Some Recent Results from the Literature on Artificial Intelligence in Higher Education

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Abstract

The increasing use of artificial intelligence has not only transformed the learning process in academic education, but it also influenced administrative decision making and institutional policy development. In universities, artificial intelligence tools such as large language models, data analytics, and intelligent tutoring systems are widely employed to enhance student engagement, reduce faculty workload, and improve institutional productivity. This paper examines and synthesizes the literature from four relevant research studies on the use of artificial intelligence in academic education, focusing on student preferences as well as institutional policies and data-driven decision-making processes. Although the discussed findings support the adoption of artificial intelligence tools due to their positive contributions to academic productivity and personalized learning, they also address challenges such as ethical concerns, privacy violations, and academic authenticity.

Keywords

Artificial Intelligence, Generative Artificial Intelligence, Higher Education.

1. Introduction

In recent years, *Artificial Intelligence* (*AI*) has rapidly expanded through various sectors, including education and the workplace, radically reshaping interaction dynamics, service functionality, and the ways individuals learn and communicate. The development of AI technologies, such as OpenAI's ChatGPT (chatgpt.com) and Google's Gemini (gemini.google.com), has facilitated both the evaluation and improvement of language processing systems, particularly *Large Language Models* (*LLMs*), which can generate text and engage in human-like conversations in real time. These tools enhance both productivity and the learning experience by automating complex tasks and effectively processing extremely large amounts of data [1, 2].

In the context of higher education, AI is revolutionizing teaching methodologies and administrative processes [3]. Through *Natural Language Processing* (*NLP*), *Machine Learning* (*ML*), and predictive analytics, institutions are increasingly adopting tools such as virtual tutors, adaptive learning platforms, and plagiarism detection software. The integration of these technologies facilitates access to personalized, data-driven education while also contributing to the achievement of the *Sustainable Development Goals* (*SDGs*), particularly in areas such as educational equity and environmental sustainability [3].

However, the development and use of AI tools is not evenly distributed across regions and education systems. Due to persistent inequalities in access to AI tools, their widespread and effective use faces significant obstacles and entry barriers. The application of AI in education also requires careful consideration of complex issues such as data protection, the maintenance of academic integrity and honesty, and the potential decline in students' critical thinking skills. While AI improves student engagement and enables personalized learning, excessive reliance on AI-driven services may compromise the authenticity of academic work. AI also influences governance decisions: predictive analytics tools used by universities to monitor student performance and improve teaching methods raise ethical concerns about data

2nd Workshop "New frontiers in Big Data and Artificial Intelligence" (BDAI 2025), May 29-30, 2025, Aosta, Italy
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usage, particularly regarding the potential risk of algorithmic discrimination. Moreover, AI governance in academic institutions varies significantly, with some universities implementing centralized policies, while others allow faculty greater autonomy in regulating these technologies.

This paper analyzes the role of AI in higher education, assessing its impact on learning, decision-making, and institutional policies. In particular, it explores how *Generative AI* (*GenAI*) can improve academic and professional performance while promoting sustainable and responsible practices. Despite the extensive literature on the adoption of AI technologies in higher education, gaps remain regarding the understanding of its application in educational and professional settings. While theoretical models such as the *Technology Acceptance Model* (*TAM*) and the *Unified Theory of Acceptance and Use of Technology* (*UTAUT*) highlight determinants like perceived usefulness and ease of use, aspects such as self-efficacy and practical integration of knowledge in AI usage remain underexplored [4, 5]. This paper intends to preliminarily investigate the factors influencing the effective adoption of AI in higher education, optimizing its use to improve academic and professional performance.

This paper is organized as follows. Section 2 contains a summary of the literature discussed in [1, 2, 3, 6]. Section 3 examines the methodologies adopted in these papers. Section 4 shows the main results obtained by using these methodologies. Finally, Section 5 outlines some conclusions and provides a brief discussion of the surveyed results.

2. Related Works from Surveyed Papers

GenAI and NLP are groundbreaking innovations that are generating growing enthusiasm across industries worldwide [7, 8, 9]. In fact, there are good reasons for the overwhelming public attention to the behavior of GenAI models: they generate content that feels remarkably human. These cutting-edge tools can generate text, images, and other forms of media with a level of sophistication that often makes them indistinguishable from human-created work. This particular aspect has sparked both curiosity and controversy through various sectors, as GenAI is transforming creative production, automating work processes, and reshaping digital engagement.

Beyond that, the true power of these tools lies in their ability to provide real-time responses to human requests. ChatGPT is considered one of the most significant innovation within GenAI, leveraging cutting-edge NLP algorithms to generate accurate and contextualized responses [7]. This tool is based on deep neural networks and operates at high speed, both for processing and content generation, making it useful across many fields, from academia to professional settings.

GenAI is transforming higher education by changing teaching methods, pedagogical approaches, and enabling new ways of learning [10, 11, 12]. Students can use these tools to ask questions, explore complex topics, and develop skills through self-guided instruction [13, 14, 15]. Furthermore, GenAI technologies can customize study content and materials to meet the unique needs of individual students [16]. The increasing use of AI in educational settings raises legitimate concerns. The primary concern is whether AI-based technologies will threaten students' academic integrity by encouraging behaviors such as plagiarism and the unsupervised use of AI-generated content [17, 18]. Adding to the administration's concern is the risk that students may become overly dependent on these technologies, to the detriment of developing critical thinking skills, which are essential for their academic success. This dependency could ultimately hinder students' ability to develop independent learning skills [19, 20, 21, 22].

These concerns also include the ethical and legal issues surrounding AI in education, including transparency of sources, protection of intellectual property rights, and the risk of distortions in generated content [23]. To address these challenges, it is crucial for academic institutions and their faculty to establish responsive and effective regulatory mechanisms.

A major hurdle to the adoption of GenAI in teaching practices is the lack of guidelines and training courses for academic staff members [24, 25]. To facilitate the responsible and effective use of GenAI, it is important for institutions to develop clear guidelines that encourage conscious use, and to provide academics and students with access to resources such as training workshops for its proper use [26].

Another aspect to consider is the impact GenAI will have on the sustainability of higher education.

The adoption of these technologies varies depending on the availability of educational resources for people in different geographical contexts [27]. While countries with more advanced infrastructure can implement GenAI in a wider range of educational programs, countries with limited access to technology may struggle to implement it at all due to a lack of training for their educators. Bridging the digital divide requires initiatives that ensure the proper supply of AI technologies, guaranteeing that AI opportunities are equally accessible [27]. GenAI offers many benefits, including personalized study support and increased success in courses; however, it is important to balance its use with pedagogical approaches that foster creativity, critical thinking, and autonomy [28]. Future research should examine how AI can transform education by identifying opportunities and challenges in its implementation. Only through aligned and regulated integration can the benefits of GenAI in education be fully optimized, while reducing the risks associated with the misuse of these technologies.

As shown in [2], AI is becoming increasingly relevant and has expanded far beyond the corporate sector: it is now deeply embedded in everyday life [29], especially through the introduction of technological tools such as ChatGPT [30]. Although AI is considered a high-potential technology and a rapidly growing field [31], it is still difficult to define unambiguously. Change is inherent in the term, as AI continues to evolve with new scientific discoveries and advances [32]. In addition to being often used as a vague and generic term, AI is also difficult to define precisely due to the inherently complex nature of intelligence, which will always make it challenging to define both its limits and exact boundaries [30, 32]. This field is inherently multidisciplinary and spans a variety of fields [33], allowing for a wide range of approaches and potentially exploitable applications [31].

In an effort to simplify the inherent complexity of this technology and make it more understandable, different ways of categorizing its features and functionalities have been developed [30]. Tools based on this technology rely on the analysis of large datasets, identifying patterns and correlations through ML algorithms. A common definition of ML-based AI describes it as the ability of a system to analyze external data, learn from it, and use that knowledge to achieve specific goals and objectives [32].

The literature shows that students often prefer AI tools that provide reliable academic support, highlighting the need for both transparency and accuracy in information. As a result, AI-based educational tools must cite authoritative sources, minimize misinformation, and offer personalized feedback to be effective. A survey of over 6,300 university students in Germany provided further insights into the preferred features of AI tools [6]. Students especially valued the ability of AI tools to provide real-time feedback and assess the reliability of information. The ability to provide immediate suggestions and adaptive learning strategies enhances students' self-directed learning, although concerns remain that overusing AI tools may suppress critical thinking and inhibit the generation of original thoughts. Additionally, in the educational landscape, resources such as virtual tutors and AI-powered assistants are being integrated into digital platforms to offer continuous learning support. In particular, these platforms provide real-time feedback to clarify complex concepts, automate assessment processes, and facilitate interactive, problem-based learning experiences. However, to be effective, these resources must deliver their promise of providing responsive, contextualized responses, as debates continue over the potential decline of human interaction in the educational process.

AI technologies such as data mining and predictive analytics are transforming the way universities make strategic decisions to improve student success. By analyzing enrollment patterns, academic performance indicators, and demographics, advanced algorithms can identify at-risk students and optimize their educational experiences. For example, predictive analytics have shown that students typically perform better when they begin their college careers in the fall semesters rather than in the winter semesters, potentially due to a higher level of integration into the academic program.

In addition to focusing on student support, AI is being used to investigate academic performance, enabling institutions to offer timely and personalized support strategies. However, AI extends beyond the realm of teaching: academic institutions are increasingly adopting AI technologies to improve and streamline administrative processes. AI-based systems facilitate the automation of course scheduling, faculty workload management, and resource allocation, improving internal processes while alleviating some of the bureaucratic burden.

However, implementing these tools raises both ethical and practical issues, including the risk of bias

in algorithms, privacy protection, and the responsible use and management of student data [3]. One of the most important concerns is ensuring that AI models do not unintentionally discriminate against certain student groups. Therefore, continuous monitoring is necessary to ensure that the technology used in the academic environment remains fair, permissible, and transparent.

Educational institutions are employing multiple strategies to clearly regulate the use of AI in education, striving to balance technological innovation with the responsibility of ensuring its appropriate use. In some cases, universities have given faculty members full discretion over how and to what extent they can incorporate AI into their courses. In other cases, universities have developed more formal regulations to guide the use of AI in courses, addressing key issues such as plagiarism, data protection, and the ethical implications of AI use in education. A recent study of 100 universities found that more than half (54.8%) have granted faculty full discretion to create their own AI policies, while more than a third (35.6%) have not yet established clear guidelines, and only a small percentage (9.6%) have implemented conditional use policies with appropriate citations [1].

This highlights the widespread lack of general consensus regarding recommended regulatory strategies at the institutional level, with some educators preferring a more restrictive approach, while other universities wish to adopt a more restrictive approach, presumably to prevent abuse of AI and ensure accountability in its use. Indeed, one of the main concerns is that the use of GenAI could promote dishonest academic behaviors, such as cheating through plagiarism or the acquisition and use of materials without adequate critical evaluation. For this reason, many universities are adopting advanced tools to detect AI-generated texts and implementing information-sharing initiatives to raise awareness about the responsible use of AI, through information campaigns for faculty and students. Some institutions have also established ethics committees specifically focused on interpreting the implications of AI in academia, in addition to the adoption of detection tools. These committees provide ongoing monitoring of AI applications in teaching and assessment, as well as advice and guidance on issues such as transparency in the use of algorithms, the reliability of instant information sources, and how AI can positively influence personalized learning.

Another aspect of institutional strategies is AI literacy, meaning training students and teachers in the informed, conscious, and critical use of AI in their learning or teaching practice. Programs are being developed to enhance the capacity and awareness to evaluate the reliability of AI-generated information, as well as the limitations of AI technologies and the ethical implications of their use. The usefulness of AI in academic practices, therefore, requires ongoing vigilance and flexible processes that can adapt to the rapid evolution of technologies. Universities must balance both the utility and opportunities offered by such innovative tools with the integrity of academic practices.

3. The Methodologies of Surveyed Papers

In recent years, as previously mentioned, AI has revolutionized many sectors, including academia, offering advanced tools for processing, analyzing and synthesizing information. However, to fully understand the impact of these technologies and of their optimal use in research and teaching environments, which are the specificities of the academia, it is necessary to adopt a methodology that integrates and synthesizes existing approaches. This study aims to outline a preliminary methodological framework based on the review and combination of pre-existing models, with the aim of analyzing how AI tools can be applied in academic contexts.

Through a critical synthesis of existing methodologies, this study identifies the most effective practices, highlighting their strengths and potential challenges. The approach is divided into different phases: from the selection and comparative analysis of previous studies to the application of evaluation criteria to assess the effectiveness of AI tools in improving productivity, and the quality of research and teaching. This approach facilitates the construction and development of a comprehensive and organized view of AI adoption in higher education, providing insights for the thoughtful and strategic application of these new technologies in the academia.

In summary, this survey synthesizes existing literature on the implementation of AI in higher

education. The studies selected for this survey employed mixed approaches, such as large-scale student surveys, data mining, analysis of specific institutional or policy contexts, and experimental case studies. These studies utilized data from universities in diverse geographic settings, including the United States, Germany, Slovenia, and South Korea, providing a comprehensive view of AI usage in higher education. The methodology involved identifying patterns in AI adoption, assessing the impact of AI-based tools on student learning, and evaluating the effectiveness of AI-driven decision-making in administrative settings. To further understand the dimensions of institutional policy related to AI implementation in universities, the authors also examined a variety of institutional policy documents. The survey will then provide an overview of each methodological approach used and analyze the results obtained.

3.1. Methodology for analyzing academic policies on GenAI

The study documented in [1] used a mixed-method approach, combining quantitative and qualitative methods to analyze policies and resources related to the use of GenAI in U.S. academic institutions. Data collection focused on the top 100 universities in the United States, according to the U.S. News Best National University Rankings 2024. Several analyses were conducted on the guidelines, official statements, and resources provided by these institutions for the responsible and sustainable use of AI, with particular attention to content published on the official websites of university entities.

The selection of information followed specific inclusion and exclusion criteria. Only official university documents addressing the use of GenAI in teaching and administration were considered valid, excluding newspaper articles and resources limited to individual departments. This mixed approach was chosen to ensure that the data reflected authoritative institutional positions and provided clear insight into AI implementation strategies in higher education.

An iterative coding system was used for the analysis. After the data collection process, the principal investigator started with a list of preliminary categories, which were surveyed and finalized with the study team. University resources and policies were classified and organized into categories to highlight trends and differences in both approaches and strategies.

While much of the analysis was qualitative, the study also developed quantitative metrics to assess university positions on AI use and the comprehensiveness of resources available on the topic. A perception scale was developed, with scores ranging from -5 (strong hesitation) to 0 (no clear position) to +5 (enthusiastic approval), based on how university policies rated their stance on AI use. Similarly, a scoring system was created to quantify the breadth and variety of resources related to GenAI, considering the target audience, type of material presented, and content categories covered. The study acknowledges that policies and resources on GenAI are constantly evolving, and the data reflects only a snapshot of the state of policy and resources as of April 2024. However, the findings help organize and understand how academic institutions are addressing the integration of AI into academic settings, revealing trends in adopted strategies, and providing insights for future research on the topic.

3.2. Methodology for analyzing students' preferences on GenAI

The aim of the research discussed in [6] is to investigate the preferences of German university students regarding GenAI tools, especially language-based ones. To achieve this goal, a *Choice-Based Conjoint analysis* (*CBC*) methodology was adopted. This approach evaluates the perceived value of different features of such tools and the willingness to pay for each of them. Conjoint analysis is a well-established method for studying consumer preferences.

In this study, the CBC variant was chosen because it simulates real purchase decisions, rather than simply preference ratings. Students were asked to choose between different combinations of features of AI tools, with varying prices, thus reflecting the value attributed to each attribute. To identify the most relevant properties of AI tools in the academic field, a literature survey of recent publications was conducted. This process led to the identification of 16 key features, which were subsequently grouped into four categories. A preliminary survey with 36 students then helped identify the five most important characteristics, which were used in the CBC: prevention of errors in the output, reliability of

the instrument; logical reasoning; success in explaining the decision, and in identifying and correcting errors in the input. The experimental design resulted in 64 possible combinations of AI tools, each with its own combination of the features described above. The price range of the options extends from €2 to €40, with ChatGPT Plus (€20/month subscription) as the reference. A sample of 250 students was considered sufficient to ensure a statistically valid summary of the main features of the research results. Data collection was carried out through the distribution of an online questionnaire, accessible to students of German universities and German institutes of applied sciences. Distribution was carried out through institutional contacts, involving 395 universities and 3,849 academic referents. The survey was conducted from May 15 to June 5, 2023, with 8,802 responses, of which 6,311 were analyzed after a data cleaning process. This methodology provided a detailed summary of students' preferences regarding AI tools by examining both the features they considered most important and the quantification of their willingness to pay for each feature. The knowledge acquired is useful for developing AI applications that are aligned with the needs of the academic and learning world.

3.3. Methodology for analyzing students' opinions on AI

The study in [3] used a quantitative approach based on an online survey to gather information on university students' opinions and perceptions regarding the use of AI tools in the academic context. The survey was conducted in March 2024 using the open-source *1KA* (1ka.si), selected for its ease of use, versatility in the types of questions supported, and compliance with data protection regulations. The survey participants were students enrolled at the University of Primorska, the third-largest public university in Slovenia, with 5,744 students in the 2023/24 academic year, and at GEA College, one of the leading private business schools in the country, with 401 students enrolled during the same period.

The questionnaire was distributed randomly, with no selection criteria related to age, gender, or level of education. A total of 422 fully completed questionnaires were collected and analyzed using descriptive and inferential statistical methods. Although no specific analysis of the sample's representativeness was conducted, the distribution of students by gender, age, and field of study suggests a good heterogeneity within the examined population.

The questionnaire was created based on a survey of existing literature and reviewed by experts in educational technology to ensure the relevance and clarity of the questions. The questionnaire was divided into three main sections. The first section, Demographic Information, included questions related to gender, age, level of education, and field of study. The second section focused on Frequency and Reason for Using AI Tools, with questions adapted from previous research (e.g., [34]). The third section, Attitudes and Perceptions about AI, asked participants to rate nine statements regarding the potential benefits and challenges of using GenAI technologies in academic learning. Six statements focused on perceived benefits, based on a study conducted in Sweden [35], and three statements focused on the level of confidence in the results generated by AI, consistent with a study in the United States [34]. The questionnaire used a three-point Likert scale (Agree, Neutral, Disagree) to measure responses. The Likert was chosen for its clarity and simplicity, making it easier to interpret and analyze the results. The analysis of section 1, i.e. demographic data, showed that the sample was composed of 53% women and 47% men. Beyond that, 39% of the sample was between 18 and 21 years old, 29% was between 22 and 25 years old, 32% was between 26 and 29 years old and two participants were over 29 years old. The interviewed students were then divided according to their academic level, resulting in 31% of the interviewees being in the first year, 19% in their second year, 27% in their final year and 27% representing postgraduate students. Finally, the interviewees were also categorized according to their area of study, with 14% of students belonging to the humanities, 23% to social sciences, 22% to natural sciences and mathematics, 20% to technological sciences and 21% belonging to interdisciplinary sectors. This methodological approach allowed the collection of reliable data on students' experiences and perceptions on the use of AI tools for educational purposes.

3.4. Methodology for studying GenAI adoption models in education

The research model used in [2] is based on TAM and UTAUT models to investigate the challenges and opportunities associated with GenAI in educational settings. TAM focuses on perceived ease of use and perceived usefulness as key determinants of technology adoption, while UTAUT includes performance expectations and social influence, in addition to perceived ease of use and perceived usefulness. Both perceived ease of use and perceived usefulness are significant factors in the adoption of GenAI.

Higher perceived ease of use means that users are able to easily understand and utilize the main capabilities of AI. Higher perceived usefulness on the other hand, indicates that students are more likely to adopt AI technologies to improve their studies and in their lives in general. Knowledge application refers to leveraging GenAI as a service to improve performance and productivity. It also helps individuals incorporate new knowledge into their practices, thereby improving their performance and outcomes. AI learning self-efficacy refers to a user's confidence in their ability to use and master the technology. High self-efficacy can improve the adoption of GenAI and its impact on individual performance. Individual impact refers to the benefits gained from using GenAI, such as improved academic and work performance. Effectiveness in applying the technology can lead to increased productivity and efficiency. Technology use measures the frequency and intensity with which users engage with GenAI. Regular use of these tools can improve academic and professional performance.

The constructs used in this methodology were derived from validated studies and were measured through a questionnaire based on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). The questionnaire was divided into three sections: demographic information, user perceptions, and use of GenAI. The research involved adult workers in South Korea enrolled in educational programs. The survey was conducted between June 10 and 12, 2024, collecting a final sample of 300 participants. Responses were filtered based on consistency and completion time. Data with significant inconsistencies or excessively short response times were excluded, ensuring the reliability of the sample. To analyze the collected data, a multivariate statistical analysis was performed. Specifically, *Principal Component Analysis* (*PCA*) was applied to validate the factorial structure of the questionnaire and ensure the internal consistency of the scales. Subsequently, a multiple regression analysis was conducted to test the proposed hypotheses and evaluate the relationships between the constructs. The software used for the analysis was *SPSS* (ibm.com/spss) for *Structural Equation Modeling* (*SEM*), which was employed to verify the causal relationships between the variables in the model.

4. Major Results from Surveyed Papers

This section presents the results obtained from the four analyzed papers, which provide an in-depth overview of the use of AI in academic education, highlighting both the benefits and challenges associated with its implementation. These case studies explore different applications of AI, from personalizing learning to automatic assessment, and show how AI is transforming teaching and educational processes. While highlighting the innovative aspects and the potential improvement in teaching effectiveness, the papers also raise questions about ethics, accessibility, and the need to adequately train teachers and students to deal with new technologies. The results, therefore, offer a comprehensive and critical picture of the current and future impacts of AI in academic education.

4.1. Universities' Policies and Perceptions on GenAI

The study involving the top 100 universities in the United States [1] reveals that none of the universities completely prohibit the use of GenAI tools such as ChatGPT, suggesting a generally permissive attitude towards such tools. However, 54.8% of universities leave the decision up to individual teachers, while 9.6% allow GenAI use only with specific citations or parameters. Meanwhile, 35.6% of universities have not yet taken a position on the matter. Of the universities that give teachers the choice, 47.4% choose no by default, allowing students to use GenAI tools only if explicitly authorized by the teacher. On the other hand, 50.9% of universities maintain an intermediate position, offering teachers the discretion

to decide on a case-by-case basis. The main concerns identified by universities include plagiarism (33.7%), proper attribution of sources (36.5%), and the limitations of GenAI tools (29.8%). Less commonly addressed concerns include intellectual property (12.5%) and data privacy (26.9%). By examining the guidelines and resources provided by universities on the use of GenAI tools, as well as the different categories involved, the following results can be observed:

1. Target audience: 67.4% of universities offer resources for instructors, while only 17.8% provide resources specifically aimed at students;
2. Type of resources: articles and blogs are the most commonly used resources, followed by policy templates, individual consultations, workshops, and discussions; and
3. GenAI-related content: the most frequently addressed topics include understanding GenAI; ethical implications; technical limitations, and privacy concerns. Many universities provide guidelines on effectively integrating GenAI into courses (53.8%), while also addressing ways to prevent its misuse (54.8%). However, no university has explicitly endorsed the reliability of GenAI detectors for identifying plagiarism.

Finally, when analyzing how university beliefs and resources regarding GenAI use may be influenced by institutional rankings and academic specializations, the research finds the following results:

1. University Ranking: there is no significant correlation between a university's rankings and its stance on GenAI. The widespread cautious perception may stem from concerns about the implications of GenAI tools in educational settings; and
2. Academic Focus: technology-oriented universities tend to adopt a more cautious approach, whereas institutions with broader academic programs generally implement more open and flexible policies.

Overall, U.S. universities exhibit a cautious yet open approach to GenAI, emphasizing teacher accountability and the necessity of regulating these tools.

4.2. Preferences and willingness to pay for AI tools in the academic context

The study discussed in [6] involved 6,311 participants, of whom 60.3% were women, 33.8% were men, 1.3% identified as gender-diverse and 4.6% as gender-neutral. The most represented fields of study were law, economics, and social sciences (36.3%), followed by humanities (19.5%), engineering (17.2%), mathematical and natural sciences (9.0%), medicine (7.9%), artistic sciences (4.6%), veterinary medicine and agricultural sciences (1.3%), and sports sciences (0.5%).

Overall, approximately 63.4% of participants, reported having used AI-based tools for studying. More than half of the participants (55%) made purchases in at least six of the simulated shopping situations, while 9% never selected any option. Six of the twelve characteristics analyzed (namely, Research of literature, Text analysis, Programming and simulations, Exam preparation, Language processing, Clarification of comprehension questions, Translations, Study of literature, Concept development, Problem solving and decision making, Data analysis and Teacher training) were found to have a positive net benefit value relative to the perceived cost. The optimal combination of attributes was determined based on the maximum partial benefit values.

The most relevant factor is scientific rigor, with a strong preference for AI tools that cite reliable academic sources, use detailed and logical language, detect and correct errors, and ensure high data transparency. Conversely, lack of transparency, short and poorly traceable responses, uncorrected or undetected errors, potential AI biases, and missing citations are perceived negatively. While preferences vary little across different fields of study, some differences emerge. Specifically, individuals who have never used AI, as well as medical, humanities, and sports science students, along with those who do not identify within binary genders, tend to favor AI that cites exclusively scientific sources.

4.3. Use, perceptions and impact of AI tools among university students

The results of the quantitative analysis conducted through an online questionnaire in [3] reveal that students are accustomed to using AI, making it widely adopted in academic settings. Among the respondents, 51% use AI often, 22% very often, 21% sometimes, 4% rarely, while only 2% report never using it. Most students utilize AI to assist with assignments, yet only 1% use AI-generated results without modifications. The most common tasks for which students seek AI support include summarizing and/or paraphrasing text, writing formal documents, translating, and checking spelling/grammar. In contrast, AI is used less frequently for generating ideas, studying for exams, and managing time. The statistical *Analysis of Variance* (*ANOVA*) reveals significant differences based on the level of study and the field of study, indicating that both factors influence the frequency with which students use AI.

Regarding attitudes toward AI, 93% of students acknowledge that AI usage is widespread among their peers at school or university. However, 39% do not believe AI improves their language skills and 35% are skeptical about its positive impact on their grades. On the other hand, 61% of students feel that AI helps them study more efficiently. Regarding the quality of AI output, there are mixed opinions; 39% of students believe AI produces better results than independent work, while 29% disagree, stating that it does not lead to improved outcomes. Overall, the majority of students (89%) hold a favorable opinion about the use of AI in education. However, there is noticeable caution regarding the reliability of AI generated content: 78% believe that AI-produced work can be recognized by teachers, 76% feel they cannot fully trust AI, and 70% think AI generated outputs cannot be equated to human work.

4.4. Results on the acceptance and use model of GenAI in academic education

In the analysis conducted in [2] to verify the presence of methodological preconceptions, the *Variance Inflation Factor* (*VIF*) values were analyzed for each construct using *SmartPLS* (smartpls.com). The results indicate that common method bias does not represent an obstacle for the analysis, since the maximum value obtained equals 2.998, which is a value lower than the critical threshold 3.3.

The factor loadings, Cronbach's alpha, the *Composite Reliability* (*CR*) and the *Average Variance Extracted* (*AVE*) allowed to evaluate the reliability and validity of the data measurement model. All constructs presented factor loadings above 0.70, demonstrating a high reliability of the indicators. Cronbach's alpha ranged from 0.843 to 0.887, indicating good internal consistency. The CR values, mostly above 0.844, further supported model stability. Additionally, all AVE values exceeded 0.5, indicating that the variance captured by the constructs was greater than the variance attributed to measurement error. For example, the construct technicality achieved a CR of 0.905 and an AVE of 0.762, while the construct application of knowledge had a CR of 0.911 and an AVE of 0.774, confirming both strong reliability and convergent validity. Finally, discriminant validity was assessed using the Fornell-Larcker criterion, which reveal that the square root of the AVE for each construct was greater than the correlations with other constructs, indicating that each variable measured a distinct concept within the model. The significance of the hypothesized relationships in the structural model was calculated through a bootstrap procedure with 5,000 samples. Each path was found to be significant, supporting the theoretical model by suggesting and demonstrating its strong predictive capacity.

5. Conclusions and Discussion

The use of ChatGPT technologies and, more broadly, GenAI tools in academic education offers both significant opportunities for improvement and notable challenges, related to ethical and pedagogical issues. Universities are moving slowly, adopting a cautious approach, developing resources and guidelines rather than outright banning AI. This approach aims to increase student engagement while addressing the associated risks and ethical issues. Highlighted benefits include personalized learning, support for research and improvements in academic performance. However, three main concerns emerge from institutions: plagiarism, the quality of information and the potential for excessive reliance on AI. Strategies to address institutional concerns include the use of different assessment modalities,

the careful use of AI detection tools and the implementation of different assessment and evaluation methodologies, such as oral presentations. Data privacy considerations and the maintenance of trust in the teacher-student relationship are critical pillars to focus on. A study on student preferences revealed that students are consistently seeking reliable, scientifically valid tools. students in STEM fields tend to use AI more frequently and consistently than students in the humanities, arts, and social sciences.

The results suggest that students primarily use AI as a support tool for tasks such as synthesis and translation, rather than to develop original thought. Additionally, the level of AI usage demonstrates a difference between different academic levels and different subject areas. Studies show that students in STEM fields tend to use AI more frequently and consistently than students in the humanities, arts, and social sciences. The results indicate that the implementation of AI positively impacts both academic and professional outcomes by improving access to information and facilitating personalized learning. The effectiveness of these tools, however, largely depends on their ease of use and the self-efficacy of users, which determines both the frequency and the ways in which AI technologies are utilized. Despite these benefits, several challenges remain, including the risk of bias in algorithms, the digital divide and concerns about data protection. In light of this, to maximise the benefits of AI, it is crucial to implement a balanced approach that combines educational initiatives for conscious technology integration.

Overall, AI-based tools are transforming the academic experience not only in terms of learning and student engagement, but also in teaching methods and instructional tools. However, the integration of AI in education requires careful monitoring and regulation strategies to ensure that students use these technologies consciously and sustainably. One of the key aspects emerging from these studies is the role of AI in improving learning efficiency. AI technologies offer personalized support tools, facilitating access to information and optimizing individual study processes. However, it is crucial to balance the use of technological tools with the development of essential cognitive skills, such as critical thinking and academic autonomy. While students recognize the benefits of AI, they also express concerns about the reliability of its outputs and its long-term impact on their ability to process information independently. An attitude of cautious optimism emerges from institutional perspectives: many universities are exploring ways to integrate AI into teaching, while remaining mindful of risks related to plagiarism, privacy and teaching quality. A common strategy is to establish flexible guidelines that allow teachers to tailor AI use to the specific needs of their disciplines. Additionally, training activities and initiatives on AI for teachers are increasingly promoted by universities, such as workshops and instructional materials, to foster awareness and develop the skills necessary for the effective use of AI and its powerful tools.

A key recommendation for successfully integrating AI into academic education is to design teaching strategies that not only leverage the advantages of technology but also emphasize the importance of human interaction. These solutions include adopting intuitive and transparent AI tools, promoting diverse and mixed assessment methods to reduce reliance on detection tools, and establishing learning pathways that promote the critical use of AI technology. Additionally, achieving these goals requires investment in AI literacy programs for both students and educators, ensuring responsible, informed, and conscious use of AI. The future of AI adoption in academic education appears optimistic and promising. It will be important to monitor how AI use evolves over time, particularly its impact on academic performance, student engagement, and teaching quality.

Future research should focus on three key objectives: first, examining differences in AI use across disciplines more specifically; second, identifying the most effective strategies to maximize AI's benefits without compromising academic integrity; and third, conducting longitudinal studies to better understand AI adoption dynamics.

Acknowledgments

This work was partially supported by the Italian Ministry of University and Research under the PRIN 2022 grant 20223SRYFJ for the project *GAMEFUL* (*Videogame-based Assessment of Executive Functions through Machine Learning*).

Declaration on Generative AI

The authors have not employed any Generative AI tools.

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