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DISCIPLINE-SPECIFIC AI ADOPTION IN HIGHER EDUCATION: INSIGHTS FOR ADVANCING QUALITY EDUCATION AND SUSTAINABILITY (SDG 4)

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Purpose: This study examines the usage patterns of artificial intelligence (AI) tools among 859 university students in Poland, representing three major academic fields. The research aims to identify discipline-specific differences in AI adoption, usage motivations, perceived benefits, and challenges, contributing to evidence-based strategies for advancing Sustainable Development Goal 4 (Quality Education).
Design/methodology/approach: An exploratory quantitative approach was employed using a cross-sectional online survey conducted from February to May 2025. Data from 859 students across humanities and social sciences, natural sciences and technology, and arts and communication were analysed using descriptive statistics and nonparametric methods (Kruskal-Wallis and DSCF post-hoc tests).
Findings: Significant inter-group differences were identified in AI adoption patterns. Humanities students primarily use AI for knowledge expansion (54%) and translation (48%). Natural sciences students emphasise problem-solving (51%) and knowledge acquisition (62%). Arts students focus on translation (63%) and creative content generation (46%). Despite widespread adoption, students across all disciplines express concerns about data privacy, ethics, and employment impacts.
Research limitations/implications: Convenience sampling and unequal group sizes limit generalizability. The cross-sectional design captures a single point during rapid technological change. Future longitudinal and comparative studies are recommended.
Practical implications: Universities should develop discipline-specific AI integration strategies, targeted professional development for faculty, and comprehensive AI literacy curricula. Preparing graduates for the evolving business landscape requires aligning AI literacy, critical thinking, and ethical competencies with industry expectations.
Social implications: The findings underscore the need for inclusive and equitable AI integration in higher education to prevent new forms of digital inequality, contributing to sustainable economic growth, digital transformation, and responsible workforce development.

Originality/value: This study provides empirical evidence on discipline-specific AI adoption patterns in the underexplored Central and Eastern European context, documenting usage during the critical transition from experimental to systematic AI integration in higher education.
Keywords: artificial intelligence, higher education, AI literacy, cross-disciplinary differences, sustainable education.
Category of the paper: Research paper.

1. Introduction

The emergence of generative artificial intelligence (GenAI) has catalysed a profound transformation in higher education, often described as a paradigm shift comparable to the advent of the internet (Polyportis, 2024). Since the launch of ChatGPT in November 2022, universities worldwide have moved from experimental AI use toward more systematic integration strategies. While 2024 has been described as a critical design phase, 2025 is expected to become the "year of discovery" for meaningful AI implementation (Inside Higher Ed, 2024). These developments are reshaping how students acquire knowledge, create content, and develop academic skills while presenting both opportunities and challenges for educational institutions (Alreshidi et al., 2025).

This transformation aligns with Sustainable Development Goal 4 (Quality Education), which aims to ensure inclusive and equitable education and promote lifelong learning (United Nations, 2030). AI technologies may act as educational equalisers by supporting language accessibility, personalised learning, and broader access to resources (Pachava et al., 2025). However, disciplinary differences in the adoption and integration of AI may also create new inequalities, as academic fields vary in their engagement with and acceptance of these technologies. Understanding such variations is essential for designing inclusive AI integration strategies that advance SDG 4 targets (Zapata et al., 2024).

Empirical evidence indicates significant disciplinary differences in students' engagement with generative AI. Technology-oriented fields typically demonstrate higher adoption rates than the arts, humanities, and social sciences. These differences extend beyond frequency of use: technical disciplines often integrate AI into complex problem-solving tasks, while humanities and social sciences more commonly use it for communication or content analysis (Kim et al., 2025). Although students across disciplines frequently use AI for routine tasks, their engagement with cognitively demanding activities varies considerably, suggesting that task characteristics and disciplinary epistemologies influence AI adoption patterns (Qu et al., 2024).

AI-powered tools are increasingly embedded in modern educational environments, enabling personalised learning, real-time feedback, and improved access to global knowledge resources (Zhou et al., 2024). Generative tools such as ChatGPT, Google Gemini, and Microsoft Copilot facilitate academic writing, problem-solving, and project development (Von Garrel, Mayer,

2023; Almassad et al., 2024). At the same time, translation technologies and writing assistants help overcome linguistic barriers for multilingual student populations (Bensalem et al., 2024). These developments reflect the growing importance of digital and AI literacy in higher education (Celik et al., 2024).

Despite rapid adoption, institutions face significant implementation challenges. A 2024 survey of chief technology officers found that only 9% believe higher education institutions are adequately prepared for the continued expansion of AI (Inside Higher Ed, 2024). Research also suggests that students may view AI less positively when applied to summative assessment or wellbeing support, while expressing greater acceptance for career support, formative learning, and administrative services (Rodway, Schepman, 2023). These findings highlight the importance of implementation strategies that prioritise student agency, disciplinary relevance, and ethical considerations.

Acceptance of AI also varies across academic disciplines. Students in natural sciences and technology report more frequent use of AI platforms and greater acceptance of their integration into academic workflows (Balabdaoui et al., 2024). In contrast, humanities students often express greater concern about ethics, data privacy, and the impact of AI on creativity and analytical thinking (Qu et al., 2024). Arts and communication students constitute a distinct group, frequently using AI for translation and content generation while also expressing high levels of concern about ethics and intellectual property (Amini, 2025).

Although global research provides valuable insights into AI adoption, regional perspectives remain underexplored, particularly in Central and Eastern Europe. Poland's higher education sector, combining traditional universities with innovative private institutions, offers a useful context for examining how AI adoption interacts with diverse disciplinary cultures and educational traditions. Local institutional environments and disciplinary cultures strongly influence how students perceive and engage with AI technologies (Qu et al., 2024).

This study addresses gaps in knowledge about discipline-specific AI adoption by analysing how students in the humanities and social sciences, the natural sciences and technology, and the arts and communication use AI tools in their academic work. Conducted between February and May 2025, during a period when universities were transitioning from experimental to more systematic AI integration, the study captures student experiences during a critical phase of educational transformation.

The research examines AI usage among 859 students from Polish universities and addresses three research questions: (1) What are the primary purposes of AI use across disciplines? (2) How frequently do students from different fields use various AI tools? (3) What benefits and challenges do students associate with AI in higher education?

The study contributes to the literature in several ways. First, it provides empirical evidence from Central and Eastern Europe, complementing existing studies from other regions (Diloy et al., 2023; Von Garrel, Mayer, 2023). Second, it identifies disciplinary differences in AI adoption, offering insights for developing targeted support strategies and more equitable

approaches to AI integration. Third, it highlights ethical and pedagogical challenges associated with AI adoption across fields, providing guidance for policymakers and educational leaders seeking responsible implementation. Finally, the findings contribute to discussions on achieving SDG 4 by examining how patterns of disciplinary AI adoption may support or hinder efforts to ensure inclusive and equitable quality education.

The remainder of this article is structured as follows: the Theoretical Background section reviews current research on AI applications in education, ethical challenges, and global adoption trends. The Methodology section outlines the survey-based research approach. The Results section presents findings on AI usage frequency, user motivations, perceived benefits and challenges, and statistically significant differences across disciplinary groups. In the Discussion section, these findings are contextualised within the broader academic landscape. Finally, the Conclusion highlights the main findings, research limitations, practical recommendations, and potential directions for future studies.

2. Theoretical Background

2.1. The Evolution of Artificial Intelligence in Higher Education

Artificial intelligence (AI) has evolved from experimental applications to integral components of contemporary higher education systems, fundamentally transforming how students acquire knowledge and engage with academic content across disciplines (World Economic Forum, 2024). The rapid acceleration in AI adoption, particularly following the launch of ChatGPT in November 2022, has created what researchers characterise as a paradigm shift in educational practices (Zhou et al., 2024). This transformation represents more than technological adoption; it constitutes a fundamental reimagining of teaching methodologies, learning processes, and academic skill development in the digital age (Walter, 2024).

AI-powered tools enable a shift from traditional, instructor-centred teaching methods to more interactive, personalised learning experiences that adapt to individual student needs and learning preferences. Modern students are increasingly utilising AI-based technologies to complete complex projects, create sophisticated presentations, and engage in advanced analytical tasks, effectively replacing conventional note-taking and research methods with more efficient and automated solutions (Haleem et al., 2021). These changes align with broader trends toward digitalisation in education, making knowledge acquisition more accessible, streamlined, and globally connected.

The integration of AI into educational systems has opened new pathways for skill development and knowledge acquisition, offering tailored learning approaches that respond to individual student needs, learning styles, and academic goals (Mariappan, Krishnan, 2023).

Contemporary students, characterised by high levels of digital competence, can effectively leverage AI tools to enhance their academic performance and develop essential 21st-century skills (Karagül et al., 2021). Their growing familiarity with generative AI (GenAI) technologies enables them to utilise these tools strategically and purposefully in their learning processes, resulting in more efficient and effective educational outcomes (Kelly et al., 2023).

2.2. Theoretical Frameworks for Understanding AI in Education

Personalised Learning Theory and AI Integration

The theoretical foundation for AI in education rests significantly on personalised learning theory, which emphasises the adaptation of educational experiences to individual learner characteristics, needs, and preferences (Zhiyenbayeva et al., 2022; Rodríguez et al., 2024). AI's capacity to analyse vast amounts of learning data and adapt to individual learning styles enables students to progress at their own pace in ways that align with their cognitive preferences and academic strengths (Mariappan, Krishnan, 2023). This personalisation increases engagement and learning effectiveness, allowing students to overcome academic challenges more efficiently while building confidence in their abilities. AI-powered learning platforms exemplify this theoretical approach by simplifying complex topics and presenting them in accessible formats tailored to individual comprehension levels. These systems ensure that students grasp fundamental concepts before progressing to more advanced material, creating scaffolded learning experiences that support academic success across diverse student populations (Celik et al., 2024).

Social Learning Theory and AI-Mediated Interactions

The application of social learning theory to AI-enhanced education reveals how AI technologies can facilitate collaborative learning experiences and peer interactions. Recent research demonstrates that AI tools can support social learning processes by enabling students to engage in collaborative content creation, peer review activities, and group problem-solving exercises mediated by intelligent systems (Zhou, Schofield, 2024). This theoretical perspective suggests that AI's educational value extends beyond individual learning enhancement to include facilitating meaningful social learning experiences.

Constructivist Learning Theory and AI Tools

Constructivist learning theory offers another crucial framework for understanding the role of AI in education. AI tools support constructivist principles by enabling students to actively construct knowledge through interaction with intelligent systems, exploration of AI-generated content, and creative application of AI capabilities to solve authentic problems (Grubaugh et al., 2023; Sima et al., 2024). This approach positions AI as a cognitive tool that supports students' active construction of understanding rather than passive consumption of information.

2.3. AI Tools in Higher Education

Generative AI and Content Creation Tools

AI tools offer an extensive range of functionalities that support diverse aspects of the learning process, with generative AI representing the most transformative category (Dang, Liu, 2022). Chatbots such as ChatGPT, Google Gemini, and Microsoft Copilot provide real-time academic support by answering complex questions, generating original content, and assisting in the creation of presentations, research proposals, and algorithmic solutions (Fauzi et al., 2023; Labadze et al., 2023). These tools effectively simulate academic consultation processes, providing students with immediate access to sophisticated analytical and creative capabilities.

Language Support and Communication Tools

Translation and language support technologies, including Google Translate, DeepL, and advanced language processing tools, help students overcome linguistic barriers while facilitating access to academic resources in multiple languages (Galante, 2020; Varela Salinas, Burbat, 2023). These tools are particularly valuable for international students and multilingual academic environments. Text analysis and transformation tools, such as QuillBot, Consensus, and advanced paraphrasing systems, assist students in synthesising information, rephrasing content, and preparing comprehensive literature reviews. Writing assistants like Grammarly and ProWritingAid enhance the quality of academic writing by identifying grammatical errors, suggesting stylistic improvements, and providing feedback on clarity and precision (Koltovskaia, 2020).

Immersive and Interactive Learning Technologies

Advanced AI technologies, designed to simulate human interactions, further enrich educational experiences by creating immersive learning environments. Virtual avatars and intelligent tutoring systems serve as sophisticated tools for online education, creating engaging environments that enhance student motivation and improve academic performance (Herbert, Dołżycka, 2022). These innovations significantly transform the academic landscape by making education more accessible, interactive, and effective for diverse learner populations.

2.4. Discipline-Specific AI Adoption Patterns

STEM Fields

Research consistently demonstrates that students in natural sciences, technology, engineering, and mathematics (STEM) fields represent the most frequent and sophisticated users of AI tools in higher education contexts (Von Garrel, Mayer, 2023). These students primarily leverage AI technology to comprehend and solve complex problems, analyse data, make decisions, develop programming skills, and tackle advanced academic writing tasks (Sergejev et al., 2024; Tyaningsih et al., 2024). STEM students commonly utilise tools such as ChatGPT for coding assistance, Canva for scientific visualisation, and specialised AI platforms for data analysis and mathematical modelling (Fadli, Iskarim, 2024). However, despite their

frequent usage, a substantial majority of STEM students recognise critical issues related to the reliability, accuracy, and potential biases inherent in AI systems, demonstrating a sophisticated understanding of AI limitations (Balabdaoui et al., 2024). Recent research indicates that natural science students approach AI tools deliberately and strategically, often integrating multiple AI applications into comprehensive problem-solving workflows (Balabdaoui et al., 2024). Studies reveal a strong interest among STEM students in the expanded integration of AI within educational processes, with many expressing expectations that universities should provide AI-powered tools based on credible, peer-reviewed academic sources (Balabdaoui et al., 2024).

Humanities and Social Sciences

Recent studies highlight the growing adoption of artificial intelligence tools in social sciences and humanities, though with distinct patterns compared to STEM fields. These technologies enable personalisation of learning processes while supporting content generation, critical analysis, and research synthesis activities (Kyrpa et al., 2024; Lobanova et al., 2024). In communication-related disciplines, tools such as ChatGPT are widely utilised for writing assistance, research support, and content development (Prokhorchuk, 2023). Students in humanities and social sciences recognise AI's value in both academic and professional contexts, particularly for tasks involving language processing, content analysis, and research organisation. Among the most frequently utilised AI tools are adaptive learning platforms, intelligent tutoring systems, and data visualisation solutions that support progress tracking and learning analytics (Lobanova et al., 2024). However, concerns about data privacy, academic integrity, and the authenticity of AI-generated content have emerged as significant considerations (Arly et al., 2023). Despite numerous benefits, persistent challenges include ethical considerations, reliability concerns, and insufficient preparation of educators for effective AI integration in humanities teaching (Lobanova et al., 2024).

Arts and Creative Disciplines

Art students represent the least studied group regarding the use of AI tools in learning, design, creative processes, and project development, creating a significant gap in the current research literature. Limited available studies suggest that art students generally accept AI technologies, viewing them as support tools for artistic activities rather than replacements for human creativity (Garwol, 2024). However, these students express substantial concerns about intellectual property rights, copyright protection, and the potential impact of AI on artistic originality and authenticity. Research conducted among creative professionals indicates that artificial intelligence can effectively serve as a "partner in the creative process", assisting artists in developing interactive installations, graphic design projects, and multimedia presentations (Cherevatiuk, 2024). AI tools have shown particular promise in enhancing formal analysis skills among students in art history and visual studies courses, providing new approaches to understanding artistic techniques and cultural contexts (Carpino, Hudson, 2024).

2.5. Contemporary Challenges and Ethical Considerations

The rapid expansion of AI in higher education has revealed concerning disparities in access, comfort, and proficiency across different student populations and academic disciplines. Recent research indicates that while educators generally show higher comfort levels with AI technologies compared to students, significant gaps exist in their adherence to institutional AI ethics policies and understanding of appropriate usage guidelines (Copyleaks, 2024). These disparities raise critical questions about educational equity and the potential for AI adoption to exacerbate existing inequalities rather than addressing them. The integration of AI in higher education requires careful consideration of ethical frameworks that address privacy, academic integrity, bias, and the preservation of human agency in learning processes. Recent systematic reviews emphasise the importance of developing comprehensive ethical guidelines that balance AI's educational benefits with the protection of student rights and the preservation of educational values (Batista et al., 2024). Educational institutions must navigate a complex ethical terrain involving data privacy, algorithmic bias, academic dishonesty, and the appropriate balance between AI assistance and independent learning.

2.6. Implications for Sustainable Development Goal 4

The relationship between AI adoption in higher education and Sustainable Development Goal 4 (Quality Education) represents a critical area for contemporary research and policy development. AI technologies have demonstrated significant potential to enhance educational accessibility, personalisation, and effectiveness, particularly for underserved populations and students with diverse learning needs (AI for Good Foundation, 2024). However, the discipline-specific nature of AI adoption creates new challenges for achieving equitable quality education. Recent research proposes comprehensive frameworks for AI integration that prioritise educational equity, cultural sensitivity, and sustainable development principles (Pena et al., 2025). These frameworks emphasise the importance of understanding disciplinary differences while ensuring that AI implementation supports inclusive educational practices that benefit all students regardless of their academic field or background.

3. Methods

This study employs an exploratory quantitative approach to analyse how university students use artificial intelligence (AI) tools, their motivations, and their perceptions of these technologies in an academic context. A cross-sectional survey method was employed, enabling the examination of trends and attitudes among students from various fields of study during the critical period of AI adoption in 2024.

3.1. Research Setting and Participants

The study was conducted at leading private universities in Poland, with campuses located in major cities across the country. The research setting provides valuable insights into AI adoption patterns within Central and Eastern European higher education contexts, where educational systems are undergoing rapid digital transformation. A total of 859 undergraduate and postgraduate students participated in the research, representing a substantial sample size that enables reliable statistical analysis across disciplinary groups.

Due to research constraints and the need for timely data collection during a period of rapid AI evolution, a convenience sampling method was employed, allowing for efficient data collection across multiple institutions. However, this method did not provide comparable sample sizes in each group and limited the generalizability of the findings to the entire student population in Poland. Despite this limitation, the substantial sample size provided valuable insights into the diverse ways AI tools are utilized in the academic environment.

The final sample consisted of 564 students from the humanities and social sciences (65.7%), 200 students from the natural sciences and technology (23.3%), and 95 students from the arts and communication (11.1%). Age analysis revealed that 79.1% of respondents were 25 years old or younger, while the remaining participants belonged to older age groups. This demographic structure enables the assessment of differences in AI tool usage across various student groups while reflecting the contemporary Polish higher education demographic profile.

3.2. Data Collection Process

An anonymous online survey, conducted from February to May 2025, gathered quantitative data on student AI tool usage across disciplines. This data collection period marks a critical moment in AI adoption, coinciding with the transition from experimental to systematic AI integration in higher education institutions. The questionnaire addressed usage frequency, AI technologies used, perceived benefits, and application concerns while ensuring participant anonymity and ethical compliance.

The 35-question survey was organised into five theoretically grounded sections: (1) Demographic characteristics and academic background; (2) AI tool usage methods and contexts; (3) AI usage frequency across different categories; (4) Perceived benefits and learning outcomes; (5) AI technology challenges and ethical concerns. The questionnaire employed multiple measurement approaches: 5-point Likert scales (1 = strongly disagree to 5 = strongly agree) for attitudinal measures, frequency scales for usage patterns, multiple-choice questions for categorical data, and open-ended questions for qualitative insights.

3.3. AI Tool Application Areas Covered in the Study

The study examined student usage across six comprehensive AI tool categories, selected based on a systematic literature review and consultation with educational technology experts: (1) Generative AI chatbots (e.g., ChatGPT, Microsoft Copilot, Google Gemini) for content generation and academic consultation; (2) Text editing and translation applications (e.g., DeepL, Grammarly, Google Translate) for language support and writing enhancement; (3) Virtual assistants (e.g., Google Assistant, Siri, Alexa, Cortana) for task management and information retrieval; (4) AI-enhanced educational platforms (e.g., Duolingo, Coursera, Khan Academy) for personalized learning experiences; (5) Academic integrity tools (e.g., Copyscape, Turnitin) for plagiarism detection and originality verification; (6) Research and citation support tools (e.g., QuillBot, Citation Machine) for paraphrasing and bibliographic management.

3.4. Data Analysis

Data analysis employed a multi-stage statistical approach combining descriptive statistics and inferential testing. The primary analysis utilised the non-parametric Kruskal-Wallis one-way ANOVA, followed by Dunnett's C (DSCF) post-hoc pairwise comparisons, to determine statistically significant differences in student AI usage patterns across disciplines. The Kruskal-Wallis test was selected due to the ordinal nature of the Likert scale data, confirmed absence of normality (Shapiro-Wilk tests), and the presence of unequal variances and group sizes across disciplinary categories. Effect sizes (eta-squared) were calculated to assess the practical significance of observed differences. All analyses were conducted using SPSS version 29.0, with an alpha level set at 0.05 for statistical significance testing.

4. Results

The utilisation of commonly available AI tools among students of various academic disciplines reveals distinct patterns, associated with specific needs and problems they face. Humanities and social sciences students use AI predominantly for expanding knowledge (54%), text translation or proofreading (48%), and developing the concepts of work or projects (43%), showcasing a balanced reliance on AI for both research and communication tasks (Figure 1). Conversely, natural sciences and technology students prioritise AI for expanding knowledge (62%) and problem-solving, decision-making, and making recommendations (51%). However, text translation or proofreading (53%) remains among the most popular reasons for AI utilisation (Figure 2). These findings seem to reflect their engagement with complex, data-driven processes and the use of multiple, multilingual sources. Lastly, students in arts and communication rely most heavily on AI for text translation or proofreading (63%), expanding

knowledge (57%), and text analysis, processing, and generation (46%) (Figure 3). This indicates a strong focus on communication and content creation within their field.

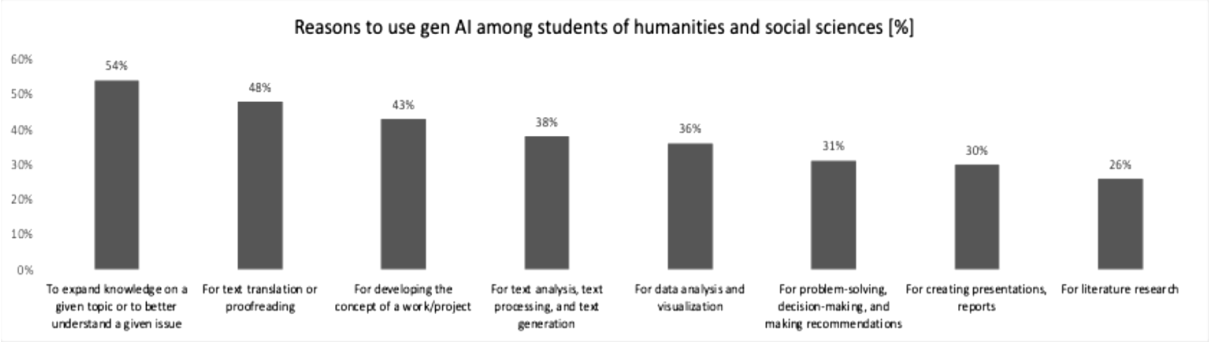

Figure 1. The utilisation of AI among students of humanities and social sciences [%, multiple-option choice, n = 564].

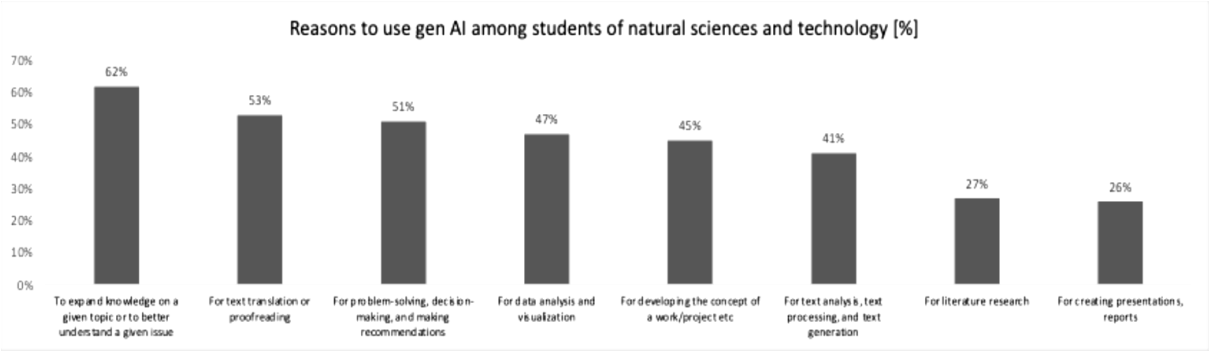

Figure 2. The utilisation of AI among students of natural sciences and technology [%, multiple-option choice, n = 200].

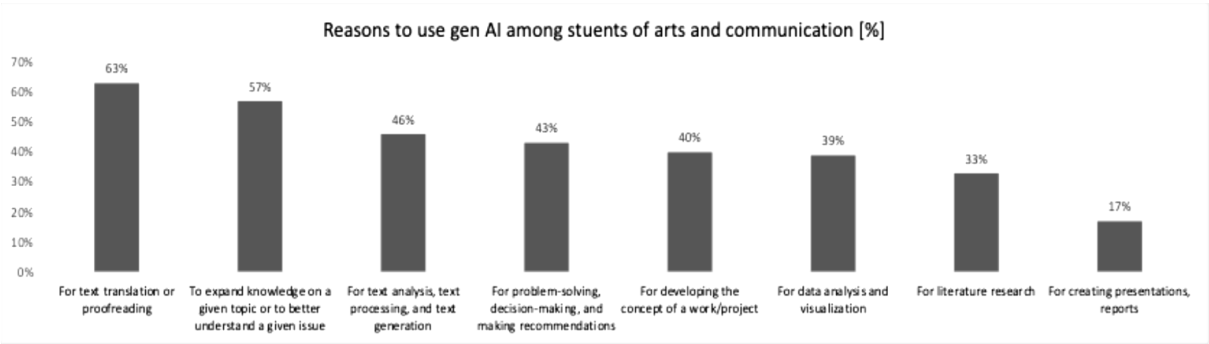

Figure 3. The utilisation of AI among students of arts and communication [%, multiple-option choice, n = 95].

Table 1.

The frequency of using various AI tools among students in different fields of study

Type of AI tool	Field of study	Mean	SD
AI chatbots	Humanities and social sciences	3.06	1.148
	Natural sciences and technology	3.54	1.124
	Arts and communication	3.27	1.096
Virtual assistants	Humanities and social sciences	2.80	1.458
	Natural sciences and technology	2.59	1.450
	Arts and communication	2.47	1.435

Cont. table 1.

Language translation and correction tools	Humanities and social sciences	2.53	1.378
	Natural sciences and technology	2.71	1.423
	Arts and communication	2.85	1.414
Learning platforms	Humanities and social sciences	2.36	1.225
	Natural sciences and technology	2.62	1.435
	Arts and communication	2.65	1.435
Antiplagiarism tools	Humanities and social sciences	1.50	0.833
	Natural sciences and technology	1.44	0.849
	Arts and communication	1.83	1.182
Automated citation generators	Humanities and social sciences	1.50	0.913
	Natural sciences and technology	1.54	0.971
	Arts and communication	1.61	1.170

The frequency of using various AI tools among students in different fields of study differs greatly (Table 1). AI chatbots like ChatGPT enjoy the greatest use frequency among students of all reported fields of study. In fact, 54% of natural science and technology students, 44% of art and communication students, and 36% of humanities and social science students use AI chatbots at least a few times a week. Language translation and correction tools are also frequently used. 39% of art and communication students use such tools at least a few times a week. 32% of natural science and technology students and 30% of humanities and social science students use language translation and correction tools with matching frequency. Virtual assistants seem to be used quite as often as language translation tools. Learning platforms are used less frequently, with 33% of art and communication students, 25% of natural science and technology students, and 20% of humanities and social science students using them at least a few times a week. Antiplagiarism tools and automated citation generators are among the least popular tools reported to be used.

Nonparametric one-way ANOVA using the Kruskal-Wallis test, together with DSCF (Dunnett's C) pairwise comparison, was used to investigate whether there are statistically significant differences between students' AI usage patterns stemming from their respective fields of study. The results suggest a few noteworthy cases where students of different study fields differ significantly in their frequency of using various AI tools. Students in natural sciences and technology use AI chatbots significantly more often than students in humanities and social sciences (3.54 vs. 3.06, $p < 0.001$), perhaps reflecting the former's need to solve complex problems related to their field. Similarly, natural science and technology students use learning platforms more often than humanities and social science students (2.62 vs. 2.36, $p < 0.021$). This difference may stem from the nature of natural and technical studies, which require precision and keeping pace with rapid advancements. Interestingly, there is also a significant difference in the use of AI-powered antiplagiarism tools. Arts and communication students (1.83) use these tools significantly more often than humanities and social science students (1.50, $p < 0.038$) and natural science and technology students (1.44, $p < 0.009$). This may reflect greater sensitivity among arts and communication students regarding the ethical use of others' work.

Table 2.
How AI helps students with learning [%, multiple-option choice]

Benefit of AI use	Humanities and Social Sciences	Art and Communication	Science and Technology
Increases efficiency in acquiring information	69.7%	63.2%	74.5%
Helps develop skills through adaptive learning	40.2%	36.8%	53%
Facilitates personalization of the learning path	39.9%	40%	40.5%
Increases speed of acquiring information	0%	0%	0%

Students surveyed seem to value AI in their learning process for similar reasons. Regardless of their field of study, students most appreciate the increased efficiency in acquiring information thanks to AI tools (between 63.2% and 74.5%) (Table 2). It is interesting to note, however, that while efficiency is highly valued, other potential benefits of AI tools, such as personalized and adaptive learning experiences, were not as frequently mentioned.

Table 3.
Potential challenges associated with using AI [%, multiple-option choice]

Challenges of AI use	Humanities and Social Sciences	Art and Communication	Science and Technology
Lack of understanding of AI	35.1%	41.1%	33%
Fear of job loss	33.7%	49.5%	35%
Ethical challenges	35.1%	44.2%	30.5%
Privacy concerns	47.2%	54.7%	45%

Surveyed students most often cited privacy concerns as a challenge associated with using AI. Other challenges, such as a lack of understanding of AI, fear of job loss, and ethical issues, were reported at similar rates. However, art and communication students expressed the most concern about the potential challenges of using AI tools (Table 3).

5. Discussion

The results of this study confirm the transformative impact of artificial intelligence (AI) tools across higher education disciplines, providing empirical evidence of what researchers have characterised as a paradigm shift in educational practices (Zhou et al., 2024). The findings reveal that AI adoption has moved beyond experimental usage to become integral to academic workflows, with over 95% of surveyed students actively utilising AI tools in their educational activities. The timing of this research—conducted during the critical transition period from February to May 2025—captures AI usage patterns during what experts have identified as the

shift from experimental to systematic integration phases in higher education (Inside Higher Ed, 2024).

The study's most significant contribution lies in revealing how discipline-specific factors shape AI adoption patterns. The findings demonstrate that disciplinary differences extend far beyond simple tool preferences to reflect deeper philosophical approaches to knowledge creation and academic practice, confirming recent theoretical frameworks that emphasise the cultural-historical dimensions of technology adoption in educational contexts (Qu et al., 2024).

Students in humanities and social sciences demonstrate a communication-oriented approach to AI usage, primarily employing tools for knowledge expansion (54%), text translation and proofreading (48%), and conceptual project development (43%). This pattern reflects the interpretive and communicative nature of humanities disciplines, where AI serves as a supplementary tool for enhancing textual analysis, cross-cultural communication, and content synthesis rather than replacing core analytical processes (Lobanova et al., 2024). The emphasis on translation and language support tools reflects the increasingly multilingual and globally connected nature of humanities scholarship.

Students in natural sciences and technology fields demonstrate the most sophisticated integration of AI tools into their academic workflows, with 62% using AI for knowledge expansion and 51% for problem-solving and decision-making. This pattern reflects the analytical and computational nature of STEM disciplines, where AI tools align naturally with existing methodological approaches and research practices (Sergejev et al., 2024). The statistically significant higher usage of generative chatbots (3.54 vs. 3.06, $p < 0.001$) and educational platforms (2.62 vs. 2.36, $p < 0.021$) among STEM students compared to humanities students confirms previous research indicating that technical fields naturally emerge as leaders in technological innovation adoption (Balabdaoui et al., 2024).

The findings reveal that arts and communication students occupy a unique position in AI adoption, demonstrating both the highest usage rates for translation tools (63%) and the strongest concerns about ethical implications. This paradoxical pattern reflects the complex relationship between AI and creative practice, where students simultaneously embrace AI's creative potential while grappling with fundamental questions about authorship, originality, and intellectual property (Garwol, 2024). The significantly higher usage of anti-plagiarism tools among arts students (1.83 vs. 1.50 for humanities, $p < 0.038$) suggests heightened sensitivity to issues of originality and academic integrity.

5.1. Theoretical Implications

The disciplinary differences observed in this study can be understood through cultural-historical activity theory, which emphasises how technological tools are mediated by cultural practices, community norms, and historical traditions. Each academic discipline represents a distinct activity system, characterised by specific tools, rules, and community practices that shape how AI technologies are perceived, adopted, and integrated into academic work.

STEM disciplines, with their emphasis on quantitative analysis and systematic problem-solving, naturally align with AI capabilities for data processing and algorithmic thinking. Humanities disciplines, focusing on interpretation, critical analysis, and cultural understanding, utilise AI differently, emphasising language processing and content synthesis capabilities while maintaining human agency in interpretive processes.

The findings support constructivist learning theory by demonstrating that students actively construct their understanding of AI tools based on their disciplinary contexts and educational needs. Rather than passively adopting AI capabilities, students engage in purposeful selection and integration of AI capabilities that align with their field-specific learning objectives and methodological approaches.

The study reveals universal concerns about data privacy, ethical implications, and academic integrity across all disciplinary groups, confirming recent research indicating that students are increasingly aware of the complex ethical dimensions of AI usage in educational contexts. The finding that arts students express the strongest ethical concerns aligns with research indicating that creative disciplines are particularly sensitive to issues of intellectual property, authorship, and originality.

The study's findings occur within a broader context where only 9% of higher education leaders believe their institutions are adequately prepared for AI's continued expansion (Inside Higher Ed, 2024). This preparedness gap suggests that students are navigating AI adoption with limited institutional guidance, which may lead to inconsistent practices and missed opportunities for pedagogically sound integration.

5.2. Implications for Sustainable Development Goal 4

The study's findings have significant implications for achieving Sustainable Development Goal 4 (Quality Education), revealing both the potential for AI to enhance educational accessibility and quality while also creating new challenges for educational equity. The discipline-specific nature of AI adoption suggests that institutions must develop nuanced approaches to AI integration that ensure all students, regardless of academic field, can benefit from AI's educational potential.

The study's findings support the development of comprehensive frameworks for AI integration that prioritise educational equity, cultural sensitivity, and sustainable development principles. Such frameworks must acknowledge disciplinary differences while ensuring that AI implementation supports inclusive educational practices that benefit all students. Key components of inclusive AI integration include: (1) discipline-specific AI literacy programs that address both technical skills and ethical considerations; (2) comprehensive support systems that help students navigate AI tools effectively while maintaining academic integrity; and (3) institutional policies that promote responsible AI usage while preserving the core educational values of different academic disciplines.

5.3. Practical Implications for Stakeholders

For Educational Institutions

Institutions should develop discipline-specific AI integration strategies that acknowledge the unique needs, challenges, and opportunities within different academic fields. This includes creating targeted professional development programs for faculty, developing comprehensive AI literacy curricula for students, and establishing clear ethical guidelines for the use of AI in academic contexts. Institutions should invest in infrastructure and support systems that enable all students, regardless of disciplinary background, to benefit from AI's educational potential while maintaining appropriate oversight and guidance.

For Faculty and Educators

Faculty should develop an understanding of how AI tools can enhance rather than replace core disciplinary practices and learning objectives. This includes exploring pedagogical approaches that integrate AI tools meaningfully into course design while maintaining focus on critical thinking, creativity, and disciplinary expertise. The findings highlight the importance of explicit discussions about AI usage in academic contexts, including ethical considerations, appropriate usage guidelines, and the relationship between AI assistance and independent learning.

For Students

Students should develop AI literacy skills that include both technical competency and ethical awareness. This includes understanding the capabilities and limitations of different AI tools, developing critical evaluation skills for AI-generated content, and maintaining awareness of academic integrity requirements in AI-enhanced learning environments. The findings suggest that students across all disciplines can benefit from AI tools, but practical usage requires purposeful integration aligned with disciplinary learning objectives and methodological approaches.

For Policymakers

Policymakers should support the development of comprehensive frameworks for AI integration in higher education that prioritise educational equity, academic integrity, and sustainable development goals. This includes funding research on the educational impact of AI, supporting professional development for educators, and developing guidelines for the responsible use of AI in educational contexts. The findings suggest the need for policies that address the digital divide and ensure that all students, regardless of disciplinary background or socioeconomic status, can access and benefit from AI-enhanced educational opportunities.

6. Summary

This study provides valuable empirical evidence of the complex, discipline-specific nature of AI adoption in higher education, revealing both the transformative potential and significant challenges associated with integrating AI across various academic fields. The findings demonstrate that AI adoption reflects more profound differences between disciplines, requiring nuanced approaches to integration that acknowledge and support disciplinary diversity while promoting educational equity and academic integrity. The research contributes to an understanding of how AI technologies are reshaping higher education while highlighting the importance of maintaining human agency, critical thinking, and disciplinary expertise in AI-enhanced learning environments.

6.1. Limitations

Several limitations should be acknowledged when interpreting these findings. The convenience sampling methodology may have overrepresented students with greater interest in or experience with AI technologies, potentially biasing the results toward higher usage rates and more positive attitudes. The unequal sample sizes across disciplinary categories, particularly the smaller sample sizes in the arts and communication, may limit the statistical power to detect differences in this group. Additionally, the cross-sectional design captures AI usage patterns at a single point in time during a period of rapid technological change, potentially missing important temporal dynamics in adoption patterns.

6.2. Future Research

Future research should address several critical questions emerging from this study. Longitudinal studies are necessary to track the evolution of AI usage patterns as students progress through their academic programs and as AI technologies continue to advance. Research examining the long-term impact of AI usage on learning outcomes, critical thinking skills, and academic performance across different disciplines would provide valuable insights for educational policy and practice. Comparative studies across different national and institutional contexts would help identify universal patterns versus culturally specific factors in AI adoption. Additionally, qualitative research exploring the lived experiences of students using AI tools across different disciplinary contexts would provide deeper insights into the motivations, challenges, and outcomes of AI adoption.

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