Global Readiness for AI-Integrated Education: Students' Competence and Perceptions of Generative AI in Learning and Assessment

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Abstract

This study is about global readiness for AI-integrated education: students' competence and perceptions of generative AI in learning and assessment in higher education in Nepal and Indonesia. The purpose of this study was to understand the perceptions and experiences of higher level teachers about the roles of Generative AI in classroom learning and assessment. We applied qualitative approach along with interview method to collect data. Nine teachers from Nepal and another nine teachers were from Indonesia participated in this study.

Semi-structured interview questions were used as research instrument to collect data. Content analysis was used to analyse the interview data based on inductive approach which included preparation of data from recorded audio to texts, selecting key codes and converting key codes into subcategories. The subcategories were converted into main categories. Ethical criteria was followed during the research processes focusing on interviewees' security, anonymity, and consent of participation in this research.

The interviewees highlight that a fair picture of how higher level educational institutions can use AI in classroom teaching. They not only highlight how technology can help students learn and teachers teach, but they also highlight the major problems and risks that higher level educational institutions face during their teachning activities. They summarised that the best thing is that they get better outputs at what they do and learn more. They often use AI to make lesson plans because it is quick and easy to find accurate, helpful, and up-to-date information, which makes the materials better and saves time. The implications of this study benefit to educators, policymakers and researchers to understand the current practice of AI in learning and assessment.

Keywords: *AI-integrated education, classroom learning, generative AI, global readiness, higher education, students' competence skills*
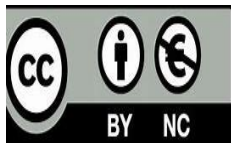
Introduction

Artificial intelligence (AI) has become increasingly important in education, and interest in it has rapidly increased since the release of ChatGPT (Guo, Zheng & Zhai, 2024; Ali et al., 2024). Teachers and researchers have been exploring ways to use AI in classrooms that focus on students because they know it can improve lessons and help students learn more knowledge (Hilal Uğraş et al., 2024; Crompton, Jones & Burke, 2022). AI technologies have come a long way in the last ten years.

These include chatbots, intelligent tutoring systems, virtual classrooms, and automated grading tools (Maphosa & Maphosa, 2023; Ekin et al., 2025; Khan et al., 2024). There is not a single definition of AI that everyone agrees on. However, Díaz and Nussbaum (2024) and Lee and Kwon (2024) say it is an educational technology that can find patterns in existing or real-time data and make decisions about how to teach students on its own. Artificial intelligence in education (AIEd) is the use of AI methods, such as machine learning and deep learning, to improve teaching and learning across many areas (Irwanto, 2025).

Problem statement

The rapid, unregulated incorporation of Generative AI (GenAI), such as ChatGPT, into education has created a gap between its promise and students' readiness to utilise it ethically and effectively (Alier, Penalvo & Camba, 2024; Dwivedi et al., 2023). GenAI offers innovative pathways for personalised learning (Kamalov, Santandreu-Calonge & Gurrib, 2023); however, its swift implementation—often surpassing policy development—raises concerns about its effects on fundamental skills, including critical thinking and original composition, as well as its potential risk to academic integrity (Chan & Hu, 2023; Cotton et al., 2024).

There is a lack of empirical evidence regarding students' AI competence, specifically their ability to prompt, evaluate, and critically analyse AI outputs in various contexts (Celik, 2023; Ng, Su & Chu, 2021). To ensure that AI helps, not harms, intellectual advancement, it is essential to understand how students feel, what they are worried about, and what their moral limits are (Holmes & Tuomi, 2022; UNESCO, 2023).

Aims and objectives

This study aims to investigate and analyse the perceptions of both higher education professors and students regarding the advantages, disadvantages, and ethical considerations associated with the utilisation of Generative AI (GenAI) tools in educational settings and assessments.

Objectives

To find out how teachers feel about using AI technology in the classroom and how it affects how well students learn.

To find out how teachers think about AI help that is supposed to assist students get better at the practical skills they need for their jobs.

To find out how teachers think about and have used AI-powered education that helps students improve their soft skills, like creativity, critical thinking, and digital literacy.

To comprehend the viewpoints and experiences of educators and learners concerning the perceived student engagement or motivation when utilising AI-enhanced learning tools.

To learn how teachers feel about using AI in vocational education and to find out if they should support or oppose this kind of integration, as well as what problems or challenges might come up.

To find out what teachers think and feel about the AI tools they use in class and the standards they use to pick these tools to help them learn.

To learn what teachers think and feel about using AI systems to test students' skills and see how fair and accurate they are.

To learn how teachers feel about their school's readiness to use AI in the classroom and whether they have received any help or training.

To find out what teachers think and feel about the steps that have been taken to make sure that AI is used in schools in a fair, safe, and open way.

To learn how teachers feel about AI-based learning, how they have used it, and whether it helps students get ready for the job market now and in the future.

Research questions

How have you used AI in your teaching, and how has it changed the way your students learn?

How has AI helped your students get better at the technical or hands-on skills they need for their jobs?

How does using AI to learn help kids improve their creativity, technology use, and critical thinking?

What differences have you seen in how motivated or involved students are when you use AI-based learning tools?

What level of AI is in the vocational curriculum you follow or create? What are the chances or problems?

What kinds of AI tools have you used in your classroom? How do you choose which ones to use for each goal?

Have you ever used AI systems to see how well your students are doing? If so, how do you know that they are right and fair?

Are you and your school ready to use AI in the classroom? What kind of help or training have they gotten?

How do you make sure that everyone in the classroom has equal access to AI, that data is kept safe, and that it is used fairly?

What do you think AI-based learning does to help students get ready for jobs now and in the future?

Significance of this study

This research is of paramount importance as it goes beyond mere technology adoption to focus on the essential cognitive and attitudinal skills necessary for an AI-enhanced global workforce. This study investigates attitudes towards AI literacy and its relationship with computational thinking (CT) and creative problem-solving, providing critical evidence to address the gap between technological proficiency and student preparedness. It is essential to know if students see Generative AI (GenAI) as a helpful co-pilot (which would show high AI literacy and strong CT) or just a way to get things done faster, which could lead to cognitive offloading and a loss of natural creative problem-solving skills. The findings will directly inform policymakers and curriculum developers in formulating practical, ethical, and sustainable pedagogical approaches that actively promote, rather than hinder, the essential 21st-century skills necessary for global economic readiness.

Literature review

Numerous previous studies have examined AI education in K–12 settings from various perspectives, including attitudes towardsAI literacy and computational thinking, creative problem-solving (Richard et al., 2012; Yang et al., 2024; Bailis & MacCoun, 1996), academic performance (Moher et al., 2015), and motivation, as well as preferred reporting items for systematic review and meta-analysis protocols. Krugman (1998) conducted a study in which high school students programmed a mobile robot to demonstrate physics concepts, thereby augmenting their understanding of Newtonian mechanics. Figueiredo et al. (2021) as well as Aria and Cuccurullo (2017) Brayan Díaz and Nussbaum, (2024) and Lee, (2021) and García et al., (2020) also discovered that AI increased students' interest, engagement, and motivation. Topal, Yildiz and Yildiz, (2020) and van Eck and Waltman (2010) both discovered that AI chatbots helped 10th-grade science students learn more. Chen et al. (2020) and Vergara et al. (2025) both showed that employing chatbots to help students learn new vocabulary made a big difference in how well they did. These results highlight how AI could revolutionise education and stress how important it is to use existing research to drive future practices.

There are many literature reviews and bibliometric analyses that look into AI in education (Crompton et al., 2022; Lee, 2021; Andre, 2024; Abu Huson, Sierra-García & Garcia-Benau, 2024). However, most of the work on developing and evaluating the effectiveness of artificial intelligence STEAM education programs focusses on higher education rather than K–12 settings (Ali et al., 2024; Maphosa & Maphosa, 2023; García et al., 2020; Salas-Pilco, 2020). This is a big concern because AI is employed in different ways in K–12 and higher education, especially when it comes to curricula, developmental phases, and teaching approaches (Donthu et al., 2021). Asia is a suitable site to investigate AI in K–12 education because

it is making quick progress in both technology and education and is putting a lot of money into developing AI (Khan et al., 2024; Yang et al., 2024). Several Asian countries have made changes to their education systems that have gradually brought their curricula in line with international norms, which has encouraged innovation (Abu Huson et al., 2023). Studying how AI is being used in K–12 schools across Asia can give us a lot of useful information that can help influence policy and guide future research.

As more empirical investigations are done in the domain, bibliometric analysis is a good way to find publishing patterns, key scholars, and subject areas (Lee, 2024). However, many past studies have only looked at one country, field, or short time span. Lee & Kwon (2024) and Khan et al. (2024) looked at AI in South Korean K–12 classrooms from 2019 to 2023 and found that it had big cognitive and emotional benefits. However, their research was limited to a small area and was based on 64 trials. Kavitha and Joshith (2024) and van Eck &and Waltman (2010) looked at how AI may be used in K–12 scientific classes from 2013 to 2023. They found that it made classes more interesting and personalised, however their research only looked at science classes. Heeg and Avraamidou (2021) and Lee and Kwon (2024) similarly showed that most AI uses in school science were aimed towards increasing skills in physics and geology, although their datasets were small. Yang et al. (2021) and Lee (2024) investigated AI in special education; nevertheless, their sample sizes were significantly constrained.

This study builds on previous research by giving a full picture of how AI has changed in K–12 schools in Asia over the past 30 years, up to 2025, and by giving an updated, in-depth look at how AI is used in different K–12 settings. The goal of this long-term review is to help people understand better, shape future teaching methods, and encourage more research into AI-driven K–12 education in the area. Since the release of ChatGPT (Holl, 2024; Ali et al., 2024; Sutherland et al., 2014), artificial intelligence (AI) has become very important in education. Since they know AI might make courses better and more interesting,

teachers and researchers have been looking into ways to employ technology in the classroom that place the student at the center (Guo et al., 2024; Irwanto, 2025). Using the Scopus database (1996–2025), a bibliometric analysis looks at research trends in K-12 education in Asia that use artificial intelligence. Over the past 10 years, the application of AI technologies, including chatbots, intelligent tutoring systems, virtual learning environments, and automated grading tools, Jan 2026 has come a long way (Uğraş et al., 2024; Crompton et al., 2022; Maphosa & Maphosa, 2023).

Díaz and Nussbaum (2024) and Ekin et al. (2025) state that AI is an educational technology that finds patterns in data and makes decisions on how to teach on its own for educational purposes, even if there is no one definition that everyone agrees on. AIEd, or artificial intelligence in education, is the use of AI techniques like machine learning and deep learning to assist students in learning and teaching in a wide range of subjects.

Researchers have looked at AIEd in K–12 settings from a number of angles, including how people feel about AI (Yang et al., 2024), how well they understand AI (Haraway, 1988), how well they think computationally (Zupic & Čater, 2013), and how creative they are. AI is employed in K–12 and higher education in very different ways, including in terms of curricula, developmental stages, and instructional methodologies (Donthu et al., 2021). Asia is a wonderful place to learn about AI in K–12 schools since it is quickly improving in both technology and education and is putting a lot of money into AI research and development (Khan et al., 2024; Yang et al., 2024). Changes in education in certain Asian countries have slowly brought their curricula in line with international norms, which has encouraged new ideas (Abu Huson et al., 2023). Examining the utilisation of AI in K–12 educational institutions throughout Asia can yield significant insights for policy formulation and future research planning. Bibliometric analysis gives a full picture of publication patterns, important scholars, and subject areas as more real-world studies are done in the field (Lee, 2024). Previous studies, on the other hand, frequently had a narrow focus, looking at only one country,

discipline, or short period of time. Lee & Kwon (2021) and Khan et al. (2024) examined AI inside South Korean K–12 educational contexts.

Table 1. Summary of the literature

Authors (years)	Objective	Methods	Results	Research gaps
Ravšelj et al. (2025)	Map how HE students worldwide use and perceive ChatGPT; identify patterns across regions.	Extensive cross-sectional survey (n≈23,218; 109 countries)	Students mainly used ChatGPT for brainstorming, summarizing, and sourcing; attitudes varied by region and discipline.	Need longitudinal studies to track changes over time and experimental work to link use patterns to learning outcomes.
Stöhr, Ou & Malmstrom, (2024)	Examine adoption patterns and perceptions among HE students	Extensive multi-institution survey (n≈5,894)	High adoption rates: students report the system's usefulness but also express concerns about its reliability and academic integrity.	More qualitative work to unpack reasons for trust/ distrust; intervention studies on guidance/training.
Wang and Fan, (2025)	Quantify ChatGPT's impact on learning performance & higher-order thinking	Meta-analysis of 51 studies (Nov 2022–Feb 2025)	Mixed effects: some gains in practice settings but limited transfer to exam performance; variability by task type.	Need standardized outcome measures and studies that test transfer to high-stakes assessment.
Munaye et al. (2025),	Synthesize opportunities, challenges, and directions for ChatGPT in the education sector.	PRISMA systematic review of empirical & conceptual papers (2023–2025)	Identifies benefits (efficiency, scaffolding) and risks (plagiarism, misinformation); calls for alignment of policy & pedagogy.	Empirical field trials and cross-cultural comparisons are limited — they need more diverse contexts.
Almassaad et al. (2024)	Snapshot of student views on GenAI adoption (2023/24 academic year)	Cross-sectional survey (semester sample)	Students recognise potential for help with tasks; concerns about accuracy and skill erosion were common.	Small-sample and short-timeframe studies; lack longitudinal competence measures.
Campillo-Ferrer , Lopez-Garcia & Miralles-Sanchez, (2025),	Explore perceptions and usage within a HE programs	Survey + descriptive analysis (Spanish university sample)	Students view Gen-AI as applicable for drafting but worry about developing a learning dependency.	Need to study instructional designs that integrate Gen-AI while preserving skill development.
Yeung et al. (2025)	Describe use patterns, perceived benefits/ drawbacks	Mixed survey of undergrad & postgrad students in Hong Kong	Benefits: timesaving, idea generation; Drawbacks: accuracy concerns and ethical concerns.	Comparative studies across assessment types and disciplinary practices.
Bhuiyan et al. (2025)	Assess literacy, transparency's role, and adoption drivers	Survey + model testing (quantitative)	Low-to-moderate ChatGPT literacy; transparency increases adoption and trust.	Need validated instruments for ChatGPT literacy and training intervention studies.
Henderson et al. (2025)	Compare the effectiveness of GenAI feedback and human teacher feedback	Experimental / quasi-experimental comparisons	GenAI can match human feedback on some tasks, but students report reservations and lower trust.	Explore scaffolding that combines AI + teacher to improve trust and learning transfer.
Granström and Oppi (2025)	Measure teachers' readiness & perceived usefulness of AI tools	Extensive teacher survey (n≈3,848)	Teachers show mixed readiness; many want training and a clear policy.	Link teacher readiness to student competence and co-design of curricula.
Ali et al, (2025)	How exposure & demographics shape perceptions	Cross-sectional survey & regression analysis	Prior exposure predicts more positive perceptions; demographic factors moderate attitudes.	Experimental exposure studies to test causality and long-term effects.

Dragomir and Todorescu (2025)	Explore perceived impacts among technical university students	Survey of 292 students	Students reported practical benefits but raised concerns about skill atrophy and plagiarism.	Research on assessment redesign and detection/ mitigation strategies.
Bootchuy, Amomrit, and Tantaphalin (2025)	Measure readiness levels and differences across undergrad/grad students	Readiness survey (n=445)	Varied readiness across disciplines; gaps in formal AI training noted.	Broader, cross-institution comparisons and validated readiness scales.
Almahases et al. (2024)	Identify uses, advantages, and ethical concerns	Survey of HE students (demographic analysis)	Many students use ChatGPT; reported benefits (speed, clarity), but ethical worries remain.	In-depth qualitative work to understand how use affects study habits and academic integrity.
Blahopoulou and Ortiz-Bonnín (2025)	Compare users' vs non-users' perceptions and outcomes	Survey (n≈737) + comparative analysis	ChatGPT users report perceived benefits but also identify cognitive offloading and ethical trade-offs.	Need experimental designs linking ChatGPT use to assessed learning outcomes.
Abdallah et al. (2025)	Synthesize evidence on ChatGPT use in higher education	Systematic review (Jan 2023–Mar 2025)	Evidence concentrated on perceptions and small pilots; few rigorous RCTs.	Call for standardized methods, controlled trials, and competency measures.
Dos (2025)	Map empirical studies (2023–2025) and methods used	PRISMA synthesis of 20 empirical studies	Most studies are cross-sectional surveys; geographic spread but little longitudinal work.	Suggests the need for longitudinal, mixed-methods, and cross-cultural research.
Jin et al. (2025)	Explore GenAI-powered feedback tools and student responses	Case study / LA tool evaluation	GenAI can speed feedback delivery; student uptake depends on perceived usefulness and transparency.	More replication across contexts and studies linking feedback to measurable learning gains.
Nelson et al. (2025)	Understand student beliefs about GenAI in language learning	Small sample qualitative/ quantitative (n≈56)	Students worried that GenAI might hinder language development, despite providing short-term help.	Larger studies across EFL contexts to examine language skill trajectories.
Nawaz et al. (2022)	Measure prevalence and institutional preparedness	National survey/policy report	Reports very high AI use (rising to ~92% in 2025) and limited formal training offered by institutions.	Nationally representative research linking AI use to assessment outcomes and equity impacts.

Interview method

This qualitative, semi-structured interview examined the perceptions and experiences of higher education teachers and students to analyse their views on the benefits, risks, and ethical considerations of incorporating Generative AI tools into educational and assessment settings, specifically assessing global readiness for AI-integrated education: students' proficiency and perceptions of Generative AI in learning and assessment, its role in enhancing their professional skills during career development, and its effects on their educational experiences. The study utilised personal, semi-structured interviews as the principal data collection method, enabling the authors to serve as interviewers and to investigate the experiences and emotions of teachers and students comprehensively. This method, known for its adaptability (Lichtman, 2013), was ideal for thoroughly examining how the induction program worked. The semi-structured format was better than a rigid survey because it let the interviewer talk directly to participants, ask probing questions, change the order of topics, and accurately record nuanced answers (Adhikari, 2022). Following Patton's (2002) qualitative research philosophy, the objective was to guarantee that participants could completely and accurately express their personal emotions and experiences with

GenAI during their teaching and learning activities in higher education. An interview protocol was employed to maintain consistency, with identical open-ended questions—directly sourced from the study's research inquiries—posed to all participants in a uniform sequence (Patton, 2002). Interviews took place in private spaces to facilitate the sharing of sensitive information and lasted about 45 minutes (40-48 minutes). If the core questions did not provide all the important information, the interviewers actively asked for more details to ensure they got everything they needed.

Content analysis

Data analysis steps of content analysis
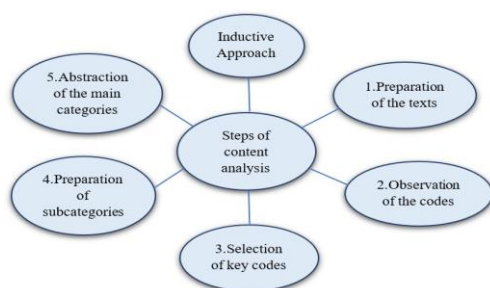
Figure 1. Qualitative data analysis processes (Adhikari, 2022, p.124)

Content analysis is the method used to analyse the data. It has four main steps. The first step is to prepare the texts from the recorded data. The second step is to identify the key codes that align with the research questions. The third step is to choose the key codes, and the fourth step is to make subcategories from them. The last step is to make the main category from the subcategories (see Figure 1).

Validity and reliability of the interview data

Sociologists Lincoln and Guba (1982) introduced the concept of trustworthiness to replace the traditional quantitative terms of validity and reliability for qualitative studies. They emphasised on the original four criteria of trustworthiness are credibility, transferability, dependability, and confirmability. Later, they added a fifth criterion,

authenticity, to better align with the constructivist research approach. To ensure qualitative rigor, Lincoln and Guba (1982) proposed various strategies, including using an audit trail, member checks, peer debriefing, and negative case analysis.

Credibility and its strategies

Credibility in qualitative research is equivalent to internal validity in quantitative research. It reflects the degree of accuracy and confidence in the data and its interpretations. This study has applied well-established methods and provides detailed procedure descriptions to allow for replication. This study further demonstrated that the findings are consistent with those of similar studies using different methods and incorporated feedback from participants and peers to ensure the results accurately reflect the studied phenomenon.

To enhance the validity and reliability of the interview data, we sent an analysis of interview data to the corresponding interviewees, whether their original data were properly analysed or not. Each interviewee returned the analysed data file without comments, so we argue that interview data are reliable and valid. Key strategies for enhancing credibility are prolonged engagement.

This study spent enough time collecting data to gain a deep understanding of the study perspectives of AI application in classroom teaching, which builds trust and rapport with interviewees and helps identify and correct any misinformation (Cohen, Manion & Morrison, 2018). Secondly, persistent observation, which focuses and concentrates on the most significant aspects of the data being collected to capture the nuances and details essential for an accurate understanding of the research topic, global readiness for AI-integrated education: students' competence and perceptions of generative AI in learning and assessment.

The final component of the qualitative data is debriefing that presents and discusses the research findings with qualified professional researchers and professionals, which has helped prevent our bias, aids in conceptual development, and enhances the overall rigor and objectivity of the data evaluation (Maqbali, 2024).
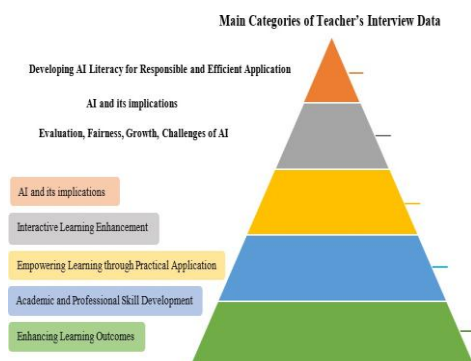
Results

Content analysis based on teachers' experiences and opinions

The first main category: Enhancing Learning Outcomes

How have you integrated AI technology into your teaching practice, and what impact has it had on student learning?

The first main category came from three smaller categories: content preparation and quality, educational tools and applications, and benefits and outcomes. The three groups came from the keycodes for positive impact, taking notes, making a presentation, getting enough reliable information, finding possible benefits, avoiding bias and false information, getting accurate, relevant, and up-to-date information, giving complete and reliable content, providing tailored resources, and giving clear explanations (see Figure 2).

Figure 2. Main categories of teachers' opinions and experiences

The results show that most of the teachers interviewed reported having two successful queries. Most of the people who were interviewed said they liked the idea of using AI in their teaching because it could make the content more reliable, get students more involved, and provide more organised notes and examples that help them better understand the topics. One of the teachers' interviewees said that AI has a positive effect on teaching and learning:

I have integrated AI technology into my teaching practice to some extent, and it has already had a noticeably positive impact on student learning.

Interviewees (M_2, M_4, and F_5) said that AI helps them prepare for and deliver more useful, up-to-date content. At the same time, interviewees (M_1, F_4, F_5, M_6, and M_7) said that AI makes it easier for students to learn and follow along. One of the teachers' interviewees said that AI helps with teaching activities

I use AI tools to gather accurate, relevant, and up-to-date information for the topics I teach. This not only enhances my confidence in delivering complete, reliable content but also ensures that students receive comprehensive knowledge in an accessible, engaging way. By integrating AI into my teaching practice, students can learn more eficiently and effectively, benefiting from tailored resources and straightforward explanations (M4).

Many teachers also said that AI helps them save time when preparing for lectures and finding resources. On the other hand, interviewee M_3 had a different, more cautious view. They were worried that students might become too reliant on AI, that it might be biased or give false information, and that it needed to be integrated more carefully. One of the teachers who was interviewed had different ideas about how to improve learning outcomes:

While AI offers potential benefits, I have chosen to integrate it less into my teaching practice due to several critical concerns, such as overdependence on AI and the need to avoid bias and misinformation (M_3).

The findings indicate that excessive reliance on AI in educational activities yields both advantages and detrimental effects on student learning, as students predominantly depend on AI, potentially impairing their creative abilities.

The second main category: Academic and Professional Skill Development

In what ways has AI helped your students improve their technical or hands-on skills relevant to vocational demands?

The second main category came from problem-solving and application, understanding concepts and learning on your own, having the right tools and resources, and being ready for school and

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work. The second subcategory was based on keycodes like critical thinking, conceptual clarity, preparing projects, helping to solve technical doubts, providing new tools, exploring and learning on your own, using accessible tools and resources, quick solutions and insights during projects, hands-on experimentation, field relies, structural analysis, numerical work, software, explaining errors, learning code, problem-solving skills, and their value in a professional setting, AI lab simulation, comparing.

Based on the information given, interviewees shared many of the similar ideas about how AI can help students improve their technical and hands-on skills, but they also had different concerns. Most of the people interviewed agree that AI is a great way to help students improve their technical and practical skills, thereby better preparing them for the demands of vocational roles. Most of the interviewees said that AI was a helpful tool for projects and real-world applications (Interviewees M_2 and M_6).

AI-based learning enhances digital literacy by introducing students to advanced tools and technologies, thereby expanding their knowledge and skills. It can spark creativity through generated ideas, but it may hinder critical thinking if students rely too heavily on AI output without questioning or understanding it, leading to less independent problem-solving (F_5).

All of the people who were interviewed (M_1, M_3, F_4, and F_5) said that AI helps students learn by providing new tools, solving technical problems, generating more ideas, and making it easier for them to learn on their own. One of the people who was interviewed said that AI helps with teaching and learning:

I have noticed that AI-supported learning tools increase student engagement and motivation, prompting them to generate more ideas. (M_1).

One of the main benefits is that AI allows students to learn and explore on their own, without relying on teachers all the time (F_4). It also gives them access to tools and resources that help them improve their technical skills. Interviewee (M_6) said that AI does not directly teach a skill, but it does help students

when they are stuck by explaining their mistakes or giving them tutorials. This makes them better at solving problems. One of the people who was interviewed said that AI can help with teaching and learning:

AI-supported learning tools have boosted student engagement by offering personalized, interactive experiences with instant feedback. They also motivate self-directed learning and encourage participation from even the quieter students (M_3).

Interviewee (M_7) offered a distinctive viewpoint, employing AI to connect theoretical knowledge with practical applications through simulations of laboratory tests and data analysis, which is especially beneficial in disciplines such as geotechnical engineering. Most people were in favour of AI integration, but there was one central point of disagreement about its potential downsides. Interviewee (M_5) said that AI can be helpful for hands-on experimentation. However, it can also make students overly dependent on it, leading them to skip essential steps and resort to quick fixes.

This is different from what the other people interviewed said, which focused only on the positive effects, like better problem-solving and faster learning. This interviewee's point of view serves as a warning about the need to balance AI use with ensuring students have a strong foundation of knowledge. One of the people who was interviewed said:

Students initially show increased engagement and motivation because AI speeds up learning, provides foundational knowledge of the content, and is more interactive, offering instant knowledge and solutions. (F_5)

The third main category: Empowering Learning Through Practical Application

How does AI-based learning contribute to developing students' soft skills, such as critical thinking, creativity, and digital literacy?

The results show that the third main category is empowering learning through real-world use, which has three subcategories. They were focused on developing skills and competencies, using them in real life, and measuring the results and effects.

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The three subcategories were also based on keycodes. They were made to help students improve their soft skills, deal with problems, learn more about work, think critically, come up with new ideas, get feedback in real time, work together to make things, learn how to use digital platforms, be responsible online, get step-by-step help, find creative solutions, and be friendly.

The results show that the people interviewed had both similar and different ideas about how AI affects students' soft skills, such as creativity, critical thinking, and digital literacy. Most of the people who were interviewed agree that AI helps students develop their skills by encouraging critical thinking, creativity, idea generation, and digital literacy. It also provides them with step-by-step instructions, real-time feedback, and opportunities to develop creative solutions. They say that AI makes students think critically by having them check and evaluate its output, and it makes them more innovative by offering many ideas for a single problem. Two of the people who were interviewed said:

AI-based learning has contributed, to some extent, to the development of students' soft skills such as critical thinking, creativity, and digital literacy. (M_1)

AI-based learning fosters critical thinking through adaptive problem-solving and real-time feedback, encourages creativity by enabling idea generation and collaborative creation, and builds digital literacy by promoting hands-on use of emerging technologies and responsible online practices. (M_3)

They also think that students' digital literacy naturally gets better as they use new technologies. There are, however, some different opinions. One interviewee said that AI could hurt critical thinking if students use it too much and don't question what it says. One of the people who was interviewed said:

AI-based learning has helped students improve their soft skills, such as critical thinking, creativity, and digital literacy. (M_1)

Another interviewee teacher said that AI's benefits depend on how the student feels about learning,

and it might only be helpful for people who already have a strong learning mindset. AI might not be helpful for students who don't want to learn. A person who was interviewed said:

A student can only use AI to broaden their work horizon if they have a positive attitude towards learning; otherwise, it can be harmful. (M_7)

AI-based learning has contributed, to some extent, to the development of students' soft skills such as critical thinking, creativity, and digital literacy. (M_1)

Another interviewee reported a different perspective, stating that AI's benefits depend on the student's attitude toward learning, and it may only be helpful for those who already have a strong learning mindset. For students who are less inclined to learn, AI could be more of a hindrance than a benefit. One of the interviewees stated:

Only if a student has a learning attitude can they effectively utilize AI to expand their work horizon, but it can harm a student who is not inclined to learn. (M_7)

The fourth main category: Interactive Learning Enhancement

What changes have you observed in student engagement or motivation when using AI-supported learning tools?

The results show that the fourth main category comprised four subcategories: student engagement and motivation, learning outcomes and benefits, interactive features and tools, and adverse effects. The four subcategories were based on keycodes like increasing student engagement and motivation, coming up with new ideas, noticing negative changes, making activities fun and engaging, boosting confidence, making sure learning is safe, speeding up learning, giving instant knowledge and solutions, cutting down on independent study, finding explanations, helping organise information and prepare drafts, and using interactive simulations (see Table 1).

The interview data show that people have both similar and different ideas about how AI-supported learning tools affect student motivation and engagement. Most of the people who were interviewed (M_1, M_3, F_4, F_5, M_6, and M_7) agree

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that AI tools make students more interested and motivated. One of the people who was interviewed said:

Students show increased engagement and motivation initially because AI makes learning faster and more interactive, providing instant knowledge and solutions. However, this can lead to dependency, where motivation for in-depth, independent study decreases as they rely on AI for everything. (F_5)

They say these tools make learning more interactive and personal, increasing students' likelihood of getting involved in the process. They also point out that AI speeds up learning by giving students instant access to information, solutions, and feedback, boosting their confidence and willingness to try new things. It was clear that interactive simulations played a big role in making learning more real and less abstract, especially in complex subjects like geotechnical engineering. One of the people who was interviewed said:

In my experience, AI-supported technologies have significantly enhanced student engagement. Learners receive instantaneous feedback, motivating them to make further attempts and improve their performance. They also appreciate the interactive simulations, which make learning less abstract and more tangible, especially in geotechnical topics, where understanding soil behaviour can be challenging. Overall, AI has boosted their curiosity, confidence, and readiness to participate. (M_7)

On the other hand, two critically different opinions came to light. Interviewee (M_2) has a different experience from the others. They say that using AI has made students behave worse. Interviewee (F_5) also issued a warning, saying that while AI can initially motivate people, it may also make them less motivated to study on their own because they rely too much on the technology to find quick answers. One of the people who was interviewed said:

Yes, there are eficiency improvements, as AI helps deliver high-quality content quickly and aids in understanding complex topics. Outcomes are better in terms of project completion and knowledge acquisition; however, this is offset by students not grasping the basics or the relevance of the results, which could negatively impact long-term learning. (M_7)

The fifth main category: AI and its implications in education

To what extent is AI integrated into the vocational curriculum you follow or develop? What opportunities or barriers exist?

The main category has three subcategories: AI Applications and Functions, Barriers and Challenges of AI, and Governance and Ethics of AI Tools. In the same way, the subcategories derived from AI keycodes are only discussed as subject matter. Increased productivity, accessible learning for everyone, limited skills in using AI tools, financial constraints, ethical guidelines, lack of institutional technologies, resources for moderation, theoretical and software-oriented predictive modelling, optimisation, data-driven decision-making, auxiliary tools, problem-solving, data interpretation, technical training, and relevance to industry (see Table 1).

 The results indicate that the majority of educators perceive the existing curriculum as having either minimal or no formal incorporation of AI. The interviewees (M_1, M_2, M_3, and M_6) clearly say that AI is not part of their curriculum, is not used, or is not officially included. Two of the people who were interviewed said:

We have not yet adopted a vocational curriculum, so the use of AI to improve students' competence skills is debatable. (M_3)

In our curriculum, AI is not formally included; it remains theoretical and software oriented. However, there is a significant opportunity to integrate AI with predictive modeling, optimization, and data-driven decision-making in structural engineering. The main barrier is that most of us teachers, including myself, have not had formal training in using AI specifically for structural engineering.(M_3)

Interviewees (M_5 and M_7) also agree, saying that AI is "less integrated" or only a "part" of the curriculum. This shows that there is a big gap in structured AI education. Another standard view

is to focus on the good things AI can do and its potential. One of the people who was interviewed said:

AI is less integrated into our curriculum's projects and classroom teaching. Barriers include a lack of institutional technologies to monitor AI use, especially in a developing country like ours, where resources for moderation and ethical guidelines are limited.(F_1)

Interviewee (M_4) sees opportunities for "increased productivity and accessible learning," while Interviewee (M_6) discusses how it can be used for "predictive modelling" and "data-driven decision-making." Interviewee (M_7) also talks about how AI could make technical training more "engaging, relevant to industry standards, and practical." These opinions show that people believe AI can help students learn and prepare for future jobs. Finally, everyone agrees there are significant problems with putting AI into practice. Teachers often talk about not getting enough training (M_6), not receiving enough support from their schools, such as technology and ethical guidelines (F_5), and not having enough money (F_4). The findings also underscore student-related obstacles, including the perception of AI as a "shortcut" and disparities in technology access (M_7). One of the people who was interviewed said. But problems like not being very good with AI tools and not having enough money make it hard to implement it fully.

The sixth main category: AI in Education

Which AI tools have you used in your classroom, and how do you select those tools to match specific learning objectives?

There are four subcategories in the main category: AI tools and their functions; educational and content applications; outcomes and skills development; integration status; and challenges. The four categories came from the keycodes for AI use in content creation: ChatGPT for coming up with ideas and clearing up doubts (F_3); Grammarly for improving writing, getting accurate and helpful information, improving presentation, supporting learning and projects, improving the overall teaching, improving the learning experience, providing quality content, problem sets, reporting writing or brainstorming research topics, soil and foundation simulation, and AI-based problem generators (M_4). Seven of the seven teachers who were interviewed said they used ChatGPT, GitHub, Copilot, and Grammarly to come up with ideas, check facts, improve their writing skills, and make notes, slides, and reports (M_7, F_5, F_1). One of the people who was interviewed said:

I mainly use generative AI tools to prepare notes, slides, and even problem sets. Students sometimes use them for report writing or brainstorming research topics. I choose tools based on their accuracy and reliability for our subject matter, and I always remind students to verify their answers with textbooks and other authentic sources. (M_6)

The most common theme in the interviewees' applications was AI tools in the classroom. This came up seven times, with both general tools (like chatbots and generators) and specific examples (like ChatGPT for generating ideas, GitHub Copilot, and Grammarly for improving writing).

The results also show that four of the interviewees said they used AI tools to create classroom materials and improve the overall teaching and learning experience (F_4, M^5). They also said they used general AI tools such as GitHub Copilot, chatbots, and generators to help with projects and provide explanations (F_1). They chose them based on how well they fit with the goals, like providing more in-depth information or making high-quality content, and whether they help people understand instead of just providing quick answers (M_8, M_3). One of the people who was interviewed said:

I have used general AI tools, such as GitHub Copilot, chatbots, and generators, to provide explanations and support projects. I select them based on how well they align with objectives, such as providing deeper insights or producing high-quality content, and on whether they promote understanding rather than just quick answers. (F_3)

Most of the people interviewed said they used GitHub Copilot and chatbots to find information that helped them explain things and work on projects. I choose them based on how well they help me reach my goals, like giving me more profound insights.

The seventh main category: Performance and growth management

Have you utilized AI systems to assess students' competencies? If so, how do you evaluate their fairness and accuracy?

The main category has four subcategories: assessment and evaluation processes, quality control and fairness, feedback and growth, and systemic challenges. The four categories came from the keycodes of quizzes, skill evaluations, and writing analysis: fairness and accuracy, manual grading, review question clarity, monitoring bias across students, personalised suggestion, tailored feedback, support overall growth, fair and accurate assessment, evaluate fairness, limited institutional support, check for biases in outputs and accuracy, manual review, use of plagiarism checkers, verifying the students' reports, ensuring fair evaluation, and calculation.

The main categories of performance and growth management include assessment and evaluation, quality control and fairness, feedback and growth, and systemic challenges. The subcategories came from quizzes, skill tests, and writing analysis. They include fairness and accuracy, manual grading, review question clarity, checking for bias among students, personalised suggestions, tailored feedback, support for overall growth, fair and accurate assessment, checking for fairness, limited institutional support, checking for bias in outputs and accuracy, manual review, using plagiarism checkers, checking the students' reports, making sure of fair evaluation, checking calculations, verifying lab data, problem-solving, and AI evaluating work and getting a faster response (M_8, F_3, M_6, M_7, F_5) (see Table 1).

Most of the people interviewed said that bias, fairness, and accuracy were the most important factors to consider when using AI systems to grade students' work in the classroom. According to the interviewees, the AI evaluation type was the second most important key code for answering the research question of how to use AI systems to evaluate students' skills in the classroom.

The results indicate that 25% of the interviewees stated that the purpose of employing AI was for practical evaluation and personalised support. They also mentioned that AI tools are utilised for various purposes, including quizzes, data verification, prompt feedback, and quality assurance by reviewing the clarity of assessment questions to ensure a fair and accurate evaluation (M_4, F_3, M_6, M_7, F_5).

Yes, I have used AI-based assessment tools for quizzes, skill evaluations, and writing analysis. To ensure fairness and accuracy, I cross-check AI-generated results with manual grading, review question clarity, and monitor for bias by comparing outcomes across different student groups (M_1)

Yes, we have used AI systems to grade students in internal examinations and provide personalized suggestions based on their results. These tailored feedback insights help students identify areas for improvement and support their overall growth, while ensuring the assessment process remains fair and accurate (F_4).

One-fourth of the people who were interviewed said that AI systems use assessment and evaluation processes, quality control, fairness, and feedback and growth to judge how well students are doing. They also said that AI tools are used to check for plagiarism, review students' reports, ensure evaluations are fair, conduct quality control, verify lab data, fix problems, and provide faster answers. One of the people who was interviewed says:

Yes, I have utilized AI to assist in assessing students, particularly in verifying calculations, lab data, and problem-solving in geotechnical engineering. To ensure fairness and accuracy, I always double-check the AI's results myself. I also ensure the tool focuses on what students are actually supposed to learn, rather than just providing a number. I will explain to students how AI evaluates their work, which helps them trust the process and reflect on their learning. By combining AI feedback with my own review, students get quicker responses without compromising fairness or reliability. (F_6)

The interviewees' final statement can be summarised as follows: people and organisations are ready for AI integration in various ways. However, there are gaps in support for student practices, training, infrastructure, and institutional

strategies for using AI systems to test students' skills and check their fairness and accuracy.

The eighth main category: AI Integration in Academia

How prepared are you and your institution to adopt AI in teaching and learning? What support or training has been provided?

The main category has three subcategories: the problems and challenges that AI solutions and support system applications face, as well as their benefits. These categories were based on keycodes like no AI adoption in the institution, fundamental infrastructure problems like internet access and digital devices, introductory workshops and training, professional development and clear guidelines, lack of formal support, absence of training, insufficient technologies and infrastructure, self-exploration, institutional-level concerns, benefits for both faculty and students, workshops or training sessions, AI tool simulations, problem-solving, data analysis, teacher training workshops, integration guidance, and better access to software (see Table 1).

Most of the people interviewed said their schools are ready to use AI in teaching and learning to help students improve their skills in the classroom. The main themes were support, training, and guidance for students, as well as the skills needed to use AI in teaching and learning (F_2, F_6, M_{10}).

They also said that their schools held workshops and training sessions, including a teacher-training workshop and guidance on helping students grow professionally (M_4, F_7). One-fifth of the teachers interviewed said the best way to ensure fairness and accuracy is a human-in-the-loop approach, meaning AI outputs need to be checked by a person.

They also said that steps are being taken to fix systemic problems, such as monitoring student bias and conducting thorough checks for bias in outputs (M_8, F_5, M_3, F_1, F_2). A person who was interviewed said:

Yes, AI-based evaluation provides accurate feedback by objectively analysing my responses. It is also fair because it removes human bias and focuses solely on my performance. (M_4)

The interviewees' last statement was that AI answers are correct, free of human bias, focus only on performance, quickly point out mistakes, design projects, make things easier to use, and give accurate answers.

The ninth main category: AI and its implications

What steps do you take to ensure ethical use of AI in the classroom, including data privacy, fairness, and equal access?

There are four subcategories in the main category: ethical use and fairness, student assessment and communication, skill development and real-world application, and productivity and support tools. The four categories were based on the key codes for not caring, warning the student, confirming through viva, problem-solving, adaptability skills, increased confidence and competence, real-world applications, promoting ethical use, making sure they have enough money, computer skills, and internet access, removing or deleting their data, emphasising understanding and relevance, discussing data privacy, promoting fairness, challenging equal access because of limited resources, support work, being freely available, double-checking the accuracy, generating content, secure platforms, generated assessments or feedback, equal access, learning safe, fair, and inclusive, and scheduling lab time (see Table 1).

One-sixth of the people who were interviewed said that AT tools' accessibility and fairness make students better prepared for the job market now and in the future (M_4, F_3, M_6, M_7, F_4, F_9). One-fourth of those interviewed said that ethical use, security, and privacy are the most critical steps to ensuring

that AI is used ethically in the classroom (M_3, M_6, F_3, F_2). In the end, the teachers interviewed said that to ensure AI is used ethically in the classroom, there must be equal access to resources and a focus on ethical use, fairness, and safety.

The final convergent statement concluded by the interviewee teachers reported that ensuring equitable access to resources and promoting ethical use, fairness, and safety are required to ensure ethical AI use in the classroom, including data privacy, fairness, and equal access.

The tenth main category: Developing AI Literacy

for Responsible and Efficient Application

In your opinion, how does AI-based learning help students become more prepared for the current and future job market?

The main category has three subcategories: the importance of AI literacy, how to use AI tools correctly and responsibly, and how to use AI tools efficiently. The three categories were based on the key codes for adapting to new technology, AI benefits in a clerical job, supporting documentation activities, verbal communication, gestures, checking AI outputs for bias, giving everyone equal access to resources (F_2), critical use of AI-generated content, students can't ignore its importance, students need a solid understanding of AI (M_5), future job markets, fast and quality work, being familiar with tools (F_7), completing tasks efficiently, struggles without AI skills (M_7), over-dependence, making oneself comfortable with a digital tool (M_6), development ability, future demand, technical skills and confidence (F_5), critical thinking, problem solving, digital literacy skills, and making practical learning (M_3) (see Table 1).

One-fourth of the people who answered said that skills for AI readiness, AI's impact on work and efficiency, and ethical and fair use are essential AI-based learning tools that help students prepare for the job market now and in the future. One of the people who was interviewed said:

I think AI prepares us in two ways: first, it gets students used to new digital tools, and second, it helps them learn to be flexible and use AI fairly and ethically. AI-based learning prepares students for that reality and gives them an edge in the job market. (F_5)

One-fifth of the teachers interviewed said that AI should focus on that data to understand better how important AI is and how it can help them grow professionally in the future, and the interviewees strongly agreed. One of the people who was interviewed said:

I believe AI prepares us in two ways: first, by making students comfortable with new digital tools, and second, by helping them develop adaptability for AI readiness and ethical and equitable usages. AI-based learning equips students for that reality and gives them an advantage in the job market. (F_5)

One-fifth of the interviewee teachers reported that AI should focus on that data to understand better the importance of AI and future professional development, which the interviewees strongly emphasized. One of the interviewees stated:

I believe AI-based technology is the future, and students cannot ignore its importance. In today's world, students are expected to have a solid understanding of AI and related technologies to remain competitive. AI-based learning equips them with the knowledge and skills needed to succeed in both the current and future job markets (M_7)

Summary of the results

The summary results show a fair picture of how schools can use AI. They show how technology can help students learn and teachers teach, but they also highlight some of the major problems and risks schools face. The best thing is that you get better at what you do and learn more. Teachers often use AI to make lesson plans because it is quick and easy to find accurate, helpful, and up-to-date information. This makes the materials better and saves time. AI is an excellent way for kids to learn how to solve problems, study on their own with quick help, and get ready for future jobs by improving their technical skills and digital literacy. AI is helpful in assessments because it provides faster answers and more personalised feedback, making evaluations more focused on improvement.

People are less hopeful when they are worried about cheating and being dishonest in school. Many people fear that kids will depend too much on their teachers, making it harder for them to think for themselves, be creative, and learn the basics. To fix this, teachers use a "human-in-the-loop" approach, which means checking AI outputs for bias and doing manual assessments. It is essential to keep people's data safe, private, and fair. Data shows there are gaps: most schools don't officially include AI in vocational programs because they lack the money, technology, infrastructure, or teacher training. Teachers know AI can be beneficial, but they don't have a clear, ethical plan for using it.

Discussion and conclusion

This study examines the correlations among digital competence, the utilisation of Generative AI (GenAI), students' personal background attributes, and AI literacy among undergraduate students in Nepal and Indonesia. As AI becomes more common in higher education, it's important to know how students learn to utilise these tools safely and well (Dragomir & Todorescu, 2025; Harzing, 2019). Utilising validated instruments, the Student Digital Competence Scale (SDiCoS) and the Artificial Intelligence Literacy Scale (AILS), data were gathered from seven teachers of Nepal and Indonesia and examined by content analysis (Nawaz et al., 2022; Munaye et al., 2025; Graham, 1969).

The results highlight that teachers are less hopeful when they are worried about cheating and being dishonest in educational institutions. Many teachers fear that students will depend too much on their teachers, making it harder for them to think for themselves, be creative, and learn the basics (Fok & Ong, 1996). To fix this, teachers use a "human-in-the-loop" approach, which means checking AI outputs for bias and doing manual assessments. It is essential to keep people's data safe, private, and fair. Data shows there are gaps that most educational institutions don't officially include AI in vocational programs because they lack money, technology, infrastructure, or teacher training. Teachers know AI can be beneficial, but they don't have a clear, ethical plan for using it. Student background factors, such as academic achievement (CGPA), the nature of high school attended (private international versus public), and parental educational attainment, significantly impacted the association.

In particular, academic achievement had a favourable effect on both digital competence and AI literacy. However, educational background characteristics changed the way the two were related. Moreover, digital competence substantially predicted the frequency of GenAI usage, although AI literacy did not. These findings reinforce the essential role of digital competence in fostering students' AI literacy and emphasise the significance of experiential learning. Practical implications encompass the incorporation of AI ethics, critical assessment, and experiential AI interaction into digital literacy curriculum (Brayan Diaz & Nussbaum, 2024; Andre, 2024).

Conclusion

This study examines the relationship among digital competence, the utilisation of Generative AI (GenAI), students' personal background attributes, and AI literacy among undergraduate students in Nepal and Indonesia. As AI becomes more common in higher education, it's important to know how students learn to use these tools safely and well. Utilising validated instruments, the Student Digital Competence Scale (SDiCoS) and the Artificial Intelligence Literacy Scale (AILS), data were gathered from seven interviewe teachers and examined through content analysis.

The findings highlight that the role of AI is crucial to enhance student professional competency skills in the classroom teaching in higher education. Most of the interviewee teachers reported that their corresponding educational institutions did not officially launch established AI-related labs and programs in higher education.

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Interview questions for Teachers

QN1. How have you integrated AI technology into your teaching practice, and what impact has it had on student learning?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 I have integrated AI technology into my teaching practice to some extent, and it has already had a noticeably positive impact on student learning.	Interviewee 1 I have integrated AI technology into my teaching practice to some extent, and it has already had a noticeably positive impact on student learning.	-Positive impact		
Interviewee 2 I use AI for preparing notes and presentations. So, students are getting sufficient and reliable content for learning.	Interviewee 2 I use AI for preparing notes and presentations So, so students are getting sufficient and reliable content for learning.	-Prepare notes -Prepare presentation -Get sufficient and reliable content		
Interviewee 3 While AI offers potential benefits, I have chosen to integrate it less into my teaching practice due to several critical concerns, such as overdependence on AI and the need to avoid bias and misinformation.	Interviewee 3 While AI offers potential benefits, I have chosen to integrate it less into my teaching practice due to several critical concerns, such as overdependence on AI and the need to avoid bias and misinformation.	-Potential benefits -Avoid bias and misinformation	-Content Preparation and Quality -Educational Applications and Tools -Benefits and Outcomes	Enhancing Learning Outcomes
Interviewee 4- I use AI tools to gather accurate, relevant, and up-to-date information for the topics I teach. This not only enhances my confidence in delivering complete and reliable content but also ensures that students receive comprehensive knowledge in an accessible and engaging way. By integrating AI into my teaching practice, students can learn more efficiently and effectively, benefiting from tailored resources and clear explanations.	Interviewee 4- I use AI tools to gather accurate, relevant, and up-to-date information for the topics I teach. This not only enhances my confidence in delivering complete and reliable content but also ensures that students receive comprehensive knowledge in an accessible and engaging way. By integrating AI into my teaching practice, students can learn more efficiently and effectively, benefiting from tailored resources and clear explanations that enhance their understanding.	-Gather accurate, relevant, and up-to-date information -Deliver complete and reliable content -Tailored resources -Clear explanations.		
Interviewee 5 I have integrated AI tools into my teaching by using them in classroom sessions and student projects. This has helped students gain a deeper understanding of the topics. AI provides valuable insights and enhances the overall quality of content and its delivery, making learning more effective and engaging.	Interviewee 5 I have integrated AI tools into my teaching by using them in classroom sessions and student projects. This has helped students gain a deeper understanding of the topics. AI provides valuable insights and enhances the overall quality of content and its delivery, making learning more effective and engaging.	-Classroom session -Student project -Valuable knowledge -Improve overall content quality -Effective learning -Engaging learning		

Interviewee 6 I primarily use AI to prepare lecture materials, slides, and examples that align with our syllabus. It saves me a great deal of time gathering resources and allows me to explain topics with clearer illustrations. For students, it means they receive more structured notes and practical examples, which help them better understand the material. I feel it has made the classes more engaging and easier for them to follow.	Interviewee 6 I primarily use AI to prepare lecture materials, slides, and examples that align with our syllabus. It saves me a great deal of time in gathering resources and allows me to explain topics with clearer illustrations. For students, it means they get more structured notes and practical examples, which help them understand better. I feel it has made the classes more engaging and easier for them to follow.	-Prepare lecture materials, slides, and examples -Time saving -Clarity -Get structure note -Get a practical example -Engagement and ease of learning		
Interviewee 7 I have begun to incorporate AI into my geotechnical engineering classes, not just as a tool, but also as a teaching partner. For instance, I use AI to create many iterations of slope stability, bearing capacity, or settlement problems rather than assigning students the same set of soil mechanics tasks. In this manner, each learner receives practice that is marginally different but yet related to the same idea. AI simulations have also been very beneficial to me; they enable students to visualize how soil responds under loading or during consolidation, which is typically difficult to observe from theory alone.	Interviewee 7 I have started integrating AI into my geotechnical engineering classes, not just as a tool but also as a teaching partner. For example, I use AI to generate multiple versions of slope stability, bearing capacity, or settlement problems, rather than giving students the same soil mechanics tasks. This way, each student gets practice that is slightly different but still related to the same concept. AI simulations have also been constructive; they enable students to visualize how soil behaves under load or during consolidation, which is often difficult to observe solely from theory.	-Teaching partner -Personalized Problem - AI simulations - Visualization - soil mechanics tasks		

QN2. In what ways has AI helped your students improve their technical or hands-on skills relevant to vocational demands?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 AI has supported my students in developing technical and hands-on skills aligned with vocational requirements, and has further strengthened their critical thinking and conceptual clarity.	Interviewee 1 AI has supported my students in developing technical and hands-on skills aligned with vocational requirements, and has further strengthened their critical thinking and conceptual clarity.	- Critical thinking -Conceptual clarity	-Problem-Solving and Application -Conceptual Understanding and Independent Learning	Academic and Professional Skill Development
Interviewee 2 Students use AI as a supporting tool to prepare their projects.	Interviewee 2 Students use AI as a supporting tool to prepare their projects.	-Prepare project		
Interviewee 3 AI has enhanced students' technical skills by providing new tools and helping them with their technical doubts.	Interviewee 3 AI has enhanced students' technical skills by providing new tools and helping them with their technical doubts.	Help to solve technical doubts -Provide new tools		

Interviewee 4 AI has opened new avenues for students to explore and learn independently, without relying solely on teachers. It allows them to acquire various skills conveniently, using accessible tools and resources. This has significantly helped students enhance their technical and hands-on abilities, aligning them more closely with current vocational demands.	Interviewee 4 AI has opened new avenues for students to explore and learn independently, without relying solely on teachers. It allows them to acquire various skills conveniently, using accessible tools and resources. This has significantly helped students enhance their technical and hands-on abilities, aligning them more closely with current vocational demands.	- To explore and learn independently -Use accessible tools and resources	-Tools and Resources-Professional and Academic Preparedness	
Interviewee 5 AI tools help students apply concepts practically during projects, enhancing their technical skills by providing quick solutions and insights. This prepares them for vocational demands by allowing hands-on experimentation, though it sometimes leads to over-reliance, where they skip foundational steps.	Interviewee 5 AI tools help students apply concepts practically during projects, enhancing their technical skills by providing quick solutions and insights. This prepares them for vocational demands by allowing hands-on experimentation, though it sometimes leads to over-reliance, where they skip foundational steps.	-Quick solutions and insights -Practically during projects -Hands-on experimentation		
Interviewee 6 Since our field relies heavily on structural analysis, numerical methods, and software, AI does not directly teach these tools. However, what it does is help them when they get stuck. For example, they can ask AI to explain errors, look for tutorials, or learn coding basics related to structural modelling. This makes them more confident in using software and improves their problem-solving skills, which is very useful in the professional world.	Interviewee 6 Since our field relies heavily on structural analysis, numerical methods, and software, AI does not directly teach these tools. However, what it does is help them when they get stuck. For example, they can ask AI to explain errors, look for tutorials, or learn coding basics related to structural modelling. This makes them more confident in using software and improves their problem-solving skills, which is very useful in the professional world.	- Field relies -Structural analysis, numerical, and software -Explain errors -Learning code -Problem-solving skills -Useful in a professional		
Interviewee 7 AI has helped my students improve their technical and hands-on skills by connecting what they learn in college with real-world applications. In geotechnical engineering, for instance, I utilize AI tools to simulate laboratory tests, such as unconfined compression or consolidation. This way, students can change the parameters virtually and see the immediate change in how the soil behaves. It is safe for them to try out their ideas here before they use the real equipment in the lab. AI has also helped people figure out what data means. Students can enter data from the lab or the field, such as SPT values, moisture content, or shear strength parameters, and AI will help them analyze the results, verify their calculations, and even compare the results to standard examples.	Interviewee 7 AI has helped my students improve their technical and practical skills by connecting what they learn in college with real-world applications. In geotechnical engineering, for example, I utilize AI tools to simulate laboratory tests, such as unconfined compression or consolidation. This allows students to change parameters virtually and see how the soil behaves immediately. It provides a safe environment for them to experiment with ideas before working with actual lab equipment. AI has also helped improve data understanding. Students can input data from the lab or field, such as SPT values, moisture content, or shear strength parameters, and AI helps analyze the results, verify their calculations, and compare outcomes to standard examples.	- AI Lab simulation -Compare the results -SPT values -Moisture content -Shear strength parameters		

QN 3. In what ways has AI helped your students improve their technical or hands-on skills relevant to vocational demands?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 AI-based learning has contributed, to some extent, to the development of students' soft skills such as critical thinking, creativity, and digital literacy.	Interviewee 1 AI-based learning has contributed, to some extent, to the development of students' soft skills such as critical thinking, creativity, and digital literacy.	-Develop student soft skills	Skills and Competencies Development Functional and Practical Applications Outcomes and Impacts	Empowering Learning Through Practical Application
Interviewee 2 Only if a student has a learning attitude can they effectively utilize AI to expand their work horizon, but it can harm a student who is not inclined to learn.	Interviewee 2 Only if a student has a learning attitude can they effectively utilize AI to expand their knowledge and understanding. It can hurt a normal student, but it can also have a positive impact on a motivated student.	-Negative impact -Expand the horizon of work		
Interviewee 3 AI-based learning fosters critical thinking through adaptive problem-solving and real-time feedback, encourages creativity by enabling idea generation and collaborative creation, and builds digital literacy by promoting hands-on use of emerging technologies and responsible online practices.	Interviewee 3 AI-based learning fosters critical thinking through adaptive problem-solving and real-time feedback, encourages creativity by enabling idea generation and collaborative creation, and builds digital literacy by promoting hands-on use of emerging technologies and responsible online practices.	- Fosters critical thinking -Problem-solving -Idea generation -Real-time feedback -Collaborative creation -Builds digital literacy -Responsible online practices		
Interviewee 4 Many AI-based applications are designed to guide students as mentors and even interact with them in a conversational, friendly manner. These tools can provide step-by-step instructions for completing tasks, encouraging students to think critically, explore creative solutions, and navigate digital platforms effectively. In this way, AI-based learning plays a valuable role in developing soft skills such as critical thinking, creativity, and digital literacy.	Interviewee 4 Many AI-based applications are designed to guide students as mentors and even interact with them in a conversational, friendly manner. These tools can provide step-by-step instructions for completing tasks, encouraging students to think critically, explore creative solutions, and navigate digital platforms effectively. In this way, AI-based learning plays a valuable role in developing soft skills such as critical thinking, creativity, and digital literacy.	- step-by-step guidance -Explore creative solutions -navigate digital platforms -friendly manner		
Interviewee 5 AI-based learning enhances digital literacy by introducing students to advanced tools and technologies, enabling them to develop a deeper understanding of digital concepts. It can spark creativity through generated ideas, but it may hinder critical thinking if students rely too heavily on AI output without questioning or understanding it, leading to less independent problem-solving.	Interviewee 5 AI-based learning enhances digital literacy by introducing students to advanced tools and technologies. It can spark creativity through generated ideas, but it may hinder critical thinking if students rely too heavily on AI output without questioning or understanding it, leading to less independent problem-solving.	-Boost digital literacy -Generated ideas - Reduce independent problem-solving		

Interviewee 6 When students use AI, they do not just accept the answers unquestioningly. They must verify that the output is correct and relevant. That makes them think critically. Additionally, AI often generates multiple ideas for a single problem, which helps designers become more creative in their approach to solving it. Furthermore, since they are constantly working with digital tools, their overall digital literacy naturally improves.	Interviewee 6 When students use AI, they do not just accept the answers unquestioningly. They must verify that the output is correct and relevant. That makes them think critically. Additionally, AI often generates multiple ideas for a single problem, which helps designers become more creative in their approach to solving it. Moreover, since they are constantly working with digital tools, their overall digital literacy naturally improves.	- Give multiple ideas -Working with digital tools -Improving digital literacy		
Interviewee 7 In addition to improving students' technical knowledge, AI-based learning has proven highly helpful in developing their soft skills. When students utilize artificial intelligence (AI) to solve geotechnical problems, for instance, they are prompted to critically examine whether the solution is practical in real-world situations, compare alternatives, and question the methods involved. Strong critical thinking is developed by this evaluation and verification practice.	Interviewee 7 In addition to improving students' technical knowledge, AI-based learning has proven highly helpful in developing their soft skills. When students utilize artificial intelligence (AI) to solve geotechnical problems, for instance, they are prompted to critically examine whether the solution is practical in real-world situations, compare alternatives, and question the methods involved. Strong critical thinking is developed by this evaluation and verification practice.	- Improving students' technical knowledge -Problem solves -Alternative Comparison -Method Verification -Practical situation		

QN4. What changes have you observed in student engagement or motivation when using AI-supported learning tools?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 I have noticed that AI-supported learning tools increase student engagement and motivation, prompting them to generate more ideas.	Interviewee 1 I have noticed that AI-supported learning tools increase student engagement and motivation, prompting them to generate more ideas.	- Increase student engagement and Motivation -Generate a new idea	-Student Engagement and Motivation -Learning Outcomes and Benefits	Interactive Learning Enhancement
Interviewee 2 I have observed a negative change.	Interviewee 2 I have observed a negative change.	- Observed a negative change		
Interviewee 3 AI-supported learning tools have boosted student engagement by offering personalized, interactive experiences with instant feedback. They also motivate self-directed learning and encourage participation from even the quieter students.	Interviewee 3 AI-supported learning tools have boosted student engagement by offering personalized, interactive experiences with instant feedback. They also motivate self-directed learning and encourage participation from even the quieter students.	Boosted student engagement -personalized interactive experiences -Instant feedback -Self-directed learning		

			Interactive Features and Tools Negative Impacts	
Interviewee 4 Students show increased excitement and enthusiasm when using AI-supported learning tools. They find the process easy, engaging, and enjoyable, which boosts their confidence and sense of security in the learning process. As a result, their overall motivation and participation in the learning process have noticeably improved.	Interviewee 4 Students show increased excitement and enthusiasm when using AI-supported learning tools. They find the process easy, engaging, and enjoyable, which boosts their confidence and sense of security in the learning process. As a result, their overall motivation and participation in the learning process have noticeably improved.	-Increased excitement and enthusiasm -Find an easy process, engaging, and enjoyable -Boost confidence -Security in learning		
Interviewee 5 Students show increased engagement and motivation initially because AI makes learning faster and more interactive, providing instant knowledge and solutions. However, this can lead to dependency, where motivation for in-depth, independent study decreases as they rely on AI for everything.	Interviewee 5 Students show increased engagement and motivation initially because AI makes learning faster and more interactive, providing instant knowledge and solutions. However, this can lead to dependency, where motivation for in-depth, independent study decreases as they rely on AI for everything.	-Increased engagement and motivation -Fast learning -Providing instant knowledge and solutions -Decrease Independent study		
Interviewee 6 I have noticed students are more motivated when they know they can quickly find explanations or alternative approaches through AI. They feel less stuck and more willing to try new things. Especially in research tasks, they seem more confident to start because AI helps them organize information and prepare drafts.	Interviewee 6 I have noticed students are more motivated when they know they can quickly find explanations or alternative approaches through AI. They feel less stuck and more willing to try new things. Especially in research tasks, they seem more confident to start because AI helps them organize information and prepare drafts.	-Find an explanation -Helps organize information and prepare drafts -Increase confidence		
Interviewee 7 In my experience, the use of AI-supported technologies has significantly enhanced student engagement. Learners receive instantaneous feedback, motivating them to make further attempts and improve their performance. They also appreciate the interactive simulations, which render learning less abstract and more tangible, especially when it comes to geotechnical topics, where comprehending soil behavior can be challenging. Overall, AI has boosted their curiosity, confidence, and readiness to participate.	Interviewee 7 In my experience, the use of AI-supported technologies has significantly enhanced student engagement. Learners receive instantaneous feedback, motivating them to make further attempts and improve their performance. They also appreciate the interactive simulations, which render learning less abstract and more tangible, especially when it comes to geotechnical topics, where comprehending soil behavior can be challenging. Overall, AI has boosted their curiosity, confidence, and readiness to participate.	-Improve performance -Interactive simulations -Curiosity Boost -Confidence		

QN5. Have you noticed improvements in students' learning efficiency or outcomes as a result of using AI? Please explain.

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 I have observed that the use of AI has enhanced students' learning efficiency and outcomes, enabling them to produce more ideas and develop new skills in areas such as graphic design, creative writing, and proposal formulation.	**Interviewee 1** I have observed that the use of AI has enhanced students' learning efficiency and outcomes, enabling them to produce more ideas and develop new skills in areas such as graphic design, creative writing, and proposal formulation.	-produce more ideas -develop new skills -graphic design -creative writing -proposal formulation.	Skill Development and Creativity Functional and Practical Applications Outcomes and Impacts	Professional and Personal Growth
Interviewee 2 No, I have not.	**Interviewee 2** No, I have not.			
Interviewee 3 Yes, adaptability to technology-driven work environments	**Interviewee 3** Yes, adaptability to technology-driven work environments.	-technology-driven work environments		
Interviewee 4 Yes, I have observed significant improvements in students' learning efficiency and outcomes through the use of AI. This is because they can learn at any time, in a manner that suits their individual preferences. Students can ask questions as often as they need without feeling insecure or limited by human factors, allowing for a more personalized and comfortable learning experience.	**Interviewee 4** Yes, I have observed significant improvements in students' learning efficiency and outcomes through the use of AI. This is because they can learn at any time, in a manner that suits their individual preferences. Students can ask questions as often as they need without feeling insecure or limited by human factors, allowing for a more personalized and comfortable learning experience.	-suits their individual preferences -ask questions -feeling insecure -comfortable learning experience -more personalized		
Interviewee 5 Yes, there are efficiency improvements, as AI helps deliver high-quality content quickly and aids in understanding complex topics. Outcomes are better in terms of project completion and knowledge acquisition; however, this is offset by students not grasping the basics or the relevance of the results, which could impact long-term learning.	**Interviewee 5** Yes, there are efficiency improvements, as AI helps deliver high-quality content quickly and aids in understanding complex topics. Outcomes are better in terms of project completion and knowledge acquisition; however, this is offset by students not grasping the basics or the relevance of the results, which could impact long-term learning.	-Deliver high-quality content -Understanding complex topics -project completion -knowledge acquisition -long-term learning		
Interviewee 6 Yes, definitely. Students' complete tasks more efficiently because they do not waste time searching for background information. For example, when doing literature reviews or preparing reports, they can get a structure quickly and then refine it. As a result, their work is more focused, and outcomes are better.	**Interviewee 6** Yes, definitely. Students' complete tasks more efficiently because they do not waste time searching for background information. For example, when doing literature reviews or preparing reports, they can quickly establish a structure and then refine it. As a result, their work is more focused, and their outcomes are better.	- More efficiently -Background information. -Outcomes are better		

Interviewee 7 I have observed a clear improvement in both efficiency and results. With the use of AI tools, students receive prompt feedback on their assignments, enabling them to address errors immediately rather than waiting until the following class. This accelerates the learning process, allowing concepts to be internalized more quickly. In the field of geotechnical engineering, for instance, students who utilize AI simulations for analyzing soil behavior or laboratory data understand concepts more rapidly and excel in problem-solving activities. In summary, AI has rendered its learning more targeted, quicker, and effective.	Interviewee 7 I have observed a clear improvement in both efficiency and results. With use of AI tools, students receive prompt feedback on their assignments, enabling them to address errors immediately rather than waiting until the following class. This accelerates the learning process, allowing concepts to be internalized more quickly. In the field of geotechnical engineering, for instance, students who utilize AI simulations for analyzing soil behavior or laboratory data understand concepts more rapidly and excel in problem-solving activities. In summary, AI has rendered its learning more targeted, quicker, and effective.	- Prompt feedback -Accelerates the learning - Understand concepts more -Rapidly problem-solving - learning more targeted, quicker, and effective.		

QN 6. To what extent is AI integrated into the vocational curriculum you follow or develop? What opportunities or barriers exist?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 We have not yet adopted a vocational curriculum.	Interviewee 1 We have not yet adopted a vocational curriculum.		Student Engagement and Motivation	AI and its implications in education
Interviewee 2 AI is discussed as subject matter, but it is not integrated.	Interviewee 2 AI is discussed as subject matter, but it is not integrated.	-AI is discussed as subject matter only		
Interviewee 3 No, I have no idea about the vocational curriculum.	Interviewee 3 No, I have no idea about the vocational curriculum.	- No idea		
Interviewee 4 We incorporate AI technology to some extent in the vocational curriculum we follow. The key opportunities include increased productivity and accessible learning for all. However, challenges such as limited skills in using AI tools and financial constraints pose barriers to its full implementation.	Interviewee 4 We incorporate AI technology to some extent in the vocational curriculum we follow. The key opportunities include increased productivity and accessible learning for all. However, challenges such as limited skills in using AI tools and financial constraints pose barriers to its full implementation.	-Increased productivity -Accessible learning for all -limited skills in using AI tools -financial constraints	Learning Outcomes and Benefits	
Interviewee 5 AI is less integrated into our curriculum's projects and classroom teaching. Barriers include a lack of institutional technologies to monitor AI use, especially in a developing country like ours, where resources for moderation and ethical guidelines are limited.	Interviewee 5 AI is less integrated into our curriculum's projects and classroom teaching. Barriers include a lack of institutional technologies to monitor AI use, especially in a developing country like ours, where resources for moderation and ethical guidelines are limited.	-Ethical Guidelines -Lack of institutional technologies -Resources for moderation		

Interviewee 6	Interviewee 6	-Theoretical and software-oriented	Interactive Features and Tools	
In our curriculum, AI is not formally included; it remains theoretical and software oriented. However, there is a significant opportunity to integrate AI with predictive modeling, optimization, and data-driven decision-making in the field of structural engineering. The main barrier is that most of us teachers, including myself, have not had formal training in using AI specifically for structural engineering.	In our curriculum, AI is not officially part of it; it remains theoretical and focused on software. However, there is an excellent opportunity to incorporate AI with predictive modeling, optimization, and data-driven decision-making in structural engineering. The main challenge is that most of us teachers, including myself, lack formal training in using AI specifically for structural engineering.	-Predictive modelling -Optimization -Data-driven decision-making	Negative Impacts	
Interviewee 7	Interviewee 7	- auxiliary tool		
The practical curriculum I currently follow incorporates only a portion of AI. Instead of using it as a formal component of the syllabus, I primarily utilize it as an auxiliary tool for geotechnical engineering, assisting students with simulations, problem-solving, and data interpretation. Since AI can make technical training more engaging, relevant to industry standards, and practical, there is a significant opportunity to expand this approach. However, there are other obstacles as well. Some students still view AI as just a shortcut rather than a teaching tool, and not all pupils have equal access to devices or internet connectivity. Since AI-based modules have not yet been formally incorporated into the curriculum, it is up to teachers to take the initiative in this regard.	The practical curriculum I currently follow incorporates only a portion of AI. Instead of using it as a formal component of the syllabus, I mainly utilize it as an auxiliary tool for geotechnical engineering, assisting students with simulations, problem-solving, and data interpretation. Since AI can make technical training more engaging, relevant to industry standards, and practical, there is a significant opportunity to expand this approach. However, there are other obstacles as well. Some students still view AI as just a shortcut rather than a teaching tool, and not all pupils have equal access to devices or internet connectivity. Since AI-based modules have not yet been formally incorporated into the curriculum, it is up to the teachers to take the initiative.	- problem-solving -data interpretation - technical training - relevant to industry		

QN7. Which AI tools have you used in your classroom, and how do you select those tools to match specific learning objectives?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1

I have not incorporated AI tools into my classroom practice. | Interviewee 1

I have not incorporated AI tools into my classroom practice. | -No AI integration in classroom practice | AI Tools and Their Functions Educational and Content Applications | AI in Education. |
| Interviewee 2

 I have not used any AI tools in the classroom. However, I use AI in content development. | Interviewee 2

 I have not used any AI tools in the classroom. However, I use AI in content development. | -No AI use in the classroom -AI use in content development | | |
| Interviewee 3

 I have used AI tools such as ChatGPT for idea generation and clarification of doubts, and Grammarly for writing improvement. | Interviewee 3

 I have used AI tools such as ChatGPT for idea generation and clarification of doubts, and Grammarly for writing improvement. | -ChatGPT for idea generation -Doubt clarification -Grammarly for writing improvement. | | |

Interviewee 4 I primarily use ChatGPT and Copilot to gather accurate and relevant information quickly and efficiently. Additionally, we use various AI tools to enhance the visual appeal and effectiveness of our presentations. I select these tools based on their ability to support specific learning objectives and improve the overall teaching and learning experience.	Interviewee 4 I primarily use ChatGPT and Copilot to gather accurate and relevant information quickly and efficiently. Additionally, we use various AI tools to enhance the visual appeal and effectiveness of our presentations. I select these tools based on their ability to support specific learning objectives and improve the overall teaching and learning experience.	-Gather accurate and relevant information -Improve presentation -Support learning - Improve the overall teaching -Improve learning experience		
Interviewee 5 I have utilized general AI tools, such as GitHub Copilot, chatbots, and generators, for explanations and project support. I select them based on how well they align with objectives, such as providing deeper insights or quality content, ensuring they promote understanding rather than just quick answers.	Interviewee 5 I have utilized general AI tools, such as GitHub Copilot, chatbots, and generators, for explanations and project support. I select them based on how well they align with objectives, such as providing deeper insights or quality content, ensuring they promote understanding rather than just quick answers.	- GitHub Copilot - Chatbots - Generators -Project support and explanation -Provide quality content	Outcomes and Skills Development Integration Status and Challenges	
Interviewee 6 I mainly use generative AI tools to prepare notes, slides, and even problem sets. Students sometimes use them for report writing or brainstorming research topics. I choose tools based on their accuracy and reliability for our subject matter, and I always remind students to verify answers with textbooks and authentic references.	Interviewee 6 I mainly use generative AI tools to prepare notes, slides, and even problem sets. Students sometimes use them for report writing or brainstorming research topics. I choose tools based on their accuracy and reliability for our subject matter, and I always remind students to verify answers with textbooks and authentic references.	-Prepare notes, slides -Problem set -Report writing or brainstorming research topics		
Interviewee 7 In my classroom, I have used several AI-supported tools, including Plaxis for soil and foundation simulations, AI-based problem generators for soil mechanics, and data analysis platforms for lab and field results. I select tools based on the learning objective: for example, I use Plaxis when I want students to visualize stress distribution, consolidation, or slope stability in 2D or 3D, while AI problem generators help them practice calculations and improve accuracy. The focus is always on aligning the tool with the learning goal; students should not only achieve results, but also understand the process, think critically, and connect theory to practical applications. This way, AI and tools like Plaxis complement hands-on learning instead of replacing it.	Interviewee 7 In my classroom, I have used several AI-supported tools, including Plaxis for soil and foundation simulations, AI-based problem generators for soil mechanics, and data analysis platforms for lab and field results. I select tools based on the learning objective: for example, I use Plaxis when I want students to visualize stress distribution, consolidation, or slope stability in 2D or 3D, while AI problem generators help them practice calculations and improve accuracy. The focus is always on aligning the tool with the learning goal; students should not only achieve results, but also understand the process, think critically, and connect theory to practical applications. This way, AI and tools like Plaxis complement hands-on learning instead of replacing it.	- Soil and foundation simulations -AI-based problem generators -Data analysis platforms -Calculations practice -Improve accuracy -Theory to practical application -Critical thinking		

QN8. Have you utilized AI systems to assess students' competencies? If so, how do you evaluate their fairness and accuracy?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 I have not used AI systems to assess students' competencies.	Interviewee 1 I have not used AI systems to assess students' competencies.	-Not use	Assessment and Evaluation Processes Quality Control and Fairness Feedback and Growth	Qualitative thematic analysis
Interviewee 2 No, I have not.	Interviewee 2 No, I have not.			
Interviewee 3 Yes, I have used AI-based assessment tools for quizzes, skill evaluations, and writing analysis. To ensure fairness and accuracy, I cross-check AI-generated results with manual grading, review question clarity, and monitor for bias by comparing outcomes across different student groups.	Interviewee 3 Yes, I have used AI-based assessment tools for quizzes, skill evaluations, and writing analysis. To ensure fairness and accuracy, I cross-check AI-generated results with manual grading, review question clarity, and monitor for bias by comparing outcomes across different student groups.	-Quizzes, skill evaluations, and writing analysis -Fairness and accuracy -Manual grading -Review question clarity -Monitoring bias across students		
Interviewee 4 Yes, we have used AI systems to grade students in internal examinations and provide personalized suggestions based on their results. These tailored feedback insights help students identify areas for improvement and support their overall growth, while ensuring the assessment process remains fair and accurate.	Interviewee 4 Yes, we have used AI systems to grade students in internal examinations and provide personalized suggestions based on their results. These tailored feedback insights help students identify areas for improvement and support their overall growth, while ensuring the assessment process remains fair and accurate.	-Personalized Suggestion -Tailored feedback -Support overall growth -Fair and accurate assessment		
Interviewee 5 I have not extensively used AI for assessment yet, due to limited institutional support. However, upon consideration, I would evaluate fairness by checking for biases in outputs and accuracy by cross-verifying with manual reviews, although our setup lacks tools for proper moderation.	Interviewee 5 I have not extensively used AI for assessment yet, due to limited institutional support. However, upon consideration, I would evaluate fairness by checking for biases in outputs and accuracy by cross-verifying with manual reviews, although our setup lacks tools for proper moderation.	- Evaluate fairness -Limited institutional support -check for biases in outputs and accuracy -Manual review		
Interviewee 6 Not directly. I do not entirely rely on AI for assessment, but I do use plagiarism checkers and similarity tools before verifying the student's reports. I also usually manually cross-check their work. That way, I can ensure the evaluation is fair and not solely dependent on what an AI tool suggests.	Interviewee 6 Not directly. I do not entirely rely on AI for assessment, but I do use plagiarism checkers and similarity tools before verifying the student's reports. I also usually manually cross-check their work. That way, I can ensure the evaluation is fair and not solely dependent on what an AI tool suggests.	- Use of plagiarism checkers - Verifying the students' reports -Ensuring fair evaluation		

Interviewee 7 Yes, I have utilized AI to assist in assessing students, particularly in verifying calculations, lab data, and problem-solving in geotechnical engineering. To ensure fairness and accuracy, I always double-check the AI's results myself. I also ensure the tool focuses on what students are actually supposed to learn, rather than just providing a number. I will explain to students how AI evaluates their work, which helps them trust the process and reflect on their learning. By combining AI feedback with my own review, students get quicker responses without compromising fairness or reliability.	Interviewee 7 Yes, I have utilized AI to assist in assessing students, particularly in verifying calculations, lab data, and problem-solving in geotechnical engineering. To ensure fairness and accuracy, I always double-check the AI's results myself. I also ensure the tool focuses on what students are actually supposed to learn, rather than just providing a number. I will explain to students how AI evaluates their work, which helps them trust the process and reflect on their learning. By combining AI feedback with my own review, students get quicker responses without compromising fairness or reliability.	-Calculation checking -Lab Data verification -Problem-solving - AI evaluates work - Get a quicker response	Systemic Challenges	

QN9. How prepared are you and your institution to adopt AI in teaching and learning? What support or training has been provided?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 I have not used AI systems to assess students' competencies.	Interviewee 1 I have not used AI systems to assess students' competencies.	-Not use		
Interviewee 2 No, I have not.	Interviewee 2 No, I have not.			
Interviewee 3 Yes, I have used AI-based assessment tools for quizzes, skill evaluations, and writing analysis. To ensure fairness and accuracy, I cross-check AI-generated results with manual grading, review question clarity, and monitor for bias by comparing outcomes across different student groups.	Interviewee 3 Yes, I have used AI-based assessment tools for quizzes, skill evaluations, and writing analysis. To ensure fairness and accuracy, I cross-check AI-generated results with manual grading, review question clarity, and monitor for bias by comparing outcomes across different student groups.	-Quizzes, skill evaluations, and writing analysis -Fairness and accuracy -Manual grading -Review question clarity -Monitoring bias across students	Assessment and Evaluation Processes Quality Control and Fairness	Qualitative thematic analysis
Interviewee 4 Yes, we have used AI systems to grade students in internal examinations and provide personalized suggestions based on their results. These tailored feedback insights help students identify areas for improvement and support their overall growth, while ensuring the assessment process remains fair and accurate.	Interviewee 4 Yes, we have used AI systems to grade students in internal examinations and provide personalized suggestions based on their results. These tailored feedback insights help students identify areas for improvement and support their overall growth, while ensuring the assessment process remains fair and accurate.	-Personalized Suggestion -Tailored feedback -Support overall growth -Fair and accurate assessment		

Interviewee 5 I have not extensively used AI for assessment yet, due to limited institutional support. However, upon consideration, I would evaluate fairness by checking for biases in outputs and accuracy by cross-verifying with manual reviews, although our setup lacks tools for proper moderation.	Interviewee 5 I have not extensively used AI for assessment yet, due to limited institutional support. However, upon consideration, I would evaluate fairness by checking for biases in outputs and accuracy by cross-verifying with manual reviews, although our setup lacks tools for proper moderation.	-Evaluate fairness -Limited institutional support -check for biases in outputs and accuracy -Manual review		
Interviewee 6 Not directly. I do not entirely rely on AI for assessment, but I do use plagiarism checkers and similarity tools before verifying the student's reports. I also usually manually cross-check their work. That way, I can ensure the evaluation is fair and not solely dependent on what an AI tool suggests.	Interviewee 6 Not directly. I do not entirely rely on AI for assessment, but I do use plagiarism checkers and similarity tools before verifying the student's reports. I also usually manually cross-check their work. That way, I can ensure the evaluation is fair and not solely dependent on what an AI tool suggests.	- Use of plagiarism checkers -Verifying the students' reports -Ensuring fair evaluation	Feedback and Growth Systemic Challenges	
Interviewee 7 Yes, I have utilized AI to assist in assessing students, particularly in verifying calculations, lab data, and problem-solving in geotechnical engineering. To ensure fairness and accuracy, I always double-check the AI's results myself. I also ensure the tool focuses on what students are actually supposed to learn, rather than just providing a number. I will explain to students how AI evaluates their work, which helps them trust the process and reflect on their learning. By combining AI feedback with my own review, students get quicker responses without compromising fairness or reliability.	Interviewee 7 Yes, I have utilized AI to assist in assessing students, particularly in verifying calculations, lab data, and problem-solving in geotechnical engineering. To ensure fairness and accuracy, I always double-check the AI's results myself. I also ensure the tool focuses on what students are actually supposed to learn, rather than just providing a number. I will explain to students how AI evaluates their work, which helps them trust the process and reflect on their learning. By combining AI feedback with my own review, students get quicker responses without compromising fairness or reliability.	-Calculation checking -Lab Data verification - Problem-solving -AI evaluates work - Get a quicker response		

QN 10. What steps do you take to ensure ethical use of AI in the classroom, including data privacy, fairness, and equal access?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 I have not been very concerned about this aspect so far.	Interviewee 1 I have not been very concerned about this aspect so far.	-Lack of concern		
Interviewee 2 I communicate a strong warning to students, which I confirm in class with a viva.	Interviewee 2 I communicate a strong warning to students, which I confirm in class with a viva.	-Communicate a warning to the student -Confirmation through viva		

Interviewee 3- AI-based learning equips students with digital literacy, problem-solving, and adaptability skills essential for technology-driven workplaces. It also exposes them to AI tools and real-world applications, making them more confident and competent in meeting the demands of the current and future job market.	Interviewee 3- AI-based learning equips students with digital literacy, problem-solving, and adaptability skills essential for technology-driven workplaces. It also exposes them to AI tools and real-world applications, making them more confident and competent in meeting the demands of the current and future job market.	- Problem-solving - Adaptability skills -Increased confidence and competence - Real-world applications	Student Awareness & Responsibility Skill Development & Learning Outcomes Ethical Use & Digital Rights Accessibility & Digital Divide Pedagogical Approach & Teaching Practices Technology Use & AI Support Data Security & System Management	AI and its implications.
Interviewee 4 We ensure that every student understands how their data is used and how AI is involved in their evaluation. We also ensure that all students have the necessary financial means, computer skills, and internet access to utilize AI tools effectively. To promote ethical use, we emphasize data privacy, fairness, and equal access, and we teach students how to remove or delete their data at any time.	Interviewee 4 We ensure that every student understands how their data is used and how AI is involved in their evaluation. We also ensure that all students have the necessary financial means, computer skills, and internet access to utilize AI tools effectively. To promote ethical use, we emphasize data privacy, fairness, and equal access, and we teach students how to remove or delete their data at any time.	-To promote ethical use -Ensuring financial means, computer skills, and internet access -Remove or delete their data		
Interviewee 5 I encourage students to use AI for generating ideas rather than copying entire outputs, emphasizing the importance of understanding and relevance. For ethics, I discuss data privacy verbally and promote fairness by reminding them not to over-reli on it. However, equal access is challenging due to resource limitations, and we lack formal tools to enforce this.	Interviewee 5 I encourage students to use AI for generating ideas rather than copying entire outputs, emphasizing the importance of understanding and relevance. For ethics, I discuss data privacy verbally and promote fairness by reminding them not to over-reli on it. However, equal access is challenging due to resource limitations, and we lack formal tools to enforce this.	-Emphasizing understanding and relevance -Discussion of data privacy -Promotion of fairness -Challenge of equal access due to resource limitations		
Interviewee 6 I remind students that AI should support their work, not replace their thinking. I also stress that they should always cite properly if they use AI-generated content. For fairness, I suggest using freely available tools, ensuring every student has equal access. I also encourage them to double-check the accuracy of information before using it.	Interviewee 6 I remind students that AI should support their work, not replace their thinking. I also stress that they should always cite properly if they use AI-generated content. For fairness, I suggest using freely available tools to ensure every student has equal access. I also encourage them to double-check the accuracy of information before using it.	-Support work -freely available - Double-check the accuracy -Generate content		

Interviewee 7	Interviewee 7	- Secure platforms		
I take several steps to make sure AI is used ethically in the classroom. First, I am careful about data privacy. Student information is only shared with secure platforms, and I avoid using tools that store sensitive data unnecessarily. For fairness, I always cross-check AI-generated assessments or feedback with my own review to make sure no student is disadvantaged. To ensure equal access, I strive to provide alternatives for students who may not have personal devices or stable internet, such as scheduling lab time or utilizing shared computers. I also explain to students how AI works and encourage them to use it responsibly, so they understand it is a tool to support learning, not replace effort or creativity. Overall, it is about combining technology with thoughtful guidance to keep learning safe, fair, and inclusive.	I take several steps to make sure AI is used ethically in the classroom. First, I am careful about data privacy. Student information is only shared with secure platforms, and I avoid using tools that store sensitive data unnecessarily. For fairness, I always cross-check AI-generated assessments or feedback with my own review to ensure that no student is disadvantaged. To ensure equal access, I strive to provide alternatives for students who may not have personal devices or stable internet, such as scheduling lab time or utilizing shared computers. I also explain to students how AI works and encourage them to use it responsibly, so they understand it is a tool to support learning, not replace effort or creativity. Overall, it is about combining technology with thoughtful guidance to keep learning safe, fair, and inclusive.	- Generated assessments or feedback - Equal access - Learning safe, fair, and inclusive - Scheduling lab time		

QN 11. In your opinion, how does AI-based learning help students become more prepared for the current and future job market?

Individual statement	Identifying keycodes	Selection of keycodes	Converting to subcategories	Converting into main categories
Interviewee 1 I believe students will be better prepared for the coming generation, where AI use will be at its peak, enabling them to adapt to technological advancements effectively.	Interviewee 1 I believe students will be better prepared for the coming generation, where AI use-will be at its peak, enabling them to adapt to technological advancements effectively.	-Adapt to technological advancement		
Interviewee 2 I only see the benefit of AI in clerical jobs. It only supports documentation activities remaining soft skills like verbal communication, gestures, etc are not being improved.	Interviewee 2 I only see the benefit of AI in clerical jobs, it only supports documentation activities remaining soft skills like verbal communication, gestures, etc are not being improved.	-AI benefits in a clerical job -Support documentation Activities -verbal communication, gestures	The Importance of AI Literacy	Developing AI Literacy for Responsible and Efficient Application
Interviewee 3 I review AI outputs for bias, ensure equal access to resources for all students, and provide guidance on the responsible and critical use of AI-generated content.	Interviewee 3 I review AI outputs for bias, ensure equal access to resources for all students, and provide guidance on the responsible and critical use of AI-generated content.	-Review AI outputs for bias -Provide equal access to resources -Critical use of AI-generated content	Practical Applications and Efficiency	
Interviewee 4 I believe AI-based technology is the future, and students cannot ignore its importance. In today's world, students are expected to have a solid understanding of AI and related technologies to remain competitive. AI-based learning equips them with the knowledge and skills needed to succeed in both the current and future job markets.	Interviewee 4 I believe AI-based technology is the future, and students cannot ignore its importance. In today's world, students are expected to have a solid understanding of AI and related technologies to remain competitive. AI-based learning equips them with the knowledge and skills needed to succeed in both the current and future job markets.	-Students cannot ignore its importance -Students need a solid understanding of AI -future job markets		

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Interviewee 5 AI-based learning prepares students by enabling them to produce faster, higher-quality work and become familiar with tools that are increasingly taking over various jobs. It helps complete tasks efficiently, giving an edge in the job market. However, those unfamiliar with AI may struggle and over-dependence without the basics could harm adaptability in future roles.	Interviewee 5 AI-based learning prepares students by enabling them to produce faster, higher-quality work and become familiar with tools that are increasingly taking over various jobs. It helps complete tasks efficiently, giving an edge in the job market. However, those unfamiliar with AI may struggle and over-dependence without the basics could harm adaptability in future roles.	-Fast and quality work -Familiar with tools -Complete tasks efficiently -Struggles without AI skills -Over-dependence		
Interviewee 6 I think AI prepares them in two ways: first, by making them comfortable with new digital tools, and second, by helping them develop adaptability. In the future, engineers will need to work with data and automation much more than they do today. AI-based learning prepares students for that reality and gives them a competitive edge in the job market.	Interviewee 6 I believe AI prepares them in two ways: first, by making students comfortable with new digital tools, and second, by helping them develop adaptability. In the future, engineers will need to work more closely with data and automation than they do now. AI-based learning equips students for that reality and gives them an advantage in the job market.	-Making oneself comfortable with a digital tool -Development ability -Future demand	Ethical and Responsible Use of AI tools	
Interviewee 7 I believe AI-based learning is particularly beneficial for students preparing for the job market, as it provides them with hands-on experience using the tools and simulations that they will actually encounter in real-world engineering applications. In geotechnical engineering, for example, working with AI for soil analysis, lab data, or design simulations builds both technical skills and confidence. It also helps them develop critical thinking, problem-solving, and digital literacy skills that are becoming essential everywhere. Overall, it makes learning more practical and gives students a head start in being job-ready.	Interviewee 7 I believe AI-based learning really helps students prepare for the job market because it provides hands-on experience with the tools and simulations they will actually use in real-world engineering. In geotechnical engineering, for example, working with AI for soil analysis, lab data, or design simulations builds both technical skills and confidence. It also helps them develop critical thinking, problem-solving, and digital literacy skills that are becoming essential everywhere. Overall, it makes learning more practical and gives students a head start in preparing for their careers.	- Technical skills and confidence - Critical thinking - Problem solving -Digital literacy skills -Make practical learning		