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# The Impact of Artificial Intelligence (AI) on Students' Academic Development

**Aniella Mihaela Vieriu [1,*] and Gabriel Petrea [2]**

[1] The Department of Teacher Training and Social Sciences, The National University of Science and Technology POLITEHNICA Bucharest, 060042 București, Romania
[2] The National University of Science and Technology POLITEHNICA Bucharest, 060042 București, Romania
* Correspondence: aniella.vieriu@upb.ro; Tel.: +40-756531269

**Abstract:** The integration of Artificial Intelligence (AI) in education has transformed academic learning, offering both opportunities and challenges for students' development. This study investigates the impact of AI technologies on students' learning processes and academic performance, with a focus on their perceptions and the challenges associated with AI adoption. Conducted at the National University of Science and Technology POLITEHNICA Bucharest, this research involved second-year students who had direct experience with AI-enhanced learning environments. Using purposive sampling, 85 participants were selected to ensure relevance. Data were collected through a structured questionnaire comprising 11 items as follows: seven closed-ended questions assessing perceptions, usage, and the effectiveness of AI tools; and four open-ended questions exploring experiences, expectations, and concerns. Quantitative data were analyzed using frequency and percentage calculations, while qualitative responses were subjected to thematic analysis, incorporating both vertical (individual responses) and horizontal (cross-dataset) approaches to ensure comprehensive theme identification. The findings reveal that AI offers significant benefits, including personalized learning, improved academic outcomes, and enhanced student engagement. However, challenges such as over-reliance on AI, diminished critical thinking skills, data privacy risks, and academic dishonesty were also identified. The study underscores the necessity of a structured framework for AI integration, supported by ethical guidelines, to maximize benefits while mitigating risks. In conclusion, while AI holds immense potential to enhance learning efficiency and academic performance, its successful implementation requires addressing concerns related to accuracy, cognitive disengagement, and ethical implications. A balanced approach is essential to ensure equitable, effective, and responsible learning experiences in AI-enhanced educational environments.

**Keywords:** artificial intelligence in education; academic development; personalized learning; education technology; student engagement; critical thinking



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## 1. Introduction

The rapid advancement of Artificial Intelligence (AI) is transforming various sectors, and education is no exception. AI plays a significant role in both general and higher education, influencing students' academic development by offering a mix of opportunities and challenges (Edtech, 2020). From personalized learning experiences to intelligent tutoring systems that provide tailored guidance, support, and feedback based on individual learning patterns and knowledge levels (Hwang et al., 2020), AI has the potential to revolutionize education (Holmes et al., 2019) and address the diverse needs of learners. However, positive educational outcomes are not guaranteed solely by the adoption of advanced AI

technologies (Castaneda & Selwyn, 2018; Du Boulay, 2000; Selwyn, 2016). The integration of AI in academic environments raises critical questions related to equity, accessibility, and the evolving role of traditional teaching methods. The influence of AI on education is transformative and multifaceted. AI enables personalized learning by adapting educational content to meet the unique needs of individual students (Hennekeuser et al., 2024). Studies have shown that students in personalized learning environments exhibit improved self-efficacy and a more positive attitude toward their education (Johnson & Smith, 2019). These experiences are increasingly achievable through AI-driven tools that analyze vast amounts of data to identify learning gaps and tailor interventions accordingly (J. A. Baker, 2021). For instance, AI-powered platforms, such as adaptive learning systems, have been shown to enhance student engagement and performance by providing real-time feedback and customized learning pathways (Luckin et al., 2016; Zawacki-Richter et al., 2019).

In traditional education, students are encouraged to take an active role in their learning process by developing skills in exploration, analysis, and problem solving. Critical thinking skills are essential for shaping students' overall learning experiences. Educators often rely on questioning techniques, collaborative activities, and assignments to enhance students' ability to evaluate information and develop independent perspectives (Facione, 2020). However, the rapid information processing and insightful responses provided by AI challenge traditional learning methods, raising questions about the distinctions between human learning and machine-based learning. For example, while AI can efficiently process and analyze data, it may lack the nuanced understanding and creativity inherent in human cognition (Luckin et al., 2016). This underscores the need for a balanced approach to AI integration, ensuring that it complements rather than replaces human interaction and the development of critical thinking skills (Wu, 2023).

The use of AI in education is not without its challenges. The effective integration of artificial intelligence in education requires a thorough understanding of both the technology and the learning process. This complexity is further heightened by ethical concerns, especially in the context of the increasing use of generative artificial intelligence. For instance, Qadir (2023) highlights the risk of students misusing AI tools in dishonest or unauthorized ways, such as using AI-generated content to complete assignments without proper attribution. Additionally, concerns about the application of AI in surveillance, control, and assessment practices could undermine trust and autonomy in educational settings (Williamson, 2017). Higher education institutions must clearly define the role and extent of AI in student education to address these challenges effectively (Holmes & Tuomi, 2022).

As data processing and computing technologies have evolved, artificial intelligence (AI) has been increasingly applied in the educational field, often referred to as Artificial Intelligence in Education (AIED). Applications such as intelligent tutoring systems, educational robots, learning analytics dashboards, adaptive learning platforms, and human–computer interactions have demonstrated significant potential for enhancing teaching and learning (Chen et al., 2020; Zawacki-Richter et al., 2019). For example, intelligent tutoring systems have been shown to provide personalized feedback and support, improving student engagement and learning outcomes (Luckin et al., 2016). Similarly, adaptive learning platforms leverage AI to tailor educational content to individual learners' needs, promoting more effective and efficient learning experiences (Holmes et al., 2019).

Despite advancements, AI integration in education raises critical questions about its alignment with established learning theories. While studies have explored challenges (Hwang et al., 2020), obstacles (T. Baker et al., 2019), and future perspectives (Pinkwart, 2016), few explicitly analyze AI' s diverse functions and their relationship with pedagogical frameworks. For instance, how do AI tools align with constructivist or socio-cultural theories emphasizing collaboration, context, and critical thinking? (Luckin et al., 2016)

Additionally, the long-term impact of AI on teaching, learning, and educational equity remains underexplored (Selwyn, 2022).

A key challenge is ensuring AI complements, rather than replaces, human interaction. While AI automates tasks and provides data-driven insights, it lacks the empathy, creativity, and nuanced understanding of human educators (Holmes & Tuomi, 2022). Over-reliance on AI for assessment and feedback may reduce opportunities for meaningful dialogue and reflection, essential for higher-order thinking (Facione, 2020). Ethical concerns, such as data privacy, algorithmic bias, and the digital divide, must also be addressed to ensure equitable and inclusive learning environments (O'Neil, 2016).

AI holds immense potential to transform education through personalized learning and adaptive systems. However, its integration requires caution. A deeper understanding of AI' s interplay with educational theories, alongside addressing ethical and pedagogical challenges, is essential. A balanced, human-centered approach prioritizing equitable access can ensure AI empowers rather than excludes.

This study examines the impact of artificial intelligence (AI) technologies on the learning processes and academic performance of students at the National University of Science and Technology POLITEHNICA Bucharest. Specifically, our research aims to explore the types of AI technologies utilized, the frequency of their use, and students' perceptions regarding their effectiveness in improving academic performance. Additionally, this study investigates the concerns and challenges associated with the integration of AI in education.

## 2. Materials and Methods

### *2.1. Sample*

The sample consisted of 85 second-year students, purposefully selected from the Aerospace and Medical Engineering programs, which emphasize AI integration. A purposive, non-probabilistic sampling method was employed to ensure the selection of participants with direct experience in AI-integrated learning environments, thus enhancing the relevance of the findings. Second-year students were chosen due to their foundational knowledge and early exposure to advanced technologies, such as AI.

This approach allowed for a focused examination of individuals who had direct exposure to the technologies central to the study. Given the small sample size and its focus on specific academic programs, the findings should be considered preliminary and exploratory. They cannot be generalized to all students within these programs or to those in other fields. Future research with a larger, more diverse sample is needed to provide more robust insights.

### *2.2. Data Collection and Research Instrument*

Data were collected using a self-administered questionnaire distributed via Google Forms. This platform was chosen for its user-friendly interface and integrated analytical tools, which facilitated efficient data management and interpretation. The study utilized a mixed-methods design, incorporating both quantitative and qualitative data collection techniques. The questionnaire consisted of 11 items, categorized into two types of questions as follows; 7 closed-ended questions designed to quantify students' responses and identify patterns, and 4 open-ended questions aimed at capturing detailed qualitative insights into participants' experiences, perceptions, and expectations regarding the impact of AI on their learning. The closed-ended questions were further divided as follows: yes/no questions (Items 1, 4, and 6), multiple-choice questions (Items 2 and 7), and Likert scale questions (Items 3 and 5), enabling both categorical and ordinal data analysis.

### 2.3. Analysis

Quantitative data were analyzed using descriptive statistical methods, including frequency and percentage calculations, to provide a clear overview of students' perceptions, usage patterns, and the perceived effectiveness of AI tools. For the qualitative data, responses to the open-ended questions were analyzed using thematic analysis, a well-established and rigorous method for interpreting qualitative data. The thematic analysis followed the framework proposed by Braun and Clarke (2006), ensuring a systematic and transparent approach to identifying, analyzing, and reporting patterns (themes) within the data.

The analysis was conducted at two levels as follows: vertical analysis, which focused on individual responses to identify unique insights; and horizontal analysis, which examined patterns across the entire dataset to ensure a comprehensive understanding of emerging themes. To enhance the validity and reliability of the findings, the analysis adhered to a structured, iterative process, as outlined by Ezzy (2002). This process included the following: transcription of participants' responses, creation of a coding scheme; development of an analysis grid; analysis of transcripts and thematic interpretation; and calculation of statistical indicators. To further strengthen the validity of the results, data triangulation was employed. Responses from students in the Aerospace and Medical Engineering programs were compared to identify potential program-specific trends and to validate the consistency of the identified themes across different student populations. This mixed-methods approach, integrating both qualitative and quantitative analysis, provided a rich and nuanced understanding of students' perceptions of AI in education, while ensuring the reliability, depth, and generalizability of the findings.

## 3. Results

The data interpretation involved addressing each research question both quantitatively, by calculating frequencies within specific thematic categories; and qualitatively, through the statistical analysis of the participants' responses.

According to the statistical data obtained, 95.6% of respondents use artificial intelligence technologies in academic activities. This high percentage suggests the widespread adoption of AI tools among students, reflecting the increasing integration of advanced technologies into the educational landscape.

Regarding the main types of AI used in academic activities, 88.2% of respondents use virtual assistants (e.g., ChatGPT, Siri, Google Assistant, etc.), 42.4% of respondents use AI-based educational platforms (e.g., Coursera, Duolingo, etc.), 17.6% of respondents use automatic content generation tools, 8.2% of respondents use data processing tools (e.g., predictive analysis), while 3.5% of respondents use other types of AI. For the data analysis, frequency analysis and percentage calculations were applied. These descriptive techniques allowed for the determination of the distribution of responses across each AI usage category. Percentages were calculated by relating the number of responses for each category to the total number of participants (100% of responses), providing a clear picture of the prevalence of each AI usage option. Frequency analysis was essential in identifying general trends and understanding which technologies are the most and least popular in the academic environment. The results of the analysis suggest that AI usage in academia is already a well-established practice, with a clear preference for virtual assistants and AI-based educational platforms. This reflects a global trend towards the integration of interactive and accessible technologies in the educational process. Virtual assistants, being easy to use and accessible for a wide range of academic tasks, are by far the most popular. Additionally, AI-assisted educational platforms provide a personalized learning experience, which contributes to their frequent use.

Furthermore, we set out to investigate the frequency of artificial intelligence tool usage in academic activities. The results show significant variation among students, with data indicating the widespread adoption of these technologies. Most students (57.6%) use them weekly, suggesting that these tools have become an integral part of the educational process, assisting with homework, projects, and knowledge enhancement. A considerable percentage, 18.8%, use AI daily, indicating a higher reliance on these technologies, possibly because they consider them essential for learning—whether through virtual assistants, educational platforms, or other AI-based tools. On the other hand, 11.8% of students use AI monthly, which may suggest occasional use depending on academic needs, while a similar percentage (11.8%) uses them rarely, indicating limited adoption or a preference for traditional learning methods. Only 1.2% of students stated that they do not use AI tools at all, confirming that AI has become an almost indispensable resource in education.

We also wanted to investigate students' perception of the impact of artificial intelligence (AI) use in their learning process. The results showed a significant majority of students believe AI is helpful in their academic activities. Thus, 80% of them agree that using AI-based technologies enhances their educational experience, either by optimizing the time spent studying or by providing quick access to personalized educational resources that facilitate their understanding of complex materials. However, 17.6% of students expressed uncertainty about the effects of AI on their learning, which may suggest either limited use or a lack of familiarity with the potential of these tools. This group may include students who have not explored all the options AI offers in detail or those who are not yet convinced of the effectiveness of these technologies. In contrast, only 2.4% of students considered AI to be of no benefit to their educational process. These students might prefer traditional learning methods or may face difficulties in using these technologies, limiting their understanding of AI' s potential in supporting their studies.

Regarding the impact of AI usage on academic performance in exams, projects, and grades, many students believe that AI plays a positive role in improving their results. Specifically, 82.4% of students think that using AI contributes to enhancing their academic performance. However, some (15.3%) believe that implementing AI does not bring significant changes in this regard, and 3.5% feel that it only limits knowledge acquisition. Additionally, only 2.4% of students think that using AI could lead to a decline in academic performance, suggesting that there are also critical voices regarding the long-term effects of this technology on the educational process.

We also wanted to investigate to what extent students believe that the use of artificial intelligence (AI) contributes to their efficiency in the learning process, considering aspects such as saving time or quick access to relevant information. The results show that most students (83.5%) believe that AI improves their learning efficiency by facilitating quick access to educational resources, reducing the time needed to find information, and helping them organize their academic activities better. On the other hand, 10.6% of students do not think that using AI increases their learning efficiency, which may suggest a different perception of the utility of these technologies or a lack of familiarity with their potential. Additionally, 7.1% of students stated that they are unsure about AI' s impact on their learning efficiency, which could reflect less frequent use or uncertainty about how these tools can support their learning. Most students recognize the benefits of AI in enhancing learning efficiency; however, there is still a portion of them who are not convinced by its effects, highlighting the need for the better understanding and use of these technologies.

When it comes to the main concerns students have about using artificial intelligence in education, the most significant issue is the possibility of receiving incorrect or imprecise answers, with 48.2% of students expressing this concern. This is closely followed by worries about the negative impact on critical thinking (16.5%) and the risk of becoming overly

dependent on technology (16.5%). Other concerns, though less common, include data privacy issues (9.4%), the fear that the results generated by AI may not truly belong to the student (3.5%), and a category labeled as "other" (5.9%). These concerns reflect a strong awareness among students of both the potential benefits and drawbacks of AI in education, particularly in relation to the accuracy of AI-generated content and its possible effects on their cognitive abilities and autonomy.

For the item "What suggestions do you have for improving the use of AI in education to more effectively support the learning process?", we applied thematic analysis to identify recurring patterns in student responses. This analysis followed a systematic process to ensure validity and reliability in capturing key themes. The following four our thematic categories were identified (Table 1), reflecting students' varied perspectives and concerns regarding the use of AI in education: (1) Proper Integration of AI in Educational Activities (27 responses): Students emphasized the need to strategically embed AI tools into teaching practices and learning environments, ensuring they complement rather than disrupt traditional methods. Suggestions included personalized learning platforms, instant feedback applications, and algorithms to detect knowledge gaps and recommend exercises. (2) Limited and Controlled Use of AI (14 responses): Students advocated for a balanced approach, where AI supports learning without replacing human interaction or critical thinking. Concerns about over-reliance on AI and the need for clear usage guidelines were highlighted. (3) Improved Accuracy of Information (14 responses): Students stressed the importance of reliable AI-generated content, calling for rigorous validation processes to ensure accuracy and avoid misinformation. (4) Others (24 responses): This category included diverse suggestions, such as user-friendly AI interfaces, transparency in AI decision-making, and requests for free or discounted AI tools.

**Table 1.** Suggestions for improving the use of AI in education.

| Thematic Categories | Frequency | Example Responses |
| --- | --- | --- |
| Proper Integration of AI in Educational Activities | 27 | Educating students in AI usage; interactive courses with personalized assignments; algorithms detecting knowledge gaps and suggesting exercises; personalized learning platforms; instant feedback applications. |
| Limited and Controlled Use of AI | 14 | AI should only assist with explanations, not solving exercises; information should be processed through personal critical thinking; encouraging critical engagement with AI-generated data. |
| Improved Accuracy of Information | 14 | AI should provide accurate and organized information; consistency in delivering correct answers; suggestions for improved validation processes in AI tools. |
| Others | 24 | Discounts on paid AI programs for students; suggestions for free, more efficient AI tools; no suggestions offered. |

To strengthen the validity and reliability of our findings, we employed data triangulation by comparing responses across different academic programs, namely Aerospace and Medical Engineering students. This allowed us to identify program-specific trends or concerns and cross-verify the consistency of the themes across different student populations. Triangulation further supported the robustness of our findings by ensuring that the identified themes held true across diverse student groups. The findings indicate that while students recognize the potential of AI to improve learning, they also have concerns and suggestions for optimizing its use in education. Overall, students advocate for a thoughtful and responsible approach to AI integration, emphasizing its potential to enhance the

learning process when used in a balanced and well-regulated manner. The analysis of these themes highlights the importance of ensuring AI tools add value to education without compromising the integrity of traditional learning methods.

For the item "What are the main ways in which the use of artificial intelligence enhances your learning process? (e.g., helps with understanding materials, saves time, provides additional resources, etc.)", we identified three thematic categories as follows (Table 2): (1) Timesaving, (42 responses): Students widely noted that AI tools reduce the time spent on tasks like researching, processing information, and automating repetitive activities. AI' s ability to provide summaries, find relevant information, and perform complex calculations allows learners to focus more on critical thinking and understanding. (2) Optimization of Information Comprehension (24 responses): Participants highlighted AI tools, such as intelligent tutoring systems, for simplifying complex concepts and presenting information in digestible formats. Tailored content, instant feedback, and adaptive learning enhance understanding, retention, and engagement. (3) Information Structuring (16 responses): Students emphasized AI' s role in organizing and categorizing information effectively. AI aids in visualizing data, creating outlines, and structuring research, helping learners navigate large volumes of information and focus on key aspects.

**Table 2.** Ways in which the use of artificial intelligence enhances the learning process.

| Thematic Categories | Frequency | Example Responses |
| --- | --- | --- |
| Timesaving | 42 | AI saves time by quickly synthesizing broad topics upon request; reduces study hours by 50%; AI provides clear explanations, formulates answers, and synthesizes information effectively |
| Optimization of Information Comprehension | 24 | AI helps clarify complex concepts, makes material easier to understand, and finds relevant sources for documentation; it can explain solutions step-by-step, create summaries, and logical diagrams. |
| Information Structuring | 16 | AI organizes and structures information, summarizes content, offers additional resources, and clarifies complex topics; it supports learning by making information easily accessible and well-organized. |
| Others | 24 | Discounts on paid AI programs for students; suggestions for free, more efficient AI tools; no suggestions offered. |

To strengthen the robustness and validity of these findings, descriptive statistical methods were applied to determine the frequency of responses within each thematic category, providing a quantitative dimension to support the qualitative analysis. These steps contributed to a comprehensive understanding of AI' s role in enhancing the learning process. The findings highlight the multiple ways in which AI is integrated into learning, improving both efficiency and depth of understanding. The responses underscore AI' s significant impact, not only in saving time but also in enhancing comprehension and aiding information organization, all of which contribute to a more effective and personalized learning experience.

For the item "What are the main challenges or limitations you encounter when using artificial intelligence for your studies? (e.g., incorrect information, excessive dependence on technology, lack of personalization, etc.)", we identified the following four thematic categories (Table 3): (1) Accuracy of information, (60 responses): The primary concern among users is the reliability of data provided by AI tools. Incorrect or outdated information can lead to misunderstandings and may negatively impact the learning process. (2) Over-

dependence on Technology (7 responses): Students highlighted the risk of relying too heavily on AI, which may hinder critical thinking and independent problem-solving skills. (3) Various Errors (6 responses): This category includes minor mistakes or glitches in AI systems that can disrupt the learning experience. (4) Others (6 responses): This category captures additional challenges that do not fit into the primary themes, reflecting the diverse limitations encountered by users in different contexts.

**Table 3.** Main challenges or limitations encountered when using IA.

| Thematic Categories | Frequency | Example Responses |
| --- | --- | --- |
| Accuracy of Information | 60 | The information is often incorrect and needs to be verified; I' m frequently unsure if the answers provided are accurate, and I need to cross-check with other sources; AI tools often pull from unverified or outdated databases, leading to unreliable results; some AI responses include irrelevant information, while others are incomplete or misleading. |
| Over-dependence on Technology | 7 | Excessive reliance on AI reduces critical thinking and academic independence; I worry that students will become overly dependent on technology, leading to a lack of problem-solving abilities; the growing dependence on AI may cause people to neglect their own cognitive and analytical skills. |
| Various Errors | 6 | Sometimes the AI doesn't fully understand my question, leading to irrelevant responses; there are frequent writing errors and lack of grammatical accuracy in AI-generated content; certain tasks are beyond the AI' s capability, such as more complex or nuanced problems; there is a lack of human interaction, which limits the overall learning experience. |
| Other Challenges | 6 | AI cannot replicate emotional nuances in text, which impacts its relevance in some contexts; concerns about privacy and ethics arise, especially regarding how personal data is used by AI. |

To complement the qualitative analysis, descriptive statistical methods were employed to calculate the frequency of responses in each category, providing a quantitative basis for the identified themes. This triangulation of data (i.e., combining qualitative thematic analysis with quantitative frequency counts) strengthens the validity of the findings by offering a comprehensive overview of students' concerns regarding AI usage in education. These findings emphasize the need for ongoing efforts to address the challenges associated with AI integration into education. The concerns highlighted in the responses underline the importance of ensuring the accuracy, reliability, and ethical deployment of AI tools to mitigate the risks of over-reliance and system errors, ultimately fostering an environment where AI can complement and enhance traditional learning methods.

For the item "How would you describe the impact of using artificial intelligence on the way you learn and collaborate with classmates or professors?", we identified three thematic categories as follows (Table 4): (1) Positive impact (51 responses): A significant number of respondents viewed AI as a valuable tool for enhancing learning and collaboration. AI was seen as facilitating access to resources, providing personalized content, and improving communication with peers and instructors. Tools like intelligent tutoring systems, discussion platforms, and automated feedback mechanisms were noted for increasing efficiency, engagement, and streamlining interactions. (2) Negative Impact (15 responses): Some participants experienced challenges, such as over-reliance on AI reducing critical thinking, a lack of human interaction, and concerns about the accuracy or suitability of AI-generated content. For some, AI-driven collaborations created a sense of detachment,

diminishing the depth of their learning experience. (3) Neutral Impact (15 responses): Some participants perceived no significant shift in their learning or collaboration due to AI. They found AI tools useful but not transformative, suggesting that AI supplements rather than fundamentally alters their academic interactions.

**Table 4.** Impact of using AI on learning and collaboration with classmates or professors.

| Thematic Categories | Frequency | Example Responses |
| --- | --- | --- |
| Positive Impact | 51 | AI helps us improve our relationships with classmates and enhances the learning process; learning is faster, better structured, and more accessible thanks to AI; AI provides additional resources, making the learning process more efficient and tailored to our needs; in collaborative learning, AI enables better communication through tools like chatbots or automated translations; AI supports personalized learning by adapting to individual needs and offering quick access to various educational resources. |
| Negative Impact | 15 | AI reduces my willingness to ask questions because I rely too much on it; the constant use of AI can lead to dependence, which discourages independent thinking; there is a lack of human interaction, and the line between the online and real world becomes blurred; AI can make us passive learners and reduce critical thinking; AI is potentially harmful for academic integrity because it may encourage cheating, as it makes tasks too easy. |
| Neutral Impact | 15 | AI hasn't impacted on the way I collaborate with my colleagues or professors; I don't see any major effect of AI on my learning or relationships with others; AI doesn't appear to have a significant influence on my collaboration with peers or professors; the use of AI hasn't really changed my academic habits or how I interact with those around me." |

Descriptive statistical methods were used to calculate the frequency distributions for each category, providing a quantitative representation of AI' s perceived impact. These findings align with qualitative data, where most respondents emphasized AI' s potential to enhance learning and collaboration. However, the negative and neutral categories highlight areas for improvement, such as ensuring accuracy, fostering human interaction, and promoting critical thinking.

In conclusion, the thematic analysis reveals a generally positive outlook on AI' s integration into academic environments, with most respondents reporting enhanced learning experiences. However, the findings also underscore the need for caution, as challenges like over-reliance and reduced human interaction must be addressed to optimize AI' s role in education.

## 4. Discussion

This article analyzes the impact of AI technologies on students' learning processes and academic performance, focusing on their perceptions and the challenges associated with AI integration in education.

The results show that 95.6% of respondents use AI in their academic activities, underscoring the deep integration of this technology into modern education. Virtual assistants are the most used AI applications (88.2%), providing support for information retrieval, task management, and real-time feedback. Additionally, 42.4% of respondents use AI-based educational platforms, reflecting a shift toward personalized and interactive learning. Virtual assistants help students access relevant information quickly, organize tasks, and receive instant feedback, thereby enhancing efficiency and engagement in the educational process.

The thematic analysis of open-ended responses reveals AI has a dual impact. On the one hand, students support its integration to complement traditional teaching methods;

on the other, some members of the academic community call for balanced regulations and more robust validation protocols. Triangulating data from various academic programs, such as Aerospace Engineering and Medical Engineering, confirms the consistency of these concerns, strengthening the reliability of our conclusions.

Based on this study, we conclude that AI offers significant benefits, such as personalized learning, improved educational outcomes, and increased student engagement. However, it also presents challenges, such as over-reliance on technology, diminished critical thinking, and the risk of academic fraud. Educational institutions must adopt data protection measures and prevent bias, carefully weighing the pros and cons of AI implementation. These findings align with previous research showing that AI can adapt educational content to students' individual needs, optimizing study time and enhancing academic performance (Krause et al., 2024).

Our study also highlights some notable concerns as follows: nearly half of the respondents (48.2%) expressed reservations about the accuracy of AI-generated content, while others pointed out the risks of technological dependence, which may undermine critical thinking and human interaction. These concerns are also reflected in the literature. A recent study has stressed the negative impact of AI on critical thinking and human interaction, emphasizing the need for validation mechanisms and ethical regulations for technology use (Ju, 2023). Similarly, Săseanu et al. (2024) recommend control measures to mitigate the negative effects of AI, and Łodzikowski et al. (2023) emphasize the need for ethical regulations in AI use in education. The responsible implementation of AI in education can bring significant benefits, contributing to more adaptable and efficient academic preparation. AI should not replace traditional methods but should complement them, offering a personalized and optimized learning experience.

Given the small sample size and its focus on specific academic programs, the findings should be considered preliminary and exploratory. They cannot be generalized to all students within these programs or to those in other fields. Additionally, the impact of AI on critical thinking and creativity was not extensively investigated. Future research with a larger, more diverse sample is needed to provide more robust insights. Such research could include students from various academic disciplines, years of study, and demographic backgrounds, offering a more comprehensive understanding of AI' s impact on students in different educational contexts.

## 5. Conclusions

In conclusion, our research highlights that AI has become a critical component of the modern academic landscape, offering significant benefits such as personalized learning, enhanced engagement, and improved access to educational resources. Nevertheless, while most students view AI positively—citing its capacity to enhance learning efficiency and academic performance—there remain important challenges, particularly regarding the accuracy of AI outputs, the risk of over-dependence, and the potential erosion of critical thinking skills.

To ensure the effective integration of AI in education, we recommend the following:

Comprehensive training: Institutions should implement training programs for both educators and students to foster a thorough understanding of AI tools and their proper use.

Clear guidelines and validation protocols: Establish robust standards for AI deployment that include the regular validation of AI-generated information and clear guidelines to prevent over-reliance on technology.

Ethical and privacy considerations: Develop and enforce policies to protect student data and mitigate potential biases in AI systems.

Longitudinal research: Future studies should adopt longitudinal designs with larger, more diverse samples to better understand the long-term effects of AI on academic outcomes and career development.

By addressing these recommendations, educational institutions can ensure that AI complements rather than replaces traditional teaching methods, ultimately fostering a more adaptable, efficient, and personalized learning environment that supports the development of essential skills for future success.

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**Institutional Review Board Statement:** The current study was conducted in line with the ethical standards for research involving human subjects, following approval from our University Ethics Committee. Additionally, ethical clearance was obtained in accordance with the principles outlined in the Declaration of Helsinki, given that the study included human participants.

**Informed Consent Statement:** Informed consent was waived for this study because no personal data were collected from the students, such as first and last names, email addresses, phone numbers, or any other type of information that could lead to their identification. The data analyzed were fully anonymized, with no personal data or identifiable information attached to individual students. Therefore, no personal data or links to students' identities were included in the dataset.

**Data Availability Statement:** The raw data supporting the conclusions of this article can be made available by the authors upon request.

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