



Navigating Generative AI in Higher Education: Mining Engineering Students' Practices, Perceptions, and Language Choices

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Abstract

Generative artificial intelligence (GenAI) has rapidly become an everyday academic resource, making students' actual practices increasingly important for higher-education policy and pedagogy. This small-scale exploratory survey study examines familiarity with, frequency and purposes of use of, attitudes toward, verification practices, and language choices in GenAI among 30 second-year undergraduate students from Mining Engineering, Petroleum Engineering, and Environmental Engineering programmes at the Faculty of Mining and Geology University of Belgrade. For the purposes of the study, the term Mining Engineering students is used as a departmental umbrella term encompassing these three distinct study programmes. Data were collected through an anonymous paper-based questionnaire combining closed-ended, multiple-response, Likert-type, and open-ended items. Descriptive statistics were complemented by exploratory respondent-level comparisons using Fisher's exact tests, Mann–Whitney U tests, and Spearman's rank correlation where appropriate. Twenty students (66.7%) used AI several times per week or almost every day; 21 (70.0%) used it for solving tasks or problems and 17 (56.7%) for understanding course content. Twenty-five students (83.3%) reported asking follow-up questions to obtain more precise information, while 10 of 28 valid respondents (35.7%) checked AI-generated information often or almost always. Open responses primarily emphasised speed and efficiency as benefits and inaccuracy or unreliability as limitations. Language use was flexible: Serbian was prominent, but English and bilingual interaction were also common. Higher self-reported English proficiency was strongly associated with English-involved AI use in an exploratory Fisher's exact test ($p < .001$). The findings suggest pragmatic rather than uncritical GenAI adoption and point to the need for discipline-sensitive AI literacy, transparent institutional guidance, and explicit attention to multilingual AI interaction in higher education.

Keywords: *Generative Artificial Intelligence; Higher Education; Mining Engineering Students; Student Perceptions; AI Literacy; Language Choice.*

1. Introduction

The present study aims to investigate how second-year Mining Engineering students at the Faculty of Mining and Geology, University of Belgrade, engage with generative artificial intelligence (GenAI) in their academic and everyday practices, with particular attention to their familiarity with AI tools, frequency and purposes of use, perceived benefits and limitations, and language choices when interacting with AI. For the purposes of this study, Mining Engineering students is used as a departmental umbrella term encompassing students enrolled in three distinct study programmes: Mining Engineering, Petroleum Engineering, and Environmental Engineering. Particular attention is given to the academic use of GenAI and to the role of Serbian and English in students' interactions with these tools.

The rationale for the study stems from the increasingly prominent role of GenAI in higher education and the speed with which students have incorporated readily accessible AI tools into their learning practices. As student engagement with GenAI develops faster than many institutional and pedagogical responses, understanding what students actually do with these technologies becomes essential. Rather than approaching students primarily through the potential risks of AI use, the present study examines them as active users who make decisions about when, why, and how to employ AI, while also considering their awareness of its benefits and limitations. Examining these practices within a specific engineering and multilingual educational context may provide a

more nuanced understanding of GenAI use and contribute to the development of appropriate AI literacy and pedagogical guidance in higher education.

Artificial intelligence in education (AIED) predates the recent emergence of generative AI and has long encompassed attempts to use intelligent systems to support and transform teaching and learning. Holmes et al. (2019) emphasised the considerable potential of AI for education while cautioning against both technological hype and an uncritical understanding of its educational value. Their discussion anticipated a number of issues that have become increasingly prominent with the emergence of widely accessible generative AI, including the need to reconsider curricula, teaching practices, and the broader pedagogical and ethical implications of AI-supported education.

The public availability of generative artificial intelligence (GenAI), however, has substantially altered both the scale and the character of AI use in education. Contemporary generative systems can respond to natural-language prompts by producing explanations, summaries, translations, text, code, images, and other forms of content. As a result, the discussion in higher education has shifted from whether AI might become relevant to education toward how it is already being used, what students perceive as useful, where they identify limitations, and how institutions should respond.

GenAI has been associated with opportunities for personalised learning, immediate feedback, increased engagement, and more efficient access to educational support, while simultaneously raising practical and ethical concerns related to bias, reliability, and responsible implementation (Adiguzel et al., 2023; Albadarin et al., 2024). Systematic reviews further show that students employ ChatGPT and related tools for explanations of complex topics, writing, summarising, translating, paraphrasing, grammar checking, homework support, and task clarification (Albadarin et al., 2024, pp. 1–2).

The rapid adoption of GenAI has generated both optimism and concern. Its educational affordances include personalised and immediate support, assistance with problem solving and writing, and increased access to information. At the same time, the literature repeatedly identifies inaccurate or fabricated information, bias, academic-integrity concerns, overreliance, and possible effects on independent critical thinking as important limitations (Albadarin et al., 2024, pp. 1–2; Baek et al., 2024, pp. 1–2). This tension suggests that GenAI in higher education is best approached neither as an inherently beneficial innovation nor as a technology that can realistically be excluded from students' academic lives. Baek et al. (2024, p. 6) argue that the widespread penetration of ChatGPT into higher education makes a simple use-versus-ban dichotomy increasingly unrealistic and instead requires clear policies and ethically informed integration.

Students' perceptions are particularly important because students are primary users of educational technologies and because their perceptions of learning environments and resources can influence how they engage with learning. Chan and Hu's (2023, pp. 1, 14–15) survey of 399 undergraduate and postgraduate students found generally positive attitudes toward GenAI alongside concerns about accuracy, privacy, ethics, personal development, and uncertain institutional policies. Their findings also emphasise the importance of formal guidance, critical evaluation of AI-generated content, and AI ethics education. A large global study similarly found that students' perceptions were characterised by cautious optimism: respondents recognised practical educational value while also supporting ethical guidance and expressing concern about cheating, plagiarism, and unreliable information (Ravšelj et al., 2025, pp. 20, 28).

A further reason to investigate student practices is that GenAI adoption is not uniform across disciplines, language backgrounds, or institutional contexts. Baek et al. (2024, p. 5) found that STEM majors were more likely than non-STEM majors to use ChatGPT frequently for general and academic tasks, while non-native speakers of English were more likely than native speakers to use it for writing and programming. The global study by Ravšelj et al. (2025, pp. 17, 28) likewise identified disciplinary differences in usage and in perceptions of ChatGPT's potential for skills development. These findings make discipline-specific investigations particularly valuable, since broad university-wide samples may conceal patterns associated with the nature of students' academic tasks and communicative needs.

1.1. Technology acceptance and the perceived usefulness of GenAI

One useful theoretical lens for interpreting student adoption of GenAI is the Technology Acceptance Model (TAM). Davis (1989) identified perceived usefulness and perceived ease of use as central constructs in technology acceptance. His findings showed that perceived usefulness was strongly associated with user acceptance and suggested that usefulness may be more influential than ease of use in shaping usage behaviour (Davis, 1989, pp. 333–334). This perspective is especially relevant to GenAI because students may adopt such

tools not merely because they are novel or easy to access, but because they perceive them as functionally valuable for accomplishing academic tasks.

The present study does not formally test TAM as a psychometric model, since the questionnaire was not designed as a validated TAM instrument. Instead, perceived usefulness is employed as an interpretative framework. This distinction allows students' reported reasons for using AI to be considered in relation to a well-established account of technology adoption without making causal claims that the research design cannot support. Recent research in higher education similarly treats adoption, intention to use, post-adoption behaviour, and perceived usefulness as central areas for understanding ChatGPT use (Baig & Yadegaridehkordi, 2024, pp. 3, 18).

1.2. Student practices, perceptions, and AI literacy

The growing literature on GenAI suggests that students often approach these tools instrumentally. Albadarin et al. (2024, pp. 1–2) found that learners use ChatGPT as a virtual assistant for immediate answers and explanations, as well as for writing, language support, personalised learning, and task clarification. Chan and Hu (2023, p. 14) similarly grouped perceived benefits around personalised and immediate learning support, writing and brainstorming, research and analysis, multimedia support, and administrative support. The corresponding challenges included accuracy and transparency, privacy and ethics, concerns about holistic competencies and career prospects, human values, and uncertain policies.

The coexistence of perceived benefit and perceived risk is important for conceptualising AI literacy. AI literacy should not be reduced to operational knowledge of how to prompt a system. UNESCO's AI Competency Framework for Students positions responsible AI use within four interconnected dimensions: a human-centred mindset, ethics of AI, AI techniques and applications, and AI system design, developed across the levels of understanding, application, and creation (UNESCO, 2024, pp. 13, 19). The framework emphasises critical judgement, ethical responsibility, and the ability to interact with AI effectively and meaningfully rather than passive adoption (UNESCO, 2024, pp. 13, 78).

This distinction is especially relevant to higher education. Students may be frequent users while still requiring support in verifying outputs, understanding limitations, documenting AI assistance, and distinguishing legitimate support from academically inappropriate substitution. Chan and Hu (2023, pp. 14–15) therefore argue that institutions should develop formal guidance and educational resources that help students evaluate AI-generated content and understand ethical and societal implications. Baek et al. (2024, pp. 6–7) likewise stress that clear policies and AI-literacy training can enable students to benefit from GenAI while reducing uncertainty about acceptable use.

1.3. Language choice and GenAI in multilingual academic contexts

Language is a particularly important but sometimes secondary dimension of GenAI research. Large language models can function simultaneously as information resources, writing assistants, translators, editors, and conversational partners, which makes them especially relevant to students working in a language other than their first language. Baek et al. (2024, pp. 5–6) found that non-native English speakers used ChatGPT more frequently for writing than native English speakers and reported using it to improve grammar and coherence. This suggests that language background can shape not only whether GenAI is used, but also the purposes for which it is employed.

Recent developments in English language teaching further demonstrate that the relevance of GenAI extends beyond general academic support to language-specific learning practices. Edmett et al. (2024), drawing on a review of 43 studies and international stakeholder perspectives, identify applications of AI across speaking, writing, and reading, while also emphasising the need for teacher preparation, pedagogically informed implementation, and ethical guidance. In CLIL language-teaching contexts, these issues become particularly relevant because students interact with AI not only as a source of disciplinary information but also as a language-mediated academic tool.

Liu et al. (2024) investigated GenAI specifically in English academic communication using questionnaire data from 475 students and interviews with 12 participants at two science- and technology-oriented universities. Students generally viewed GenAI positively, particularly for academic writing, grammar, vocabulary, and reading, while identifying limitations in critical thinking, creativity, speaking, information reliability, and ethics (Liu et al., 2024, pp. 1437, 1445). Their instrument explicitly included first language, English proficiency, and academic English skills, illustrating the relevance of linguistic competence to GenAI-mediated academic communication (Liu et al., 2024, pp. 1455–1457).

A regional perspective is provided by Mulalić et al. (2025), whose study of 226 university students in Bosnia and Herzegovina examined perceptions, usefulness, technical use, and positive and negative attitudes toward GenAI in English-language learning. Their participants generally held positive perceptions, and ChatGPT was the most commonly used tool (Mulalić et al., 2025, pp. 349, 358). Such research is particularly relevant in contexts where English functions as an important academic and professional language while students' first-language interaction with AI remains readily available.

1.4. Research gap and research questions

Despite the rapidly expanding literature on students' use and perceptions of GenAI, further research is needed in specific disciplinary and linguistic contexts. Engineering students are a particularly relevant population because their studies combine conceptual learning, problem solving, technical information processing, and engagement with specialised English-language resources. At the same time, relatively little is known about how students in specialised mining-related engineering programmes combine first-language and English-language interaction with AI in their everyday academic practices. By examining disciplinary academic use, critical engagement, and Serbian-English language choice together, the study contributes a discipline-specific and multilingual perspective to the growing literature on student GenAI practices.

Against this theoretical and empirical background, the present study addresses the following research questions:

RQ1. How frequently and for what academic purposes do Mining Engineering students use AI tools?

RQ2. How do Mining Engineering students perceive the benefits, limitations, and potential risks associated with AI tools?

RQ3. What role does language choice, particularly Serbian and English, play in students' interactions with AI tools?

2. Methodology

2.1. Participants and research context

The study involved 30 second-year undergraduate students enrolled in three engineering programmes—Mining Engineering, Petroleum Engineering, and Environmental Engineering—at the Faculty of Mining and Geology, University of Belgrade. The sample included 15 female and 15 male students. For terminological economy, Mining Engineering students is used throughout the paper as a departmental umbrella term; the three programmes nevertheless represent distinct disciplinary areas. The participants shared the same broader institutional environment and attended an English course incorporating CLIL principles and addressing the specific linguistic and communicative needs of students in their respective engineering disciplines. The study used an exploratory cross-sectional survey design and a convenience sample and was not intended to be statistically representative of the wider population of engineering students.

2.2. Research instrument

The study employed a researcher-designed paper-based questionnaire developed specifically to explore students' digital practices and GenAI use within the educational context under investigation. It combined closed-ended items, multiple-response questions, Likert-type statements, optional explanatory prompts, and open-ended questions. The questionnaire covered demographic information and self-reported English proficiency; general digital skills and technology use; familiarity with AI tools; frequency and duration of AI use; academic and non-academic purposes; language choice; strategies used when interacting with AI; verification of AI-generated information; academic-integrity-related behaviour; attitudes toward the future role of AI in education; and students' own descriptions of the principal benefits and limitations of AI. The broader questionnaire included items on general digital practices that are not analysed in detail in the present article; the analysis focuses on variables directly relevant to the three research questions. Because the instrument was developed for this exploratory study rather than adopted as a validated psychometric scale, individual items are interpreted descriptively and are not treated as validated latent constructs. An English translation of the questionnaire items is provided in Appendix A.

2.3. Data collection and coding

Data were collected in person using printed questionnaires. Each questionnaire was assigned an identification number from 1 to 30 for coding purposes; these numbers did not identify the students. After collection, responses were manually coded at respondent level. Unanswered items were treated as missing responses rather than being assigned to any response category. Multiple-response items were coded as non-

mutually-exclusive binary selections, so percentages for these items may sum to more than 100%. Where a respondent selected more than one option on an item intended to capture a single preference, the selections were retained rather than silently recoded. This was particularly relevant to the language-preference item, for which three respondents marked both Serbian and English. Open-ended responses were transcribed and grouped into recurring descriptive content categories.

2.4. Ethical considerations

Participation in the study was anonymous and voluntary. Before completing the questionnaire, students were provided with written information explaining the purpose of the survey, its anonymous nature, and the intended use of the collected data exclusively for educational and scientific research purposes. No personally identifying information was collected or reported. Participation involved the voluntary completion and submission of the anonymous questionnaire.

2.5. Data analysis

Descriptive statistics were used as the primary analytical approach. Frequencies and percentages are reported for closed-ended items, with the valid number of responses stated when an item contained missing data. Open-ended responses were examined through descriptive content coding, and recurring categories are reported using frequencies and percentages. Because the respondent-level coding was retained, a limited set of exploratory inferential analyses was also conducted. Fisher's exact test was used for 2×2 categorical comparisons because of the small sample and expected cell counts; Mann-Whitney U tests were used for exploratory gender comparisons on ordinal variables; and Spearman's rank correlation was used to examine the association between ordinal frequency of AI use and verification frequency. For the language analysis, self-reported English proficiency was dichotomised as lower/intermediate (A1–B1) versus upper-intermediate/advanced (B2–C2), excluding one respondent who selected 'not sure' and one respondent whose proficiency coding was ambiguous. English-involved AI use included English only, equal Serbian-English use, and cases in which both Serbian and English were marked. All inferential results are interpreted cautiously and as exploratory rather than confirmatory because of the small convenience sample and multiple comparisons.

3. Results

3.1. Familiarity with and frequency of AI use

AI use was common in the sample. Twenty of the 30 respondents (66.7%) reported using AI several times per week or almost every day: 13 (43.3%) used it several times per week and seven (23.3%) almost every day. Eight students (26.7%) reported using AI several times per month and two (6.7%) less than once per month. No respondent selected 'never'.

Table 1. Frequency of AI use

Frequency	n	%
Less than once a month	2	6.7
Several times a month	8	26.7
Several times a week	13	43.3
Almost every day	7	23.3

ChatGPT was the most widely recognised platform ($n = 29$, 96.7%), followed by Gemini ($n = 17$, 56.7%). Ten students (33.3%) recognised AI functions embedded in social-media platforms, while familiarity with other named tools was less common.

Table 2. AI tools known to respondents

Tool/category	n	%
ChatGPT	29	96.7
Gemini	17	56.7
AI in social media	10	33.3
Copilot	6	20.0
Grok	4	13.3
Claude	2	6.7
Midjourney	2	6.7
DALL·E	1	3.3

Note. Multiple responses were permitted. DeepSeek was additionally named by one respondent.

3.2. Academic purposes and patterns of AI use

The most frequently selected purpose was solving tasks or problems ($n = 21$, 70.0%), followed by understanding course material ($n = 17$, 56.7%). Eleven students (36.7%) used AI for writing assignments, essays, or other texts, while 10 (33.3%) used it for translation or language learning and 10 (33.3%) for generating images or visual material. Eight students (26.7%) selected entertainment, five (16.7%) programming or technical tasks, four (13.3%) proofreading, four (13.3%) creative work, and two (6.7%) presentation or paper structure.

Table 3. Purposes of AI use

Purpose	n	%
Solving tasks/problems	21	70.0
Understanding course material	17	56.7
Writing assignments/essays/texts	11	36.7
Translation/language learning	10	33.3
Generating images/visuals	10	33.3
Entertainment	8	26.7
Programming/technical tasks	5	16.7
Proofreading/correction	4	13.3
Creative work	4	13.3
Presentations/paper structure	2	6.7

Note. Multiple responses were permitted.

Faculty-related use was also common: five students (16.7%) reported regular use for faculty obligations and 17 (56.7%) occasional use, giving 22 students (73.3%) who used AI regularly or occasionally for academic obligations. Eight students (26.7%) reported rare academic use, and none selected 'never'.

3.3. Interaction strategies and verification behaviour

Students' reported interaction strategies indicate that AI use was often iterative rather than limited to accepting a first response. Twenty-five students (83.3%) reported asking additional questions and requesting more precise information, while 18 (60.0%) asked for explanations of procedures and steps in a specific task. Only five students (16.7%) selected the strategy of asking one question and accepting the answer. Six students (20.0%) reported using AI for ideas while writing the final text themselves; one student (3.3%) reported copying AI-generated text for a seminar paper and changing it only minimally.

Table 4. Reported strategies for working with AI

Strategy	n	%
Ask follow-up questions/request more precise information	25	83.3
Request explanations of procedures/steps	18	60.0
Use AI for ideas but write the text independently	6	20.0
Use AI when translation is needed	5	16.7
Ask one question and accept the answer	5	16.7
Copy AI text and change it minimally for a seminar paper	1	3.3

Note. Multiple responses were permitted.

Verification behaviour was recorded for 28 students. One respondent (3.6% of valid responses) reported never checking AI-generated information, six (21.4%) rarely checked it, 11 (39.3%) checked it sometimes, six (21.4%) often, and four (14.3%) always or almost always. Thus, 21 of 28 valid respondents (75.0%) reported checking AI-generated information at least sometimes, including 10 (35.7%) who did so often or almost always. Explanatory comments frequently referred to AI errors, suspicious answers, incomplete accuracy, or the need to verify unfamiliar information.

Table 5. Frequency of checking AI-generated information

Verification frequency	n	% of valid responses (n = 28)
Never	1	3.6
Rarely	6	21.4
Sometimes	11	39.3
Often	6	21.4
Always/almost always	4	14.3

3.4. Language choice and English proficiency

The language-preference item produced a complete set of responses, but three students selected both Serbian and English on an item intended to identify the language used most frequently. Retaining these selections transparently, 17 students (56.7%) selected Serbian only, two (6.7%) English only, eight (26.7%) equal Serbian-English use, and three (10.0%) marked both Serbian and English. Language switching was also common. Of 29 valid responses, 15 students (51.7%) reported changing language depending on the task or topic, six (20.7%) reported doing so sometimes, and eight (27.6%) reported that they did not.

Table 6. Reported language use with AI

Language-use category	n	%
Serbian only	17	56.7
English only	2	6.7
Equal Serbian and English	8	26.7
Both Serbian and English marked	3	10.0

Note. The final category preserves three respondents' multiple selections rather than recoding them as equal use.

An exploratory respondent-level comparison revealed a strong association between self-reported English proficiency and English-involved AI use. Among the 15 students with valid A1–B1 proficiency data, two (13.3%) reported English-involved AI use, compared with 11 of 13 students (84.6%) at B2–C2 level. Fisher's exact test indicated that this association was statistically significant (odds ratio = 35.75, $p < .001$). Higher proficiency was also associated with reporting at least some language switching: all 13 B2–C2 respondents with valid switching data reported switching at least sometimes, compared with seven of 14 A1–B1 respondents (Fisher's exact test, $p = .006$). These analyses are exploratory and should be interpreted cautiously because of the small cell counts and self-reported proficiency.

3.5. Perceived benefits, limitations, and attitudes

Fourteen students answered the open-ended question about the greatest benefit of AI. Thirteen of these 14 respondents (92.9%; 43.3% of the full sample) referred to speed, efficiency, rapid answers, or rapid access to information. One respondent (7.1% of those answering; 3.3% of the full sample) primarily emphasised support for understanding course material. Eleven students answered the corresponding question about the greatest limitation. Eight of the 11 respondents (72.7%; 26.7% of the full sample) referred to inaccurate, imprecise, unverified, or unreliable information, while three (27.3%; 10.0% of the full sample) mentioned paid features, cost, or restricted access. These open responses are consistent with the verification data, in which most valid respondents reported checking AI output at least sometimes.

Table 7. Main categories in open-ended responses

Category	n	% of N = 30
Benefit: speed/efficiency/rapid access to information	13	43.3
Benefit: support for understanding material	1	3.3
Limitation: inaccuracy/unreliability/unverified information	8	26.7
Limitation: cost/paid access restrictions	3	10.0

Students generally expected AI to remain part of education. Twenty-nine students answered the statement that AI would inevitably become an integral part of learning: 15 (51.7%) agreed and two (6.9%) strongly agreed, while 12 (41.4%) were neutral; no valid respondent disagreed. Views on whether universities should provide lectures on AI use were more mixed: nine of 30 students (30.0%) agreed, 15 (50.0%) were neutral, four (13.3%) disagreed, and two (6.7%) strongly disagreed.

3.6. Academic integrity and exploratory subgroup comparisons

Nine students (30.0%) reported having submitted an assignment that was largely or entirely generated by AI, 18 (60.0%) reported that they had not, and two (6.7%) preferred not to answer; one respondent left the item unanswered. Explanatory comments show that the circumstances varied, including using AI when unsure, using it to help complete an assignment, and relying on it when there was insufficient time. Because the questionnaire did not establish the exact extent of AI contribution or the institutional acceptability of each instance, this result should not be interpreted as a direct measure of academic misconduct.

Table 8. Submission of an assignment largely or entirely generated by AI

Response	n	% of N = 30
Yes	9	30.0
No	18	60.0
Prefer not to answer	2	6.7
Missing	1	3.3

Exploratory gender comparisons did not reveal statistically significant differences in the principal behavioural variables. Frequent AI use (several times per week or almost daily) was reported by 11 of 15 female students and nine of 15 male students (Fisher's exact $p = .700$). Regular or occasional academic use was reported by 12 female and 10 male students ($p = .682$). Among students who answered yes or no to the assignment-submission item, six female and three male students reported submitting an assignment largely generated by AI ($p = .683$). Verification frequency also did not differ significantly by gender (Mann–Whitney $U = 126.0$, $p = .187$). Frequency of AI use was not significantly correlated with verification frequency (Spearman's $\rho = .143$, $p = .469$, $n = 28$).

4. Discussion

The first research question concerned the frequency and academic purposes of AI use. The results indicate that GenAI was a regular feature of participants' study practices: two-thirds of the sample used AI several times per week or almost every day, while solving tasks and understanding course material were the two most frequently selected purposes. Almost three quarters used AI regularly or occasionally for faculty obligations. These findings are consistent with systematic evidence showing that students use GenAI for explanations, task clarification, writing, translation, and personalised support (Albadarin et al., 2024, pp. 1–2). They also support Baek et al.'s (2024, p. 6) argument that ChatGPT has already become embedded in everyday higher-education practice to an extent that makes a simple use-versus-ban dichotomy increasingly unrealistic.

The prominence of solving tasks and understanding material is particularly relevant to the disciplinary context of the sample. Mining Engineering, Petroleum Engineering, and Environmental Engineering require students to work with technical concepts, problem-solving procedures, and specialised information. Although the present sample is too small for disciplinary generalisation, the pattern is compatible with research showing substantial GenAI engagement among STEM students. Baek et al. (2024, p. 5) found that STEM majors were more likely than non-STEM majors to use ChatGPT frequently for general and academic tasks, while Ravšelj et al. (2025, p. 28) identified disciplinary variation in perceptions of ChatGPT-supported skills development.

The second research question addressed students' perceptions of the benefits, limitations, and potential risks of AI. The open-ended responses reveal a coherent pairing: among those who answered, speed, efficiency, and rapid access to information were by far the most frequently mentioned benefits, whereas inaccuracy and unreliability were the most frequently mentioned limitations. Davis's (1989, pp. 333–334) emphasis on perceived usefulness offers a useful interpretative lens: students appear to value AI primarily because it performs immediately useful functions in the context of study. However, the verification data add an important qualification. Three quarters of valid respondents checked AI-generated information at least sometimes, and more than one third did so often or almost always. Students' explanatory comments explicitly referred to errors, suspicious answers, and incomplete accuracy.

Interaction strategies reinforce this interpretation. More than four fifths of the sample reported asking follow-up questions and requesting more precise information, while three fifths asked for explanations of procedures and steps. Only five students selected the strategy of asking one question and simply accepting the answer. Taken together, these findings suggest a pattern of pragmatic rather than uncritical GenAI adoption: students value the speed and functional utility of AI while often engaging iteratively with its responses and recognising that its outputs may require verification. This balanced pattern resembles findings from Chan and Hu (2023, pp. 1, 14–15), Liu et al. (2024, pp. 1437, 1445), and the global study by Ravšelj et al. (2025, p. 20), all of which combine perceived educational value with concerns about reliability, ethics, or critical use.

The third research question concerned language choice. Serbian was the most common single-language choice, but English and bilingual interaction constituted a substantial part of reported practice. More importantly, respondent-level analysis showed a strong exploratory association between higher self-reported English proficiency and English-involved AI use: 84.6% of B2–C2 respondents used English in some form, compared with 13.3% of A1–B1 respondents. All valid B2–C2 respondents also reported switching languages at least sometimes. These findings provide empirical support for treating language choice as a meaningful dimension of GenAI use rather than a peripheral demographic characteristic.

This language pattern is particularly relevant in an engineering course incorporating CLIL principles. Baek et al. (2024, pp. 5–6) found that non-native English speakers used ChatGPT more frequently for writing-related purposes, particularly grammar and coherence. Liu et al. (2024, pp. 1437, 1455–1457) likewise demonstrate the relevance of English proficiency, first language, writing, grammar, vocabulary, and academic communication to students' GenAI practices. Edmett et al. (2024) position AI as an increasingly relevant component of English-language teaching and learning while emphasising pedagogically informed and ethically responsible implementation. In the geographically closer study conducted in Bosnia and Herzegovina, students generally viewed GenAI positively for English-language learning, with ChatGPT emerging as the most commonly used tool (Mulalić et al., 2025, pp. 349, 358).

The academic-integrity item requires a similarly cautious interpretation. Thirty percent of the sample reported having submitted an assignment that was largely or entirely generated by AI. The questionnaire does not establish the precise circumstances, the degree of AI contribution in each case, or whether a particular use contravened course rules; consequently, the finding should not be equated automatically with misconduct. It nevertheless indicates that AI-supported authorship is not merely a hypothetical issue within the surveyed cohort. Baek et al. (2024, pp. 6–7) and Chan and Hu (2023, pp. 15–16) similarly emphasise the need for clear institutional guidance so that students can distinguish legitimate assistance from academically inappropriate substitution.

From this perspective, the educational response should move beyond operational training in how to use AI tools. UNESCO's AI Competency Framework for Students emphasises human-centred judgement, ethics, technical understanding, and responsible application as interconnected dimensions of AI competence (UNESCO, 2024, pp. 19, 78). The present findings point in the same direction. Students are already using AI and many already display rudimentary verification and iterative prompting practices. The pedagogical task is therefore to develop these practices into explicit AI literacy: evaluating outputs, checking technical information against disciplinary sources, documenting AI assistance, understanding hallucination and bias, and making informed choices about language and prompting.

The exploratory subgroup analyses also help delimit the conclusions. No statistically significant gender differences were found in frequent use, academic use, assignment submission, or verification frequency, and frequency of AI use was not significantly associated with verification frequency. The strongest subgroup pattern concerned English proficiency and language behaviour. Given the small sample and multiple exploratory comparisons, these findings should not be treated as population estimates; however, they identify language proficiency as a particularly promising variable for larger-scale follow-up research.

The study therefore illustrates why small discipline-specific investigations can complement large international surveys. Global studies provide evidence about broad patterns, but the meaning of GenAI use is shaped by local curricula, disciplinary practices, language repertoires, and institutional expectations. The present sample brings together three related engineering programmes within one departmental environment and highlights the intersection of technical study, academic problem solving, critical engagement with AI output, and multilingual interaction.

4.1. Limitations

Several limitations must be acknowledged. First, the sample is small ($N = 30$), was obtained through convenience sampling, and represents a single institutional context. The findings should therefore be interpreted as exploratory and context-specific rather than generalised to engineering students as a whole.

Second, the study relies on self-reported behaviour rather than direct observation of AI use. Self-reports may be affected by recall, interpretation of questionnaire categories, and social desirability. Third, the questionnaire was researcher-designed for this exploratory study and was not subjected to formal psychometric validation; accordingly, the findings concern reported practices and attitudes rather than validated latent constructs.

Fourth, several items contained missing or ambiguous responses. These were retained transparently as missing or multiple selections rather than reconstructed. Self-reported English proficiency also contained one ambiguous coding case and one 'not sure' response, both of which were excluded from the proficiency-based inferential comparison. The inferential analyses are therefore exploratory, involve small cell sizes and multiple comparisons, and should be interpreted cautiously despite the use of exact tests where appropriate.

Finally, the open-ended responses were brief and were coded descriptively by a single researcher; no inter-coder reliability estimate was available. Future research should replicate the study with a larger multi-cohort or multi-institutional sample, a digitally captured respondent-level dataset, and a refined instrument. Interviews or

focus groups could additionally clarify why students switch languages, how they judge AI accuracy, and where they draw the boundary between legitimate assistance and substitution.

5. Conclusion and Pedagogical Implications

This study indicates that GenAI is already part of the academic practices of the surveyed Mining Engineering students, used here as an umbrella term for students in Mining Engineering, Petroleum Engineering, and Environmental Engineering programmes. Frequent use was common, and the most prominent applications were connected to academic problem solving and understanding course material. Students' interaction strategies and verification practices further indicate that use is often active and iterative rather than limited to passive acceptance of AI output.

The findings complicate two simplistic narratives: that students use AI merely because it is fashionable and that frequent users necessarily lack awareness of its limitations. In this sample, students appear to approach AI primarily as a functional academic resource while retaining reservations about the trustworthiness of its outputs. Language choice adds another layer to this pragmatism. Serbian remains prominent, but English and language switching are meaningful parts of students' interaction strategies, and the exploratory analysis suggests a strong relationship between higher English proficiency and English-involved AI use.

Pedagogically, the results support the explicit development of AI literacy within higher education. For engineering and CLIL/ESP-oriented contexts, such literacy should include verification of technical information, critical comparison of AI output with disciplinary sources, transparent acknowledgement of AI assistance, iterative prompt formulation, awareness of hallucination and bias, and informed language choice. The goal is not to position AI as a replacement for disciplinary learning or language development, but to help students become critical, responsible, and purposeful users of technologies that are already present in their academic lives.

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APPENDIX A. QUESTIONNAIRE (ENGLISH TRANSLATION)

Note. The questionnaire was administered in Serbian. The English version below is provided for publication transparency. Multiple-response items are indicated where applicable. Optional explanatory prompts followed several closed-ended questions.

SURVEY – UNIVERSITY STUDENTS' ATTITUDES TOWARD ARTIFICIAL INTELLIGENCE IN HIGHER EDUCATION

Introduction

This survey examines how university students use tools based on artificial intelligence (AI).

The survey is anonymous, and the data collected will be used exclusively for educational and scientific research purposes.

The survey takes approximately 15 minutes to complete.

In this survey, the term “digital technologies” refers to the general use of technology, including computers, laptops, smartphones, tablets, the Internet, social media, applications, learning platforms, and similar digital tools.

The term “AI” (Artificial Intelligence) is used specifically to refer to tools based on artificial intelligence, such as ChatGPT and similar chatbots, image and text generators, and related systems.

Part I. Demographic and digital background

1. Gender: Female / Male / Other / Prefer not to say.
2. Where are you from? (city/town and country).
3. How long have you been learning English? Less than 2 years / 2–5 years / 6–9 years / 10 years or more.
4. What is your level of English? (self-assessment): A1 / A2 / B1 / B2 / C1 / C2 / Not sure.
5. How would you rate your digital skills? Very poor / Poor / Average / Good / Very good.
6. How often do you use digital technologies (computer, Internet, applications)? Never / Occasionally / Every day but to a limited extent / Very frequently every day / Constantly. Optional: estimate daily hours.

Part II. Familiarity with AI tools

7. Which AI tools are you familiar with? (multiple responses): ChatGPT / Gemini / Copilot / Grok / Claude / Midjourney / DALL·E / AI in social media / I do not know their names / Other.
8. Where did you first hear about AI tools? (multiple responses): social media / friends or colleagues / university teachers or classes / media / courses or workshops / independent research / do not remember.

Part III. Use of AI tools

9. How often do you use AI tools? Never / Less than once a month / Several times a month / Several times a week / Almost every day. Optional explanation.
10. How long does one typical AI session last? Less than 5 minutes / 5–15 minutes / 15–30 minutes / 30–60 minutes / More than 60 minutes.
11. For what purposes do you most often use AI tools? (multiple responses): writing papers/essays/texts / translation and language learning / cheat sheets / understanding course material / proofreading / solving tasks or problems / programming or technical tasks / presentations or paper structure / image generation / creative work / entertainment / other.
12. Do you use AI in connection with university obligations? Yes, regularly / Yes, occasionally / Rarely / Never. Optional explanation.

13. Have you ever submitted an assignment that was largely or entirely generated by AI? Yes / No / Prefer not to answer. Optional explanation.

Part IV. Language choice in AI tools

14. In which language do you most often use AI tools? Serbian / English / Serbian and English equally / Another language. Why?

15. Do you sometimes change language depending on the task or topic? Yes / No / Sometimes. Optional explanation.

Part V. Strategies for working with AI

16. How do you usually use responses from AI tools/chatbots? (multiple responses): ask one question and accept the answer / ask follow-up questions and request more precise information / copy AI text for a seminar paper and change it minimally / use AI for ideas but write the text independently / use it when translation is needed / ask for explanations of procedures and task steps / other.

17. How often do you check the accuracy of information obtained from AI tools? Never / Rarely / Sometimes / Often / Always or almost always. Optional explanation.

18. Indicate agreement with: "AI will one day become an integral part of the learning process; this is inevitable." Strongly disagree / Disagree / No opinion / Agree / Strongly agree. Optional explanation.

19. Indicate agreement with: "Universities should provide classes/lectures on the use of AI." Strongly disagree / Disagree / No opinion / Agree / Strongly agree.

Part VI. Open-ended questions

20. In your opinion, what is the greatest benefit of using AI?

21. In your opinion, what is the greatest disadvantage of using AI?

22. Do you have any suggestions concerning the use of AI tools among students?

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