample was in the age range of 21 to 23 years, followed by 24% being 18 to 20 years old, 21% being in the age range of 24 to 27 years, and only 5% being older than 27 years.

As far as the distribution among different years of study goes, the respondents in this sample can be considered academically advanced students. The Year 3 students constituted

36%, and Year 4 students 35% of the sample. Hence, combined, Year 3 and Year 4 students constituted 71% of the sample. It is essential to note that in those years, students become more involved in technical subjects and academic activities where they need AI assistance.

The results reveal great engagement with AI tools (Figure 4.1). 59% of the sample used AI tools daily, and an additional 20% used them weekly. Thus, 79% of the sample used AI tools either daily or weekly. The result suggests that AI is already part of the academic activity of civil engineering students. There are similar findings in higher education literature, where students start using AI tools for information retrieval, generating ideas, writing, and academic help [6], [12].

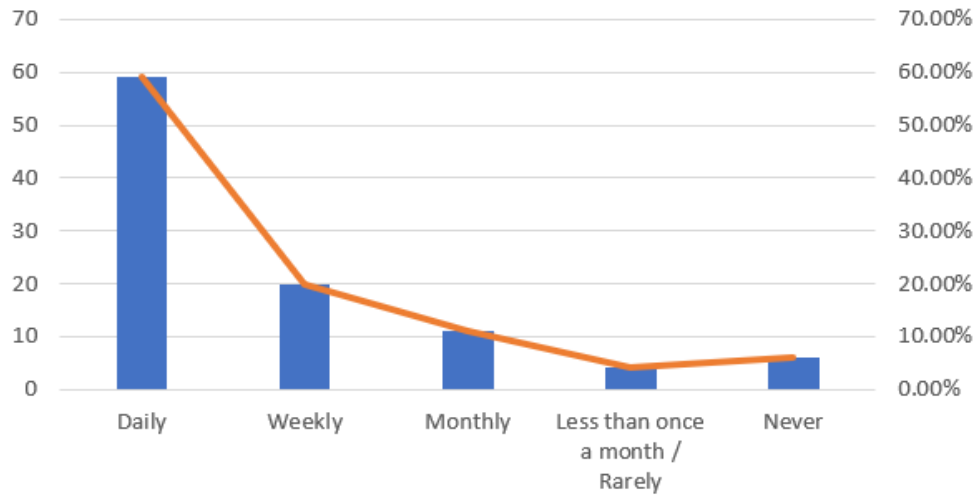


Figure 0.1 Frequency of AI Use Among Respondents

Awareness and Familiarity with AI Tools

Awareness and familiarity were examined as an important starting point for understanding students' readiness to engage with AI tools in academic learning. This dimension focused on students' general awareness of AI tools, familiarity with commonly used platforms, understanding of how AI can support academic learning, ability to identify useful tools for civil engineering education, and confidence in using AI tools effectively. Table 4.3 presents the mean scores, standard deviations, and rankings for the five statements related to awareness and familiarity.

Table 4.3 Awareness and familiarity with AI tools03

Rank	Statement	Mean	Std. Dev.
1	I understand how AI tools can support students in academic learning.	3.61	1.41
2	I am aware of Artificial Intelligence tools used for academic learning.	3.53	1.36
3	I am familiar with AI tools such as ChatGPT, Grammarly, Google Gemini, Claude AI, or similar platforms.	3.44	1.40
4	I can identify AI tools that may be useful for civil engineering education.	3.36	1.20
5	I have enough knowledge to use AI tools effectively for my studies.	3.20	1.37
	Overall Section B	3.43	1.17

The first objective of the research was to measure the level of awareness and familiarity of the

Rank	Statement	Mean	Std. Dev.
1	AI tools help me complete assignments more efficiently.	3.55	1.42
2	AI tools help me understand difficult civil engineering concepts.	3.47	1.42
3	AI tools improve my academic productivity.	3.43	1.34
4	AI tools support problem-solving in civil engineering subjects.	3.42	1.26
5	AI tools can support research and project work in civil engineering education.	3.41	1.34
	Overall Section C	3.46	1.23

participants with AI technologies employed in academic learning. According to Table 4.3, the participants exhibited a moderately positive level of awareness and familiarity with the discussed topic; thus, the mean score of the section was 3.43. The highest-rated statement was “I understand how AI tools can support students in academic learning” with a mean score of 3.61. Next, came the statement “I am aware of Artificial Intelligence tools used for academic learning” with a mean score of 3.53.

At the same time, the lowest-rated statement was “I have enough knowledge to use AI tools effectively for my studies” with a mean score of 3.20. This outcome is crucial because it means that while students have some level of awareness and understanding of AI tools and their usefulness in academic setting, they are more unsure about whether they can actually use these tools efficiently. Thus, awareness does not always lead to competence.

This finding supports the conclusions made by Jereb and Urh [6]; in their research, students were familiar with AI concepts but usually had difficulty articulating their understanding. This finding also corresponds with the findings made by Camarillo et al. [5]; according to these researchers, civil engineering students reported that they understood AI technology well, despite having little formal education in the field.

Perceived Benefits of AI Tools in Academic Learning

The section on Perceived Benefits looked into the manner by which students perceive the usefulness of AI in their academic learning. The statements covered the essential areas of learning, such as learning difficult topics in civil engineering, increasing productivity, accomplishing tasks efficiently, aiding problem solving, and helping in research or project works. These were included in order to know whether students perceive AI as a tool that is useful in their academics in civil engineering. Table 4.4 shows the ranking of the Perceived Benefits of AI in academic learning.

Table 0.4 Perceived benefits of AI tools in academic learning

The second objective of the study was to investigate the students' opinions on the perceived advantages of AI technology in helping them with their learning, productivity, and problem-solving activities. From Table 4.4, it can be seen that the average score of the perceived benefits is 3.46, which means that the students moderately agree that there are academic benefits from using AI tools.

The first statement is "AI tools help me complete assignments more efficiently," with an average score of 3.55. This means that the students see AI as an efficiency and task-related tool. The second-ranked statement is "AI tools help me understand difficult civil engineering concepts," with an average score of 3.47. The students also see the benefits of AI in explaining and clarifying some concepts. Other statements have very similar average scores as well, such as academic productivity (3.43), civil engineering problem-solving (3.42), and research/project work (3.41).

This similarity among the average scores shows that students view AI as useful in several academic activities rather than just one. But the most perceived advantage is the assignment efficiency, which shows that currently the students use AI in finishing and organizing their academic activities rather than advanced problem solving.

This is in line with Sakib et al. [8], who found that engineering students use AI tools in research, conceptual understanding, brainstorming, and the writing process. It also agrees with Vidalis et al. [9], who mentioned that civil engineering students view AI as an explanation of difficult concepts, a quicker information search, and problem-solving.

Institutional Guidelines and General Opinion toward AI Integration

These findings incorporate two different, but similar areas of investigation, namely the students' perceptions of institutional support for using AI and their general attitudes towards integration of AI in the educational process in civil engineering. The first set of questions included the aspects of the need for clear guidelines, official training, ethical use and lecturer explanation of AI usage. The second set of questions concerned the students' overall attitude towards the use of AI, future career relevance of AI use and necessity of learning AI before graduating from university.

Table 0.5 Institutional guidelines and general opinion toward AI integration

Part	Rank	Statement	Mean	Std. Dev.
Institutional Guidelines	1	Institutional guidelines can help students use AI tools ethically and effectively.	3.47	1.33
Institutional Guidelines	1	Lecturers should explain when and how AI tools can be used in academic tasks.	3.47	1.28
Institutional Guidelines	2	Students need clear guidance to understand acceptable and unacceptable uses of AI tools in academic learning.	3.42	1.28
Institutional Guidelines	3	Universities should develop clear rules for using AI tools in assignments, projects, and research.	3.38	1.35
Institutional Guidelines	4	Civil engineering students need formal training on the responsible use of AI tools.	3.37	1.37
		Overall Section D	3.42	1.19
General Opinion	1	Civil engineering students should learn how to use AI tools before graduation.	3.63	1.40
General Opinion	2	Overall, I support the use of AI tools in civil engineering education.	3.54	1.33
General Opinion	3	AI will become important for the future careers of civil engineering students.	3.48	1.39
		Overall Section E	3.55	1.29

The third objective of the study was to determine students' attitude toward the need for institutional guidelines on AI use in civil engineering education. From Table 4.5, it can be observed that the mean score for institutional guidelines was 3.42. The top two ranked statements in Section D were "Institutional guidelines can help students use AI tools ethically and effectively" and "Lecturers should explain when and how AI tools can be used in academic tasks," both having a mean score of 3.47. This shows that students appreciate both institutional-level guidelines and lecturers' explanations. "Students need clear guidance to understand acceptable and unacceptable uses of AI tools in academic learning" also received a positive

mean score of 3.42. This means that students are not against the use of AI tools in civil engineering education; they just need more guidance on how to do it.

This result corresponds to that of Saúde et al. [2], who claim that a proper integration of AI in higher education requires pedagogical support along with the development of critical, ethical, and digital literacy. This is also supported by Kamali and Samsami [7], who stress the importance of an institutional framework to ensure that AI tools contribute to, and do not harm, educational values. In the sphere of civil engineering, this matter is crucial, as it implies responsibility, accuracy, and transparency [5].

Section E demonstrated that, generally, the students' attitude towards AI integration in civil engineering education was also positive. The highest mean score of all results was obtained for the statement "Civil engineering students should learn how to use AI tools before graduation" (3.63). Other positive statements included "Overall, I support the use of AI tools in civil engineering education" (3.54) and "AI will become important for the future careers of civil engineering students" (3.48). Overall, the mean score of Section E was 3.55, and it is the highest among the four Likert-scale sections.

These results show that students approve the idea of integrating AI in civil engineering education, but prefer this integration to be organized and responsible. Figure 4.2 represents overall mean scores of four Likert scale sections.

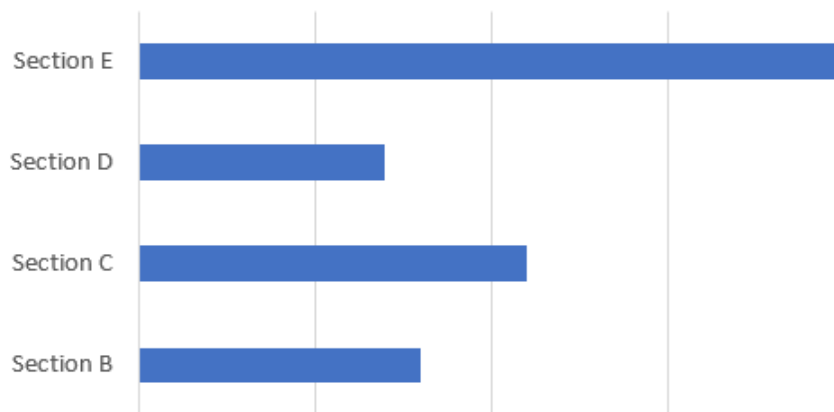


Figure 0.2 Comparison of mean scores across questionnaire sections

As shown in Figure 4.2, Section E recorded the highest overall mean score (3.55), followed by Section C (3.46), Section B (3.43), and Section D (3.42). This indicates that students expressed the strongest agreement with the general importance of AI integration, particularly the need to learn AI before graduation, while also showing positive perceptions of benefits, awareness, and institutional guidance.

Discussion

The findings show that civil engineering students at Hormuud University generally have positive perceptions of AI tools in academic learning. All four Likert-scale sections recorded mean scores above the neutral midpoint of 3.00, indicating agreement with statements on awareness, perceived benefits, institutional guidance, and general support for AI integration. However, the mean scores were moderate rather than very high, suggesting that AI use among students is still developing and requires clearer academic structure.

For the first objective, students showed moderate awareness and familiarity with AI tools. They understood how AI can support academic learning and were generally aware of AI tools used for academic purposes. However, the lowest score in this section was related to

having enough knowledge to use AI tools effectively. This suggests that students may know about AI tools, but they are not fully confident in applying them properly in their studies. This finding supports previous studies showing that students may be familiar with AI tools while still needing guidance and training for effective academic use [5], [6].

For the second objective, students perceived AI tools as beneficial for academic learning. The strongest perceived benefit was assignment efficiency, followed by support for understanding difficult civil engineering concepts, improving productivity, problem-solving, and research or project work. This indicates that students view AI mainly as an academic support tool that can help them complete tasks more efficiently and understand learning materials more easily. Similar findings were reported by Sakib et al. [8] and Vidalis et al. [9], who found that engineering students use AI for research, conceptual understanding, writing support, and problem-solving assistance.

However, these perceived benefits should be interpreted with caution. The study measured students' opinions rather than actual academic performance. Therefore, the findings do not prove that AI directly improves grades or technical competence. AI tools may support learning, but students still need to develop independent thinking, engineering judgment, manual calculation skills, and the ability to verify AI-generated information.

For the third objective, students supported the need for institutional guidelines and lecturer guidance on AI use. The results suggest that students are not calling for unrestricted AI use; rather, they prefer structured and responsible integration. Clear rules are important because they help students understand acceptable and unacceptable uses of AI in assignments, projects, and research. This agrees with previous studies that emphasize the need for ethical guidance, digital literacy, and institutional frameworks in AI integration [2], [7].

The general opinion results further show that students recognize the future importance of AI in civil engineering education and professional practice. The strongest item in the questionnaire was that civil engineering students should learn how to use AI tools before graduation. Overall, the findings suggest that AI should be integrated into civil engineering education in a guided and ethical manner. Universities should provide clear policies, lecturer support, and practical training so that students can use AI as a learning support tool without replacing critical thinking, technical reasoning, and professional judgment.

Conclusion

The study examined civil engineering students' perceptions, attitudes, and usage of Artificial Intelligence (AI) tools in academic learning at Hormuud University, Somalia. Specifically, it focused on students' awareness and familiarity with AI tools, their perceptions of the academic benefits of AI, and their views on the need for institutional guidelines or policies for responsible AI use in civil engineering education.

The findings show that students generally hold positive views toward AI integration. Students demonstrated moderate-to-positive awareness and familiarity with AI tools, with an overall mean score of 3.43. However, the relatively lower score for effective use indicates that knowing about AI tools does not necessarily mean students are fully confident in applying them appropriately. The perceived benefits section recorded an overall mean of 3.46, showing that students consider AI useful for completing assignments efficiently, understanding difficult civil engineering concepts, improving productivity, supporting problem-solving, and assisting research or project work. In addition, students supported the need for institutional guidelines, with an overall mean score of 3.42, while the general opinion section recorded the highest overall mean of 3.55. This suggests that students recognize AI as important not only for current academic learning but also for their future professional development.

The main implication of the study is that AI should be integrated into civil engineering education in a structured, ethical, and guided manner. The results suggest that students do not

reject the use of AI; rather, they need clearer direction on how to use it responsibly. Therefore, universities should develop clear AI-use policies for assignments, projects, and research. Lecturers should also explain when and how AI tools can be used in academic tasks, while students should receive practical training on ethical and effective AI use.

AI should be treated as a learning support tool, not as a replacement for critical thinking, manual problem-solving, technical reasoning, or engineering judgment. Responsible integration can help students benefit from AI while maintaining academic integrity and the core competencies required in civil engineering education.

Ethics Approval and Informed Consent

This study was approved by the Institutional Review Board of Hormuud University. Informed consent was obtained from all participants.

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None

Conflict of Interest

The authors confirm that there is no conflict of interest related to the manuscript.

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