

Article

University Students' Attitudes and Perceptions towards AI Tools: Implications for Sustainable Educational Practices

Ajda Fošner 

Faculty of Management, University of Primorska, Izolska vrata 2, 6000 Koper, Slovenia; ajda.fosner@upr.si

Abstract: The integration of artificial intelligence (AI) tools in educational settings offers significant opportunities to promote sustainability by transforming learning experiences. This study analyses the usage, attitudes, and perceptions of AI tools among university students in Slovenia providing a comprehensive analysis that informs both academic practices and policy-making with emphasis on sustainability. We used a structured questionnaire with a sample of 422 participants reflecting a diverse demographic profile across various fields of study. The questionnaire was designed to measure the frequency of AI tool usage, the purposes for which these tools are employed, and students' attitudes and perceptions towards AI's potential benefits and drawbacks in education. Statistical analyses, including Analysis of Variance (ANOVA), were utilized to test hypotheses concerning differences in AI tool usage based on the level and field of study. Findings reveal that students recognize the efficiency of AI, but express concerns about its impact on learning quality and academic integrity, emphasizing the need for a balanced and responsible integration of AI in education to achieve sustainable outcomes. Results indicated that a majority of students are engaging with AI tools, with varied frequencies of use largely dependent on their field of study and academic level. The findings suggest that while AI tools are becoming an integral part of the educational landscape in Slovenia, there is a critical need to address the educational, ethical, and psychological impacts of these technologies. The results highlight the necessity for further research into the educational implications of AI, suggesting a balanced and sustainable approach to integrating these technologies into higher education curricula. Such an approach ensures that the adoption of AI not only enhances learning outcomes but also aligns with the principles of sustainability, promoting long-term benefits for both education and society.



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Keywords: higher education; AI tools; sustainability in education; university students; students' attitude; students' perception; Slovenia; sustainable development

1. Introduction

The rapid expansion of the field of artificial intelligence (AI) is drastically altering how people live, work, learn, engage, and communicate [1–3]. In particular, AI is rapidly transforming the educational landscape. By utilizing AI-powered tools, teachers may better prepare students for success in the digital age and improve their outcomes. With personalized learning platforms and intelligent tutoring systems, AI tools are offering innovative ways to achieve student engagement and support their learning outcomes. Higher educational institutions, in particular, are at the forefront of adopting and utilizing these technologies, impacting not just the pedagogical process but also students' daily activities. Thus, it is crucial to understand the perspectives of university students who are also direct consumers and future promoters of these technologies. Additionally, the integration of AI in education can contribute to multiple Sustainable Development Goals (SDGs) by enhancing access to quality education, promoting gender equality, and supporting decent work and economic growth. This approach ensures that the deployment of new technologies not only advances educational goals but also contributes to broader socio-economic objectives and sustainability.

The use of AI tools in educational settings helps to achieve educational equity and lifelong learning, important parts of Sustainable Development Goals. By enabling personalized learning, AI tools provide all students, regardless of background, with quality educational opportunities. AI-driven education also promotes environmental sustainability by minimizing reliance on physical resources and reducing the energy consumption typical of traditional educational methodologies. Additionally, our study highlights the role of AI in preparing students for future challenges in a digitized economy, thus contributing to economic sustainability. Our research actively supports the advancement of sustainable educational practices, ensuring that the adoption of AI tools contributes positively to the broader societal and environmental goals.

We are all aware that AI tools have great potential, that they can facilitate our learning, that we can use these technologies to personalize our studies and optimize administrative processes. However, the adoption and utilization of these tools can vary significantly across different regions and educational systems. This study aims to fill a gap in the literature by investigating the use of AI tools among higher education students in Slovenia and examining how factors such as the level and field of study influence the frequency of AI tool usage. Moreover, we will link the results with sustainable practices in education.

As already mentioned, despite the promising potential of AI in education, its adoption is not uniform across different regions [4]. Slovenia is a Central European country with a well-established education system and a growing interest in digital transformation. However, there is a lack of research focused on the adoption and use of AI tools in Slovenian higher education. A preliminary review suggests that while there is an increasing awareness of AI's potential benefits, comprehensive analyses of actual usage patterns and influencing factors remain limited. This gap highlights the need for a focused study to understand how Slovenian students are engaging with AI tools. Thus, the primary objective of this study is to analyze the use of AI tools among students in Slovenian higher education institutions. The findings from this study could help tailor AI educational tools to be more effective and inclusive, supporting SDGs related to quality education and reducing inequalities. Additionally, by ensuring these technologies are accessible to all students, we contribute to building resilient infrastructure and fostering innovation, aligning with the broader objectives of sustainable development.

A structured questionnaire was designed to collect quantitative data. By analyzing collected data, we explored three key aspects: usage patterns, attitudes and perceptions. We examined the types of AI tools students are utilizing in their academic work how often they do so. We observed when and where university students are using AI technologies and how familiar they are with them. Next, we analyzed students' attitudes, exploring their perceived benefits and the efficiency of using AI tools in education. At the end, we delved into students' perceptions of the results provided by AI tools, observing students' level of trust and potential concerns associated with AI usage.

Based on the reviewed literature, we set up two hypotheses, both referring to university students in Slovenia and the use of AI tools in educational settings.

- H1.** *The level of study significantly affects the frequency of AI tool usage among university students.*
- H2.** *The field of study significantly affects the frequency of AI tool usage among university students.*

To test the hypotheses H1 and H2, we used Analysis of Variance (ANOVA). With statistical verification of the established hypotheses and by analyzing the above aspects, we gain valuable insights into how university students are integrating AI technologies into their learning experiences. We provide valuable insights into the current state of AI tool usage among Slovenian higher education students (possible patterns and prevalence), reveal differences in AI tool adaptation based on the level and field of study, and identify possible barriers to AI tool usage. Our findings can inform the development of responsible and sustainable AI practices in higher education, ensuring that students are equipped to leverage AI tools effectively while contributing to broader sustainability goals. By fostering

an environment that encourages thoughtful and ethical use of AI, we can support the long-term integration of these technologies in a way that enhances both educational outcomes and sustainable development.

2. Literature Review

The public has been interested in generative AI models because of their remarkable capacity to produce material that looks human-created. One prominent example of such a model is ChatGPT [5]. These technologies can be useful in educational settings for both teachers and students. AI tools can, for example, assist students with complex problem-solving, question-answering, and essay writing, hence expediting their learning process [6]. Adiguzel et al. [7] claim that ChatGPT provides learners with a number of chances, such as boosting intrinsic learner motivation, facilitating a deeper comprehension of topics, and facilitating the development of expertise. The integration of AI technology into the four primary educational areas of learning, teaching, assessment, and administration has been studied by Chiu et al. [8]. By applying matrix coding and text analysis techniques to the literature, the authors observed the opportunities and difficulties of integrating AI in education. The findings highlight 13 major roles of AI tools in educational settings, 7 learning outcomes and 10 significant concerns.

Personalized learning based on AI can potentially transform learning. AI-powered adaptive learning systems work to alter curricula and pedagogical approaches dynamically, dependent on real-time assessments of student's performance and engagement [9]. Those systems (i.e., intelligent tutoring systems) have the potential to simulate one-to-one instruction, thus providing a personal touch to teaching and learning processes [10]. In addition to designing effective and efficient learning experiences, AI can help students prepare for exams and achieve higher test scores [11].

Even while AI tools have many advantages, using them in the academic setting has drawbacks and challenges [12]. One of the main concerns is the potential for these technologies to reinforce existing prejudice and discrimination in research and education. Furthermore, there is a chance that AI systems will be altered or influenced, which could produce biased or incorrect outcomes [13]. Recently Lo [14] studied ChatGPT's capabilities across different disciplines, potential educational uses, and issues that researchers brought up after the first three months that the application was released. The results showed that ChatGPT's performance differed depending on the area, with notable outcomes in fields like economics and programming but poor results in mathematics.

According to Zhu et al. [15], the utilization of AI chatbots can enhance educational experiences by offering personalized support, facilitating information retrieval, and encouraging critical thinking abilities. However, some express concerns regarding potential over-reliance on AI, noting issues with creativity, originality, and the growth of autonomous thought [12]. According to a survey conducted by BestColleges, in the US, 50% of students used ChatGPT for a small percentage of their work while finishing the remainder on their own. Moreover, 30% of the students used ChatGPT for the majority of their assignments and 17% of students finished their assignments using ChatGPT and submitted them without making any changes [16]. Furthermore, von Garrel and Mayer [17] conducted a nationwide survey of German students to understand how students interact with AI technologies. Their results indicate that nearly two-thirds of respondents have utilized AI tools for their studies, with ChatGPT and GPT-4 being the most commonly mentioned. Engineering, mathematics, and natural science students reported the highest usage rates.

Several authors brought up concerns about AI usage including ethical, legal, copyright, and transparency concerns. Bias, plagiarism, a lack of creativity, erroneous content that creates misleading narratives in the workplace and school, ignorance, improper citations, cybersecurity vulnerabilities, and the possibility of disseminating false information were among the other factors taken into account [5,12]. Therefore, according to Eken [18], integrating AI chatbots into the classroom may present ethical issues that jeopardize the fundamental principles of education. Recently, Abulibdeh et al. [19] critically analyzed

the transformative potential and moral issues of the use of AI chatbots in education, the necessity of lifelong learning, and the importance of collaboration with industry.

Okulich-Kazarin et al. [20] investigated the perception of AI's impact on higher education's sustainability. By surveying 1104 students from eight Eastern European universities, their study explores concerns over AI replacing faculty and its potential to undermine a "safe" learning environment as defined under Sustainable Development Goal 4.3. Despite AI's advantages for personalized and efficient learning, a considerable minority of students fear that AI may destabilize the education system, indicating a need for strategic implementation to preserve educational integrity and sustainability (see also [21]).

Let us also point out that not all regions have adopted AI technology in education equally. Because of resources and because technology infrastructure is better, developed countries typically have higher adoption rates. In contrast, developing regions face challenges such as limited access to technology, lack of awareness, and inadequate training for educators. For instance, a comparative study by Smith and Jones [4] highlighted that while the United States and Western Europe have integrated AI tools extensively into their educational systems, countries in Sub-Saharan Africa are still in the nascent stages of adoption.

Due to the importance of the topic, the number of studies and national and international initiatives has significantly increased [22]. For instance, in order to promote greater integration of intelligent technology into education, the Chinese government launched a strategic policy in 2019 [1–3]. In the US, several institutions received grants to create AI-driven personalized learning platforms. These platforms have the potential to improve academic performance by increasing students' cognitive engagement and to lessen educational disparities by helping students from disadvantaged backgrounds [23]. Furthermore, the University of Oulu in Finland and Radboud University in the Netherlands have received grants to build a global research center designed to prepare students for the age of AI [24].

The number of review papers on the topic has significantly increased lately. For instance, there are several comprehensive reviews of trends in educational AI tools and technologies [12,25]. Bozkurt et al. [26] studied patterns in publications. Other review articles have concentrated on specific fields of study, like medicine, mathematics, and languages [27] or particular teaching activities, like assessment [28] or particular technologies and applications, like proctoring systems, assistive robots, and adaptive learning [9,29].

This study aims to bridge the knowledge gap regarding AI tool usage among Slovenian higher education students. By examining students' perception and attitudes towards AI tools usage this research will contribute to the broader discourse on digital transformation in education and support the development of more inclusive and effective educational practices in Slovenia. The findings from this study will help to ensure that the integration of AI tools in education also aligns with the goals of sustainable development, fostering an educational environment that is equitable and future-oriented.

3. Materials and Methods

We used an online structured questionnaire to obtain data and to analyze university students' views, attitudes and perceptions about AI tools usage. The questionnaire was distributed among students in March 2024 through the online open-source survey tool 1 KA which offers several advantages (e.g., user-friendly interface, supporting various types of questions and analysis), making it a popular choice for researchers, educators, and businesses. Moreover, 1 KA is designed with a strong emphasis on data protection regulations, like ensuring data are collected and stored securely.

The target population was students from the University of Primorska, the third-largest public university in Slovenia with 5744 students in the school year 2023/24 [30]. We also surveyed students at GEA College—Faculty of Entrepreneurship, the leading private business school in Slovenia with 401 students in the school year 2023/24 [31]. Without using any additional criteria based on study level, gender, age, or any other factor, the

questionnaires were randomly distributed. Following data collection, 422 fully completed questionnaires were gathered, and these were then subjected to additional analysis using both descriptive and inferential statistics.

It should also be noted that although we did not statistically analyze the representativeness of the sample, it does reflect the diversity of the underlying students in several ways, including gender (a representative balance between genders), age, academic level, and academic field.

We first identified relevant variables through a thorough literature review, ensuring the questionnaire covered key areas of interest related to students' use of AI in education. We consulted with experts in educational technology during the preparation of the questionnaire to validate the relevance and clarity of each question. This collaborative approach ensured that the content provided a holistic view of the students' experiences.

The questionnaire was divided into three parts. The questions were created by incorporating scales and measurements from earlier research, primarily survey-based empirical literature. The first part focused on demographic information: gender, age, level and field of study (see Table 1). In the second part of the survey, we asked students about the frequency and purpose of the use of AI tools. For this, we utilized questions from the Welding [32] study (see also [33,34]).

Table 1. Summary of demographic information ($N = 422$).

Demographic Characteristics	Options	Option Frequency	Relative Frequency (%)
Gender	Male	200	47%
	Female	222	53%
Age	18–21	164	39%
	22–25	123	29%
	26–29	133	32%
	Over 29	2	0%
Status	First-year Undergraduate Student	130	31%
	Second-year Undergraduate Student	81	19%
	Third/Final-year Undergraduate Student	113	27%
	Postgraduate Student	98	23%
Field of Study	Humanities	59	14%
	Social Sciences	95	23%
	Natural Sciences and Mathematics	93	22%
	Technological Sciences	86	20%
	Interdisciplinary Studies	89	21%

In the third part of the survey, we observed students' attitudes and perceptions towards AI tools usage. In this part, students evaluated nine statements. Students' attitudes regarding the benefits of using AI tools in a learning context comprise six items. Statements were taken from the Swedish study [35]. Students' perceptions regarding results generated by AI tools comprised three items. This part was taken from the US study [32]. Following the mentioned research [32,35], we used a 3-point Likert scale, comprising 'Agree', 'Disagree', and 'Neutral' options. The employment of such a simple scale was strategically chosen to align with the study's objectives, ensuring efficient data collection while maintaining the clarity and integrity of the participants' responses.

According to a descriptive study of the respondents' demographics, 53% of respondents were women and 47% of respondents were men. Of these, 39% were between the ages of 18 and 21, 29% were between the ages of 22 and 25, 32% were between the ages of 26 and 29, and only 2 students were older than 29. Regarding the responders' position, they were divided into four groups: first-year undergraduates (31%), second-year under-

graduates (19%), third/final-year undergraduates (27%), and postgraduate students (23%). We divided the respondents into five groups based on their field of study, considering the CERIF classification of fields [36]. Of these, 14% of the respondents were studying in the field of humanities, 23% of the respondents were studying in the field of social sciences, 22% of the respondents were studying in the field of natural sciences and mathematics, 20% of the respondents were studying in the field of technological sciences, and 21% in the interdisciplinary field.

4. Results

In this section, we provide the findings of the quantitative data collected by the online questionnaire using tables and graphs. In the first part, we present the results about the frequency and purpose of using AI tools among Slovenian students. This is followed by testing hypotheses H1 and H2. In the last part, we analyze students' attitudes and perceptions towards AI tools.

4.1. Frequencies and Purpose of Using AI Tools

First, we asked students about the frequency and purpose of using AI tools. According to the collected data presented in Figure 1, half of the surveyed students (51%) use AI tools often, 22% very often, 21% sometimes, 4% rarely, and just 2% of them do not use these tools at all. The average of the data in Figure 1 is 3.9 with a standard deviation of 0.9.

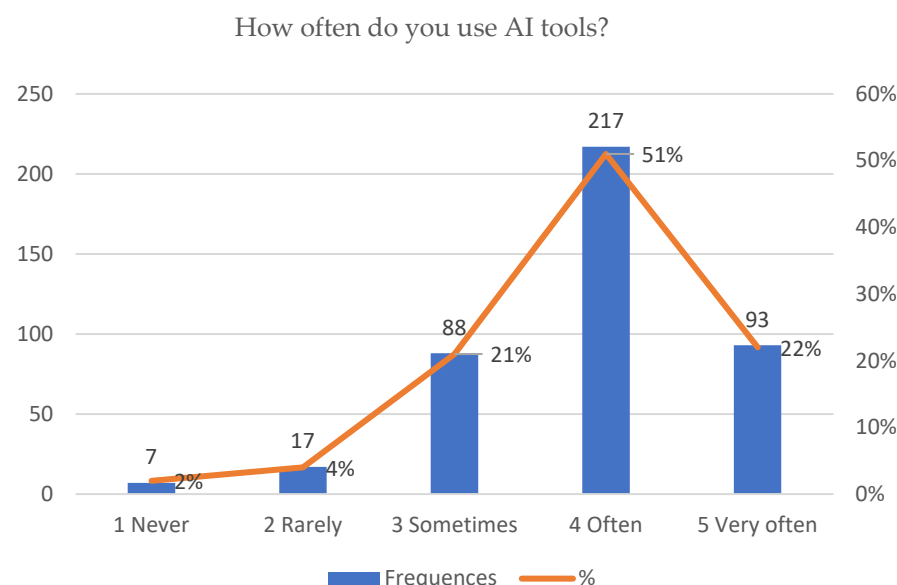


Figure 1. The frequency of using AI tools ($N = 422$).

Further, we asked students in what way they use AI tools (Figure 2). Just 1% of surveyed students use AI tools to complete student work without editing. More than half of them (53%) use AI tools just for some parts of assignments but complete the majority themselves; 31% of students use AI tools to complete the majority of the assignment but revise it; and 15% of the students do not use AI tools at all for student work.

Table 2 shows how often students use AI tools for assignments such as summarizing and paraphrasing texts; composing formal documents; translating; spelling and grammar checks; generating unique ideas; and preparing for tests. Here, we used a 5-point Likert scale ranging from (1) never to (5) very often.

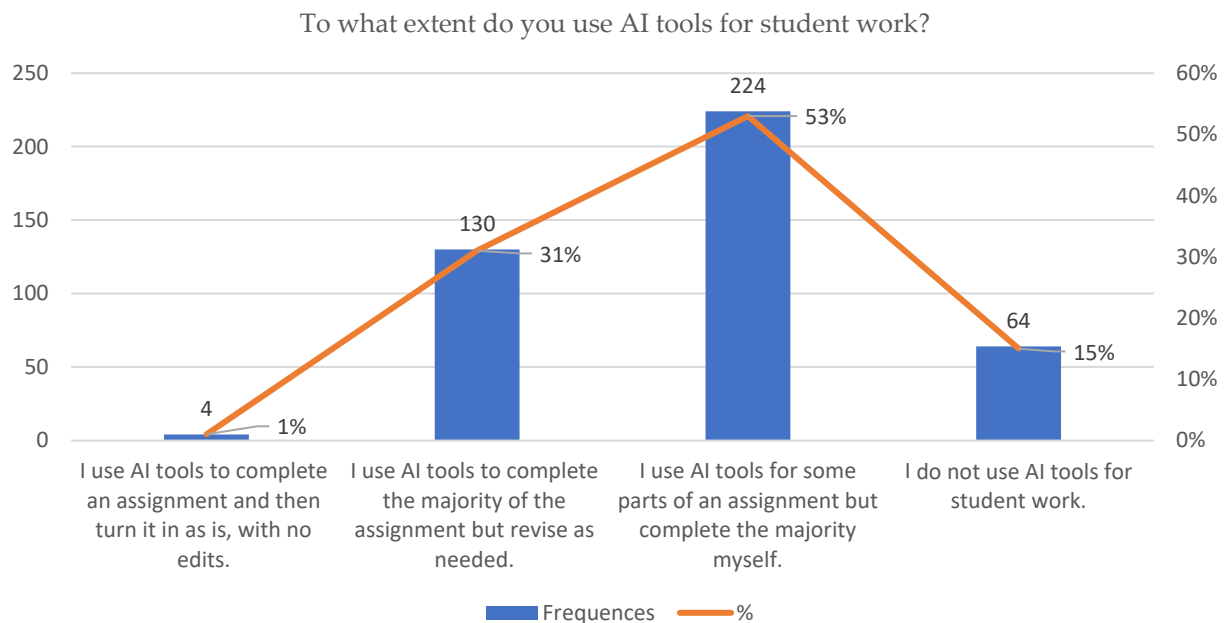


Figure 2. Ways in which students use AI tools ($N = 422$).

Table 2. The purpose of using AI tools ($N = 422$).

	Average	Standard Deviation
Summarizing and paraphrasing texts, and composing formal documents		
Summarizing essays, articles, books, movies, etc.	3.4	0.99
Paraphrasing texts	3.4	0.99
Managing and writing applications and emails	3.4	1.27
Translating, spelling and grammar checks		
Using as a translator	3.5	1.21
Using as a spelling and grammar checker	3.4	1.32
Generating unique ideas		
Generate ideas and responses for homework and assignments	2.2	1.06
Generate ideas for projects, seminars and other students' homework	2.3	1.03
Preparing for tests		
Practicing for exams and tests	1.4	0.86
Organizing academics and managing time	1.2	0.63

The results show that students often use AI tools for the following activities (average above 3): summarizing essays, articles, books, movies, etc.; paraphrasing texts; managing and writing applications and e-mails; translating; and checking spelling and grammar. On the other hand, they rarely use AI tools for generating ideas and responses for homework and assignments and generating ideas for projects, seminars and other students' homework (average less than 2.5). Surprisingly, they even rarely use AI technologies for practicing for exams and tests and for organizing and managing time (average less than 1.5).

4.2. Testing Hypotheses H1 and H2

To test hypotheses H1 and H2, we use a one-way ANOVA since we want to determine whether there are statistically significant differences in the frequency of AI tool usage based on different categories (level of study and field of study). One-way ANOVA is appropriate when we have one categorical independent variable and a normally distributed dependent variable measured on an interval scale. In our case, the categorical independent variables

are the level and field of study and the dependent variable is the frequency of AI tool usage among students.

According to the above results of the ANOVA test (see Tables 3 and 4), the p -value is $1.73 \cdot 10^{-5}$ which is significantly less than the typical alpha level 0.05 (even for $\alpha = 0.01$, which reduces the probability of making a Type I error—rejecting the null hypothesis when it is actually true—to just 1%). Therefore, we can conclude that the level of study does affect how frequently university students use AI tools. This finding is statistically significant, implying that variations in AI tool usage among students can be attributed to their different levels of study at the university.

Table 3. Summary of data for testing hypothesis H1 ($N = 422$).

Status	Frequency	Average	Variance
First-year Undergraduate Student	130	3.67	0.78
Second-year Undergraduate Student	81	3.84	0.69
Third/Final-year Undergraduate Student	113	3.86	0.62
Postgraduate Student	98	4.22	0.65

Table 4. ANOVA for hypothesis H1.

Source of Variation	SS	df	MS	F	p -Value	F Crit
Between Groups	17.59	3	5.86	8.49	0.00	2.63
Within Groups	288.49	418	0.69			
Total	306.08	421				

Note: SS = Sum of Squares; df = Degrees of Freedom; MS = Mean Square; results are rounded to two decimals.

Applying the ANOVA test for the second hypothesis (see Tables 5 and 6), we obtain the p -value $1.78 \cdot 10^{-5}$, which is again less than $\alpha = 0.05$. This indicates that the field of study does affect how frequently university students use AI tools.

Table 5. Summary of data for testing hypothesis H2 ($N = 422$).

Field of Study	Frequency	Average	Variance
Humanities	59	4.19	0.29
Social Sciences	95	3.81	0.81
Natural Sciences and Mathematics	93	3.68	0.72
Technological Sciences	86	4.16	0.84
Interdisciplinary Studies	89	3.70	0.62

Table 6. ANOVA for hypothesis H2.

Source of Variation	SS	df	MS	F	p -Value	F Crit
Between Groups	19.68	4	4.92	7.17	0.00	2.39
Within Groups	286.39	417	0.69			
Total	306.08	421				

Note: SS = Sum of Squares; df = Degrees of Freedom; MS = Mean Square; results are rounded to two decimals.

4.3. Students' Attitudes and Perceptions towards AI Tools

Following the example of the Swedish study, we further examined students' attitudes towards chatbots and other types of AI tools. In spring 2023 Malmström et al. [35] published a report based on a survey that was given to students across universities in Sweden: 5894 students answered questions concerning the use and attitude towards AI tools. We used the part of their questionnaire that referred to the students' attitudes. The results of this section which included six statements and the percentage of students who agreed, disagreed, or chose the neutral option are presented in Figure 3.

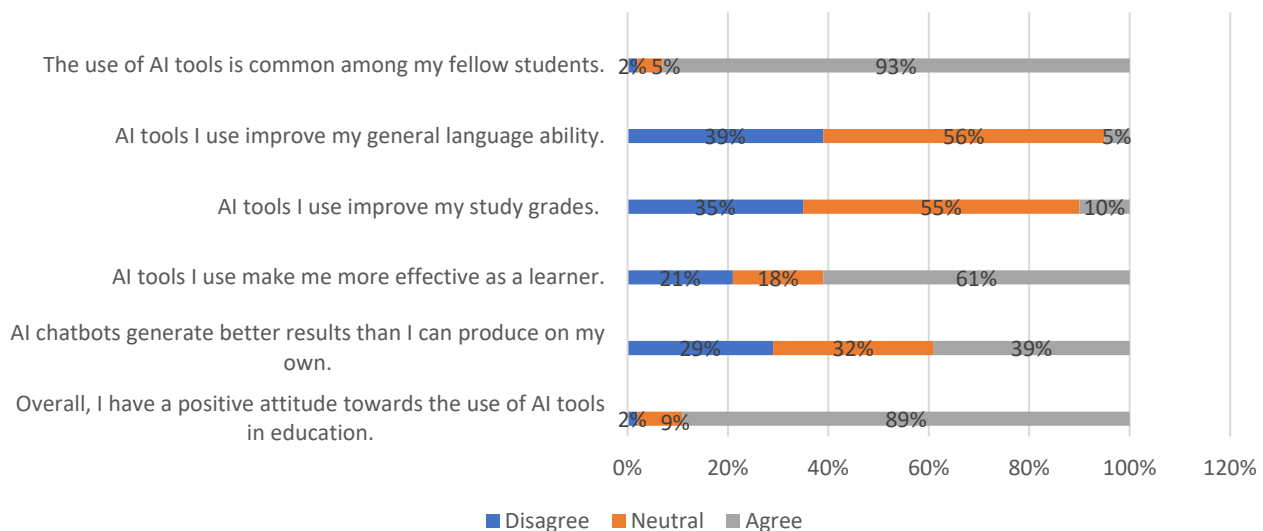


Figure 3. Students' attitudes towards AI tools (N = 422).

Most students (93%) agree that the use of AI tools is common among their classmates. However, as many as 39% of surveyed students do not agree that using AI tools improves their language ability. Regarding this, the majority (56%) are neutral, while only 5% claim that they have improved their language skills with AI tools. Similar results were obtained for the claim regarding the improvement of grades; 35% of students disagree that with using AI tools they improved their grades, 55% are neutral on this statement, and 10% agree with it. In contrast, as many as 61% of those surveyed agree with the statement that using AI tools makes them more effective as a learner; 18% are neutral about this, and 21% disagree with this statement. However, the results of the claim that AI chatbots generate better results than they can produce on their own are surprising. Here, the answers are evenly distributed in all three categories: 29% of respondents disagree with this statement, 32% are neutral and 39% agree with the statement. On the other hand, as many as 89% of students have a positive attitude towards the use of AI tools in education; only 2% disagree with this and only 9% are neutral about it.

At the end, we analyzed students' perceptions of results generated by AI tools in an academic context (Figure 4). We observed three specific perceptions: whether AI chatbots are virtually undetectable by instructors, whether AI chatbots generate accurate and reliable results, and whether AI chatbots generate results that can pass as 'human'. As above, we utilized a 3-point Likert scale: (1) disagree, (2) neutral, and (3) agree.

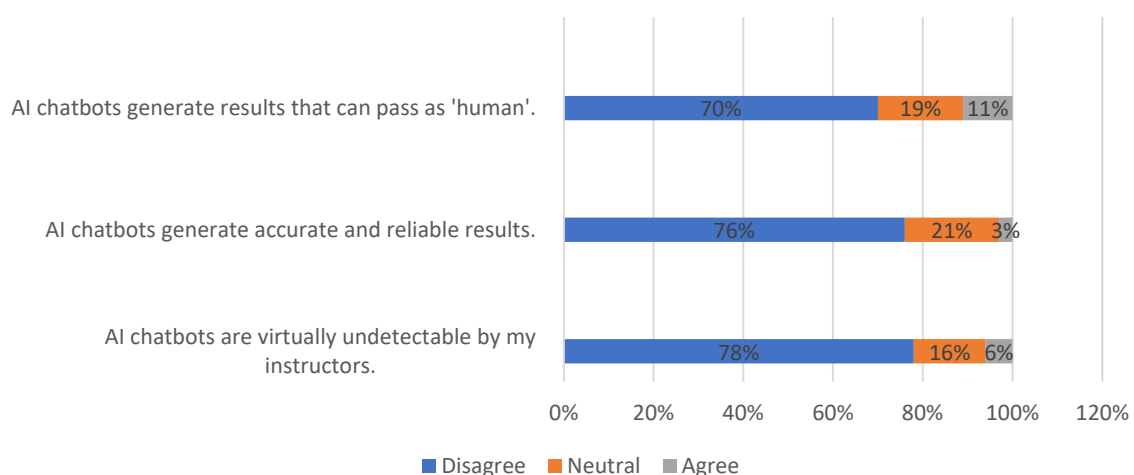


Figure 4. Students' perceptions of the results provided by AI tools (N = 422).

A significant majority of students (78%) disagree with the notion that results generated by AI tools are virtually undetectable by their instructors. Only a small fraction (6%) believe that AI-generated content cannot be detected, while 16% remain neutral. Similarly, 76% of students disagree that AI chatbots produce accurate and reliable results. On the other hand, only 3% of students agree with the statement and 21% of them are neutral about it. Lastly, a majority (70%) of students disagree that AI chatbots can generate human-like results; 11% of students agree with the statement and 19% of them are neutral about it.

5. Discussion

The main goal of this study was to analyze the use of AI-based technologies among students in Slovenian higher education institutions, with a focus on contributing to sustainable educational practices. By promoting responsible and effective use of AI, this study aligns with SDGs, particularly the goals that focus on quality education, innovation and infrastructure, and reduced inequalities. It underscores the potential of AI to enhance educational accessibility and efficiency while fostering a sustainable approach that benefits all students.

To achieve our goal, we prepared an online questionnaire, which was completed by a total of 422 students. Based on the responses, we first examined the frequency and purpose of AI tool usage. The data revealed that more than half of the surveyed students frequently use AI tools, while only 2% do not use these tools at all. We also explored how students utilize AI tools. Only 1% of the surveyed students reported using AI tools to complete their assignments without any modifications, whereas more than half use AI tools for parts of their assignments but complete the majority of the work themselves. This responsible use of AI tools reflects an awareness among students of the importance of sustainable technology use in the educational process.

We compared our results with the US survey, conducted in March 2023 by Best-Colleges [32], which included 1000 undergraduate and graduate students nationwide. According to their results, half of the respondents use AI tools for some parts of assignments (51% in our research), and 30% use AI tools for the majority of their assignments but revise them (31% in our research). On the other hand, their research showed that as many as 17% of students use AI tools for their assignments without corrections (only 1% in our research) and only 3% of respondents do not use AI tools for student assignments at all (in our research, this is as many as 15%).

Our results show that AI tool usage is widespread among Slovenian students, with most using these tools to assist with parts of their assignments or to complete the majority of the work before revising it. A small percentage of students (only 1%) use AI tools to fully complete their assignments without any revisions, suggesting a responsible approach to the use of these technologies. The comparison with the survey in the US confirms similar trends in AI tool usage, although our findings show greater caution in using AI technologies. This cautious approach not only reflects a responsible use of technology but also contributes to sustainability in education by promoting long-term learning skills and critical thinking over mere technological reliance.

Furthermore, the data from the survey show that AI tools are most valued for tasks such as summarizing, paraphrasing, composing formal documents, translating, and checking spelling and grammar. These are the tasks that help students handle large volumes of data and provide precise corrections, enhancing the efficiency and quality of work. The efficient use of AI in these areas supports sustainable educational practices by reducing time and resource consumption, thus allowing students to focus on deeper learning experiences. In contrast, AI tools are less frequently used for generating new ideas and preparing for tests. This suggests that students may still prefer human intuition and creativity for idea generation and traditional study methods for test preparation.

Within this study, we tested two hypotheses to understand the impact of selected academic variables on the frequency of AI tool usage among university students in Slovenia. By utilizing a one-way ANOVA test, we have confirmed that the level and field of study

significantly impact how often students integrate AI technologies for educational purposes. The ANOVA results supported both hypotheses with a notably low p -value, indicating strong statistical significance.

Our findings suggest that students' engagement with AI technology varies through different academic stages. First-year students might use AI tools less frequently and primarily for basic research and learning purposes; on the other hand, higher-level students are likely to use more sophisticated AI tools tailored for data analysis, problem-solving, etc. This could be a consequence of the increasing complexity of academic work and greater familiarity with AI tools among senior students. Moreover, students' major areas of study do impact their AI tool usage frequency. For example, students in STEM fields (Science, Technology, Engineering, Mathematics) are likely to report usage of AI tools for, e.g., complex data analyses, modeling, and computational tasks. Conversely, students in the humanities and social sciences may use AI tools differently, focusing more on qualitative research, text analysis, exploring historical data, etc. These findings underscore the necessity for academic institutions to tailor their technology infrastructure and educational strategies to the needs of different levels of study and different disciplines. Tailoring technology use not only enhances educational outcomes but also supports sustainability by ensuring that resources are used efficiently and that all students are equipped to meet future challenges sustainably.

We also studied students' attitudes towards using AI tools in an educational context. We examined six distinct statements, reflecting various aspects of using AI tools. The statements were analyzed in terms of the respondents' agreement levels: disagree, neutral, and agree.

A positive attitude of the majority of students towards the use of AI tools indicates a strong acceptance of AI integration in learning environments. However, a low percentage of students agree with specific benefits like improving study grades (10% of students agree) or improving general language ability (5% of students agree), indicating that while students are open to using AI, they do not see significant benefits from current AI tools. Moreover, the mixed responses to the statement that AI tools can generate better results compared to their own suggest that students are uncertain about the actual impact of AI technologies on their academic performance. This scenario presents an opportunity for educational institutions to focus on sustainable AI usage that not only enhances academic performance but also promotes responsible and ethical use of technology, ensuring that AI integration supports both educational advancement and Sustainable Development Goals.

Let us also point out that our results deviate slightly from the results obtained from Swedish students [35]. In their study, the majority of students (56%) show a positive attitude regarding the employment of AI tools in education (89% in our study), while 31% express a negative opinion (just 2% in our study). In total, 39% of them confirm that using AI tools is common among their fellow students (93% in our study); 48% of surveyed students in Sweden think that using AI tools improves their efficacy as learners (61% in our study). Furthermore, 27% of their surveyed students think that they improved their language ability with using AI tools (5% in our study), and 17% of them agreed that they improved their grades with these technologies (10% in our study). Half of the surveyed students disagree with the statement that AI tools can generate better results than they can produce (29% in our case).

The last three statements were related to students' perceptions towards using AI tools in educational settings. As above, these statements were evaluated in terms of the respondents' agreement levels: disagree, neutral, and agree. Our study reveals that students are quite skeptical about the detectability and accuracy of AI-generated results and the ability of AI to produce human-like content. Students believe that the content generated by AI can be incorrect, poorly structured and not in line with academic standards. They believe in the limitations of AI tools to produce human-like results. Moreover, they believe in the robustness of the capabilities of detection tools. At the same time, we must be aware of the rapid progress of AI technologies and the increasing capabilities that they bring. Therefore,

it is important to educate students, familiarize them with the latest developments and remind them of academic integrity and the ethical implications of using AI inappropriately. Providing students with training on how to effectively use AI tools can enhance their academic performance while ensuring they understand the limitations.

Let us also point out that our results about students' perceptions towards using AI tools are quite different from the results obtained in the US [32]. In their results, as many as 31% of students are convinced that work generated with the help of AI is unrecognizable by their instructors (6% in our research). Also, as many as 43% of their students are convinced that AI tools generate reliable and accurate results (3% in our research), and 51% of them believe that these results can be human-like (11% in our research). However, we must be aware that results in the US were obtained one year before our research started, and during that time technology has drastically advanced, as has the awareness of students.

6. Conclusions

Our study of AI tool usage among Slovenian students provides valuable insights into how these technologies are integrated into their academic routines, with a clear emphasis on supporting sustainable development in education. The analysis shows that most students are willing to use AI technologies as a supportive tool in their academic work, with the majority still valuing their contributions to completing assignments. This reflects a conscious and responsible use of AI tools, aligning with the principles of sustainability. By examining the frequency and purpose of AI tool usage we can show several important conclusions about the role of AI in higher education. We considered the average usage rates across various categories, including summarizing and paraphrasing texts, translating and checking spelling/grammar, generating unique ideas, and preparing for tests—activities that contribute to more efficient, resource-conscious learning practices and support the broader goals of sustainable educational development.

Our data indicate a clear trend of students integrating AI tools, primarily for tasks that enhance the clarity and correctness of their work. However, the reliance on AI for creative and test preparation tasks is less pronounced, pointing to areas where human input remains crucial. These insights can inform educators and policymakers about how students use AI, helping to tailor educational strategies that maximize the benefits of AI while addressing its limitations. Integrating sustainable educational practices with AI use could further enhance these strategies, ensuring that technology adoption not only supports academic success but also adheres to sustainable development principles, balancing technological advancements with the critical thinking and creativity that are essential for holistic education.

By understanding these patterns, educators can better support students in developing the skills to effectively use AI tools and balance them with critical thinking and creativity. This balanced approach can enhance learning outcomes and prepare students for a future where AI and human skills complement each other.

The statistical evidence provided by the ANOVA test confirms that the level and field of study significantly affect AI tool usage among university students in Slovenia. These highlight the need for a nuanced approach to integrating AI technologies in higher education, tailored to meet the diverse requirements of students across different academic levels and fields of study. This involves not only providing the necessary technological resources but also ensuring that higher educational institutions are adequately prepared to incorporate AI technologies into their teaching practices effectively.

Our study also reveals that Slovenian students have a high overall positive attitude toward AI tools in education which demonstrates a strong general acceptance of AI technologies. They are also convinced that almost everyone among their peers is using these tools in an educational context. However, mixed responses on specific benefits such as generating better results or improving study grades and language skills suggest that students are uncertain about the actual impact of AI tools. On the one hand, they are open to using AI and on the other hand, they do not see significant benefits from current AI tools. Maybe this is also a result of ignorance of the capabilities of this technology.

As a result, higher educational institutions should focus on increasing awareness and providing training on understanding and effectively using AI tools. Students should be taught how they can help themselves more with newer technology and how they can gain new competencies from it. Also, much more promotion would be needed for AI tools that are designed specifically to help students improve academic outcomes. We also encourage further research to explore and validate the effectiveness of AI tools from an educational point of view. All of this should lead to a more informed and beneficial integration of AI technologies into education. Additionally, by integrating sustainable practices into the deployment and use of AI tools, institutions can ensure that technology not only enhances learning outcomes but also contributes to the broader goals of environmental and social sustainability, preparing students for the challenges of a sustainable future.

Moreover, the analysis of three specific perceptions (whether AI chatbots are virtually undetectable by instructors, whether AI chatbots generate accurate and reliable results, and whether AI chatbots generate results that can pass as 'human') revealed that Slovenian students are aware of the limitations of AI tools although they often use them for academic work.

We highlight the importance of ethical considerations and educational support in the context of sustainable development. As AI tools become more integrated into academic practices, both students and educators must adapt to ensure these technologies are used to enhance learning while maintaining academic integrity. This adaptation is crucial for fostering a learning environment that aligns with the principles of sustainability, ensuring that the use of AI tools contributes positively to both educational outcomes and broader societal goals.

Let us point out that in our study we collected just quantitative data. Incorporating qualitative research methods, such as interviews or focus groups, could enrich the understanding of the reasons behind students' attitudes and perceptions regarding AI tool usage. Moreover, we have not distinguished between different types of technologies, such as AI-driven tutoring systems, plagiarism checkers, or content-generation tools. Future studies could differentiate between these tools to understand specific usage patterns and their impact on educational outcomes. Future research could also adopt a longitudinal approach to track how students' attitudes, perceptions and usage of AI tools change throughout their university careers. Conducting comparative studies across different fields of study and different higher educational institutions could show how disciplinary and institutional cultures influence AI adoption and utilization. Future studies could also focus on the educational outcomes associated with AI tool usage, examining whether and how these tools affect, for example, academic performance and learning efficiency.

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