

The Impact of Artificial Intelligence on the Learning Process among Students

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Abstract

This study investigates the impact of artificial intelligence on the learning process among students, focusing on cognitive, behavioral, and performance-related dimensions, while also exploring the variability of AI adoption across different student profiles. The research employs a quantitative design based on a structured questionnaire administered to a sample of 215 students enrolled at the University of Bucharest and Valahia University of Targoviste. The instrument evaluates two core dimensions: the general perception of AI and the role of AI in facilitating the understanding and assimilation of academic information. The results reveal that the year of study represents the most significant factor influencing the effective use of AI, with advanced students demonstrating a more strategic and efficient utilization of these technologies. In contrast, first-year students tend to exhibit a more exploratory and less structured approach. Statistically significant differences were also identified in relation to academic specialization ($p = .045$) and age ($p < .05$), indicating that both disciplinary context and generational factors shape how AI is used as a cognitive support tool. However, no significant differences were found between Bachelor's and Master's students, suggesting that academic level does not fundamentally alter AI-supported learning processes. The findings highlight that artificial intelligence functions as a cognitive amplifier in the learning process, enhancing efficiency and performance, but its effectiveness depends on the user's academic maturity and ability to critically engage with information. The study underscores the necessity of integrating AI literacy and critical thinking skills into higher education curricula in order to ensure a balanced and responsible use of these technologies.

Keywords: *artificial intelligence, critical thinking, digital education, educational process, students.*

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Introduction

The integration of artificial intelligence into education represents one of the most significant directions in the transformation of contemporary educational systems, substantially influencing the learning process among students. The rapid development of AI-based technologies, particularly generative systems, has led to profound changes in the ways information is accessed, in learning strategies, and in the dynamics of the relationship between students and knowledge. In this context, the specialized literature highlights a transition from a traditional educational model, focused on the transmission of information, to a student-centered model characterized by autonomy, flexibility, and personalization (Holmes et al., 2022). In this regard, it is important to emphasize that artificial intelligence should not be confused with human intelligence, as it operates based on algorithmic data-processing mechanisms, without involving genuine understanding or its own cognitive experience (Cîrstea, 2025).

A central element of the impact of artificial intelligence on the educational process is its capacity to support personalized learning. AI-based systems enable the adaptation of educational content to the individual needs of students, providing real-time feedback and facilitating self-directed learning. According to Zawacki-Richter et al. (2019), these technologies contribute to increased learning efficiency and improved academic performance, aspects that are also reflected in students' perceptions regarding the usefulness of AI in understanding concepts and optimizing academic activities.

At the same time, artificial intelligence is associated with the improvement of academic performance by facilitating rapid access to information and supporting processes of analysis and problem-solving. Empirical studies indicate that the use of AI contributes to increased productivity and reduces the time required to complete academic tasks (Chen et al., 2020; Kasneci et al., 2023; Lincă & Matei, 2024). These dimensions are particularly relevant in assessing the impact of AI on academic outcomes and the efficiency of the learning process, and are reflected in the items targeting student performance and productivity.

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Another essential aspect is the influence of artificial intelligence on students' involvement in the educational process. AI-based technologies offer a high degree of interactivity and accessibility, which leads to increased motivation and interest in learning. According to Bond et al. (2020), the use of digital technologies is associated with higher levels of involvement, contributing to the development of a more dynamic and engaging educational experience. However, the impact of artificial intelligence on the learning process is complex and ambivalent. While AI can facilitate understanding and access to information, the specialized literature highlights its potential negative effects on critical thinking and learning autonomy. Excessive use of AI may lead to a reduction in cognitive effort and the development of technological dependency, to the detriment of analytical and reflective processes (Budişteanu, Lincă, Andrei et al., 2022). These aspects are relevant to the dimensions investigated in this research, particularly regarding students' perceptions of dependency and the impact of AI on critical thinking. In this context, the responsibility for evaluating and interpreting information generated by artificial intelligence rests with the human user, emphasizing the importance of developing critical thinking skills within the educational process (Cîrstea, 2025).

Moreover, the use of artificial intelligence raises a number of issues related to the accuracy of information and academic integrity. AI systems may generate erroneous or incomplete content, and their use in academic activities can encourage unethical behaviors such as plagiarism. In this regard, Cotton et al. (2023) emphasize the need to develop regulatory mechanisms and educational strategies that promote the responsible use of AI. Furthermore, UNESCO (2021) highlights the importance of developing educational policies that ensure a balance between leveraging technological benefits and managing the associated risks.

Therefore, artificial intelligence influences the learning process of students across multiple dimensions, including the understanding of information, academic performance, involvement in educational activities, and the development of critical thinking. These dimensions form the conceptual foundation of the present research and are operationalized through the questionnaire items, which address both

perceptions of the impact of AI and the risks associated with its use. In this context, the empirical analysis aims to identify the relationships between the use of artificial intelligence and the main components of the learning process, contributing to a better understanding of the role of this technology in contemporary education.

Research methodology

Sample

The research sample comprises a total of 215 students enrolled at the University of Bucharest and Valahia University of Târgoviște, with their profiles analyzed through demographic and academic variables. Regarding the age structure, an interesting distribution is observed, marked by two major segments: young individuals at the beginning of their academic careers and adults returning to the education system. The predominant age group is 20-25 years old (41.9%), followed closely by the over 35 segment, which represents 37.2% of the total respondents. The remaining categories—students under 20 (9.3%), those between 31-35 (7.0%), and those between 26-30 (4.7%)—hold significantly lower shares, suggesting a sample polarized between traditional-age students and those opting for lifelong learning in adulthood (Figure 1).

From the perspective of the level of study, the sample is well-balanced between the two university cycles, with a slight predominance of Bachelor's degree programs (53.5%), while the remaining 46.5% of participants are pursuing Master's degrees. This distribution indicates that the collected data reflects the perspectives of both stages of academic training. Regarding the year of study, the highest weight is held by first-year students (27.9%), followed closely by those in years 4 and 5 (23.3% each) and year 3 (20.9%). The lowest representation is recorded among second-year students, who constitute only 4.7% of the sample (Figure 2 and 3).

In terms of specialization, all respondents belong to the field of educational sciences. The largest portion of the group consists of Special Psychopedagogy students (39.5%), while the Pedagogy and Primary and Preschool Education Pedagogy specializations are

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equally represented, each with a share of 30.2%. This diversity within the same field of study ensures a comprehensive view of the training of teaching staff and education specialists within the two aforementioned university centers (Figure 4).

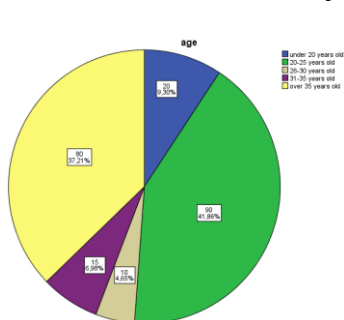


Fig 1. Demographic data - age

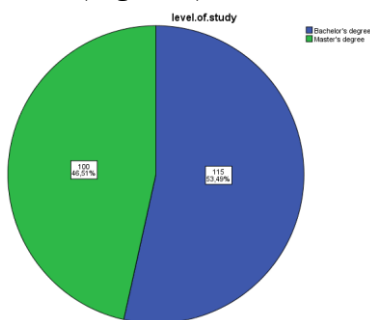


Fig 2. Demographic data – level of study

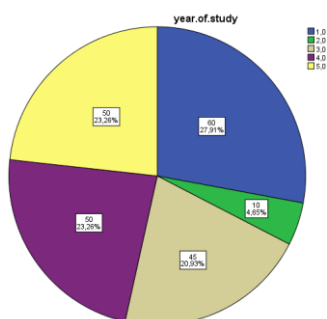


Fig 3. Demographic data – year of study

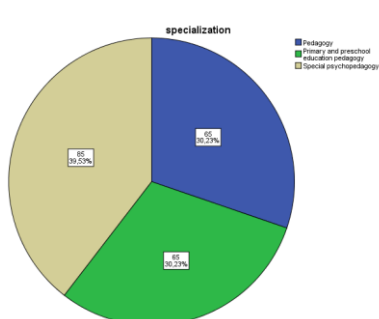


Fig 4. Demographic data - specialization

Objectives and hypotheses

Research Objective

The primary objective of this study is to conduct a comparative analysis of AI adoption patterns in academic learning environments. Specifically, it seeks to examine whether significant differences exist among students based on their demographic profile (age) and

academic status (level of study, year of study, and specialization) regarding:

- The general perception of AI utilization.
- The understanding and assimilation of information facilitated by AI in the academic process.

Research Hypotheses The central hypothesis of this research posits that there are significant differences in the patterns of adoption and the cognitive impact of AI in academic learning based on student segmentation variables. This general hypothesis is operationalized through the following specific sub-hypotheses:

H1: It is hypothesized that students in the 20–25 age group exhibit a more positive general perception of AI utilization, whereas students over 35 years old prioritize AI specifically for the understanding and assimilation of complex information related to lifelong learning.

H2: Master's degree students are expected to report a higher efficacy in the assimilation of information facilitated by AI for scientific research compared to Bachelor's degree students, who maintain a broader general perception of AI utilization predominantly for foundational conceptual clarification.

H3: Students in terminal years (3, 4, and 5) demonstrate a more sophisticated approach to understanding information with the help of AI (e.g., structuring theses, data analysis) compared to first-year students, whose general perception and utilization remains largely exploratory.

H4: Students specializing in Special Psychopedagogy identify specific benefits in understanding and assimilating information through AI when adapting educational materials for special needs, whereas students in Pedagogy and Primary/Preschool Education reflect a general perception of AI utilization focused on instructional design and creative lesson planning.

Instruments

The instrument employed in this research was a structured questionnaire, specifically developed to capture the dynamics of Artificial Intelligence utilization within the university environment, grounded in established literature on technology acceptance models (Castaneda & Selwyn, 2018; Du Boulay, 2000; Edtech, 2020; Facione, 2020; Hennekeuser et al., 2024; OECD, 2021; Kvetenska &

Myska, 2017; Vieriu & Petrea, 2025). The questionnaire comprises a total of 40 items, designed to evaluate two fundamental dimensions: on one hand, the general perception of AI utilization, and on the other, the understanding and assimilation of information with the help of AI, with each dimension represented by 20 items. To ensure precise data collection, a 5-point Likert scale was utilized, where respondents assessed their level of agreement across a spectrum ranging from 1 (to a very small extent) to 5 (to a very great extent).

The content validity and academic rigor of the instrument were guaranteed through an interdisciplinary approach during the design stage. A panel of experts, including a special psychopedagogue, a pedagogue, and an educational psychologist, contributed to the formulation of the items, ensuring that the questions accurately reflect the realities of the teaching-learning process and the specific needs of students in the field of Educational Sciences regarding their perceptions of AI and its role in knowledge assimilation. Following the conceptual phase, the instrument underwent a linguistic review and proofreading process conducted by a professional translator. In its final form, the questionnaire was administered to the sample of 215 students from the University of Bucharest and "Valahia" University of Targoviste.

Procedure

The data collection process was executed through a quantitative approach, utilizing a structured questionnaire as the primary instrument, distributed digitally via the Google Forms platform. This method was selected to ensure increased accessibility and to facilitate participation from students at both targeted academic centers: the University of Bucharest and "Valahia" University of Târgoviște.

The collection phase was preceded by an instrument validation stage, where items pertaining to the two central dimensions were defined: the general perception of AI utilization and the understanding and assimilation of information with the help of AI. Participants were recruited through convenience sampling, with the access link distributed through both official and informal university communication channels (student social media groups and e-learning platforms). Prior to completing the survey, respondents navigated an informed consent section, which guaranteed anonymity and data

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confidentiality. To ensure the integrity of the database, the "limit to one response" feature was enabled, and all items were set as mandatory. This resulted in a complete dataset for all 215 respondents, with no missing values. Subsequently, the responses were exported and numerically coded for statistical processing in SPSS.

Results

The analysis began with an assessment of the normality of data distribution, a critical step in establishing mathematical rigor. According to Table 1 (One-Sample Kolmogorov-Smirnov Test), both investigated dimensions—the general perception of AI ($M = 17.047$, $SD = 4.4719$) and the capacity for understanding and assimilating information ($M = 16.837$, $SD = 4.8910$)—exhibit a non-linear distribution, with an asymptotic significance threshold of $p = .000$. This data asymmetry indicates that student opinions are not uniformly concentrated around the mean; instead, there are specific clusters of "early adopters" and skeptical users, which necessitated the use of non-parametric tests.

Table 1. One-Sample Kolmogorov-Smirnov Test			
N		general.perception.of.ar tificial.intelligence	understanding.and.assi milating.information
		215	215
Normal Paramete rs ^{a,b}	M	17,047	16,837
	SD	4,4719	4,8910
Most Extreme Differenc es	Absolute	,095	,091
	Positive	,095	,091
	Negative	-,091	-,075
Test Statistic		,095	,091
Asymp. Sig. (2-tailed)		,000 ^c	,000 ^c
a. Test distribution is Normal.			
b. Calculated from data.			
c. Lilliefors Significance Correction.			

Regarding the level of study, data from Table 2 (Ranks – U Test) suggests an interesting trend: Master's students report a higher

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mean rank for the general perception of AI (115.38) compared to Bachelor's students (101.59). This difference suggests a more optimistic outlook among graduate students regarding the technology's potential. However, Table 3 (Mann-Whitney U) reveals that this difference does not reach the threshold of statistical significance ($p = .103$ for perception and $p = .934$ for assimilation). Thus, we can deduce that the complexity of the study level does not fundamentally alter how information is assimilated through AI.

Table 2. Ranks – U Test				
	level.of.study	N	Mean Rank	Sum of Ranks
general.perception n.of.artificial.inte lligence	Bachelor's degree	115	101,59	11682,50
	Master's degree	100	115,38	11537,50
	Total	215		
understanding.an d.assimilating.inf ormation	Bachelor's degree	115	108,33	12457,50
	Master's degree	100	107,63	10762,50
	Total	215		

Table 3. Mann-Whitney U^a		
	general.perception.of.a rtificial.intelligence	understanding.and.assi milating.information
Mann-Whitney U	5012,500	5712,500
Wilcoxon W	11682,500	10762,500
Z	-1,629	-,083
Asymp. Sig. (2-tailed)	,103	,934
a. Grouping Variable: level.of.study		

The specialization variable offers a nuanced perspective. From Table 4 (Ranks), we observe that students in Special Psychopedagogy have a more favorable general perception (116.97), likely due to AI's potential to assist in personalizing materials for special educational needs. A crucial result appears in Table 5 (Kruskal Wallis Test),

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where the variable "understanding and assimilating information" obtains a threshold of $p = .045$. This value, being below 0.05, confirms that academic specialization dictates the efficiency with which AI is used as a cognitive mediator, with Pedagogy and Special Psychopedagogy students reporting distinct modes of information processing compared to those in Primary and Preschool Education (PIPP).

Table 4. Ranks - Kruskal Wallis Test 1

	specialization	N	Mean Rank
general.perception.of.a rtificial.intelligence	Pedagogy	65	104,35
	Primary and preschool education pedagogy	65	99,92
	Special psychopedagogy	85	116,97
understanding.and.assi milating.information	Total	215	
	Pedagogy	65	117,04
	Primary and preschool education pedagogy	65	92,62
	Special psychopedagogy	85	112,85
	Total	215	

Table 5. Kruskal Wallis Test^{a,b}

	general.perception.of.arti ficial.intelligence	understanding.and.assimi lating.information
Chi-Square	3,117	5,918
df	2	2
Asymp. Sig.	,210	,045
a. Kruskal Wallis Test		
b. Grouping Variable: specialization		

The most profound impact is generated by the year of study. Table 6 (Ranks) highlights a striking contrast: first-year students have extremely low mean ranks (approx. 72), while third-year students reach a peak of 157.72 for information assimilation. Table 7 (Kruskal Wallis Test 2) validates this discrepancy with a threshold of $p = .000$

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(Chi-Square of 61.358 for assimilation). These figures demonstrate that as students approach the completion of their undergraduate degrees and face complex academic tasks (such as drafting a bachelor's thesis), they learn to use AI much more effectively to understand and synthesize large volumes of data.

Table 6. Ranks - Kruskal Wallis Test 2			
	year.of.study	N	Mean Rank
general.perception.of .artificial.intelligenc e	1,0	60	72,79
	2,0	10	125,50
	3,0	45	134,67
	4,0	50	105,25
	5,0	50	125,50
	Total	215	
understanding.and.as similating.informatio n	1,0	60	72,17
	2,0	10	103,00
	3,0	45	157,72
	4,0	50	86,00
	5,0	50	129,25
	Total	215	

Table 7. Kruskal Wallis Test 2^{a, b}		
	general.perception. of.artificial.intellig ence	understanding.and.assimilating.inform ation
Chi-Square	32,644	61,358
df	4	4
Asymp. Sig.	,000	,000
a. Kruskal Wallis Test		
b. Grouping Variable: year.of.study		

Finally, the age variable (Table 8 and Table 9) confirms the existence of generational differences. The 20–25 age group dominates both dimensions (mean rank of approximately 65), while groups under 20 and over 26 report lower scores. The Kruskal-Wallis test confirms statistical significance ($p = .032$ for perception and $p = .045$ for

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assimilation), suggesting that biological maturity, combined with native digital skills, plays a role in the acceptance and utilization of AI.

Table 8. Ranks - Kruskal Wallis Test 3			
	age	N	Mean Rank
general.percept ion.of.artificial. intelligence	under 20 years	20	48,00
	old		
	20-25 years old	90	65,22
	26-30 years old	10	43,00
	Total	12	
understanding. and.assimilatin g.information		0	
	under 20 years	20	44,88
	old		
	20-25 years old	90	64,94
	26-30 years old	10	51,75
	Total	12	
		0	

Table 9. Kruskal Wallis Test 3^{a,b}		
	general.perc eption.of.art ificial.intelli gence	understanding.and.assimil ating.information
Chi-Square	6,873	6,185
df	2	2
Asymp. Sig.	,032	,045
a. Kruskal Wallis Test		
b. Grouping Variable: age		

Conclusion

The research conducted among students from the University of Bucharest and "Valahia" University of Târgoviște provides a multidimensional image of how Artificial Intelligence is transforming the current educational landscape.

A primary major conclusion indicates that the year of study represents the critical variable in the process of technological mediation of learning. The evolution from a mean rank of 72 (Year 1)

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to 157 (Year 3) suggests that students transition from an exploratory and uncertain usage to a strategic utilization of AI. This transition indicates that AI tools are not merely accessories but become essential "cognitive partners" as academic demands increase in complexity.

Secondly, the study demonstrates that there is a digital divide influenced by specialization and age. The fact that specialization significantly influences the assimilation of information ($p = .045$) underscores the need for AI usage guidelines tailored to the specific nature of each pedagogical discipline. While Master's students possess a more mature perception of general utility, the success of knowledge assimilation appears to be an attribute of individual skills developed through experience (year of study and the active 20–25 age group).

In conclusion, the data suggests that Artificial Intelligence acts as an amplifier of academic performance, yet its effectiveness depends on the academic maturity of the user. For the academic institutions involved, the results indicate a need for earlier integration of AI literacy into the curriculum, given the low scores of first-year students. Although general perception is largely positive across all levels, transforming information into knowledge through AI remains a sophisticated process that requires time and sustained academic practice.

Beyond the current findings, this study opens several pathways for future academic inquiry, with two directions being particularly salient. First, there is a clear need for longitudinal research to monitor the evolution of student cohorts from their first year through the completion of their Master's degree. Since this study identified the third year as a critical inflection point for information assimilation via AI, tracking students over an extended period would clarify whether this "digital maturity" is merely a punctual adaptation to the pressure of final graduation requirements or a stable, integrated professional competence. Such a perspective would allow researchers to observe how AI-mediated learning strategies solidify as students transition from theoretical training to more complex research activities. Second, future inquiries should bridge the gap between self-reported data and objective academic performance metrics. While this research focused on students' perceptions of utility and assimilation,

subsequent studies could correlate AI usage frequency with tangible outcomes, such as Grade Point Averages (GPAs), the qualitative rigor of bachelor's theses, or pre- and post-test scores on complex conceptual tasks. Investigating the direct impact of AI assistance on the depth of knowledge acquisition—rather than just perceived efficiency—would provide universities with the empirical evidence needed to design evidence-based AI literacy programs and ethical guidelines for the next generation of educators.

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