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THE INFLUENCE OF GENERATIVE AI TECHNOLOGIES ON COGNITIVE INFORMATION PROCESSING AND KNOWLEDGE ASSIMILATION IN USERS

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Abstract: This study examines the influence of generative artificial intelligence (AI) tools on information processing and knowledge assimilation among young users, with particular attention to secondary school and university students. The aim was to explore how learners use AI in educational contexts, identify the perceived benefits and risks associated with its application, and assess users' perceptions of AI's influence on cognitive processes and independent learning. The study was conducted using an anonymous online survey, and the collected data were analysed using descriptive statistical methods. The findings indicate that generative AI has become an integral part of educational practice, supporting access to information, content creation, and personalized learning. At the same time, respondents recognized potential risks related to excessive reliance on AI-generated content, reduced critical thinking, and ethical issues associated with its use. The results provide insights into current patterns of AI use in education and highlight the importance of promoting responsible, critical, and ethical use of generative AI to support, rather than replace, independent cognitive effort.
Keywords: artificial intelligence, generative AI, information processing, critical thinking, cognitive skills, learning automation

1. INTRODUCTION

Contemporary education is undergoing a dynamic transformation driven by the rapid development of digital technologies, particularly those based on artificial intelligence (AI) (Hai-Jew, 2023; Jaafar and Owais, 2025; Nirmala et al., 2025; Pawlak, 2025; Rosak-Szyrocka, 2025; Tuomi, 2018). AI-powered tools, including text generators, intelligent assistants, translators, summarization systems, and automated data-processing applications, are increasingly becoming part of students' everyday learning practices. Their growing availability changes the way information is searched for, interpreted,

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processed, and incorporated into educational activities. As a result, AI is no longer only a technological support tool but is becoming an important element of contemporary knowledge acquisition and intellectual work (Ingaldi et al., 2023; Radek et al., 2023).

Generative artificial intelligence (GAI) represents one of the most significant developments in this area. Unlike conventional AI systems, which are usually designed to recognize patterns, classify information, or perform predefined tasks, generative AI can create new content, including text, images, audio, and other digital materials (Patel and Arasanipalai, 2021; Lee, 2023; Fan, 2025; Pratschke, 2024; Lim et al. 2023). These systems are trained on large datasets and use advanced machine-learning architectures to generate outputs based on patterns identified in the available data. A widely recognized example is ChatGPT, which can produce coherent responses, explain complex issues, summarize information, and support users in completing educational tasks.

Generative AI offers numerous educational benefits, including easier access to information, personalized learning, support in understanding complex topics, and assistance in content preparation and organization (Hai-Jew, 2023; Elkhodr and Gide, 2025; Pratschke, 2024). At the same time, excessive reliance on AI-generated content may reduce independent reasoning, critical analysis, and active knowledge construction, particularly among young users who are still developing critical evaluation skills (Lennox, 2023). Therefore, while generative AI has considerable educational potential, its effectiveness depends on responsible and critical use rather than replacing independent intellectual effort.

Recent studies indicate that the role of artificial intelligence is evolving from a purely technological solution towards a human-centred support system that enhances decision-making, knowledge management, and learning processes. In engineering, production management, and higher education, AI is increasingly perceived as a tool that should complement human competencies rather than replace them. Consequently, the successful implementation of AI requires not only technological advancement but also the development of digital competencies, critical thinking, and responsible use of intelligent systems (Jaafar and Owais, 2025; Płaza et al., 2025; Rosak-Szyrocka, 2025).

The use of generative AI also involves ethical and educational challenges (Iordache et al., 2025). AI-generated information may be inaccurate, incomplete, biased, or misleading, while users may accept it without verification. Moreover, AI tools can be used in ways that conflict with academic integrity, for example, by replacing independent work with automatically generated assignments. These issues create a need for clear educational standards, responsible-use policies, and the development of AI literacy. Understanding how generative systems operate and how they influence decision-making and information processing is therefore essential for their conscious and ethical use (Klimecka-Tatar and Ingaldi, 2022; Klimecka-Tatar and Kapustka, 2025; Pietraszek et al., 2020; Wołoszyn, 2023).

Although the educational applications of generative AI have received growing attention, many publications focus mainly on technological capabilities, practical benefits, or general ethical concerns. Less attention has been paid to how users themselves perceive the influence of AI on cognitive independence, critical thinking, information processing, and knowledge assimilation. Empirical evidence concerning whether frequent use of AI supports learning or contributes to reduced intellectual engagement remains limited and

requires further investigation. Therefore, the aim of this study is to examine how young users, particularly secondary school and university students, use generative AI tools in educational and intellectual work. The study focuses on the frequency and purposes of AI use, perceived benefits and risks, its possible influence on cognitive autonomy and critical analysis, and users' attitudes toward the ethical use of AI in education. The research is exploratory in nature and seeks to provide a better understanding of the role of generative AI in contemporary learning processes.

2. RESEARCH METHODOLOGY

The primary objective of this study was to examine how users employ generative AI tools in educational contexts and to explore their perceptions of the benefits and risks associated with these technologies. Particular attention was given to the perceived impact of AI on learning effectiveness, cognitive autonomy, critical thinking, and ethical aspects of AI-supported educational activities.

Considering the exploratory nature of the study, the research was designed to identify general tendencies and user perceptions rather than to verify causal relationships. Therefore, the study was based on research questions instead of hypothesis testing. The following research questions were formulated:

1. To what extent do learners use generative AI tools in the context of education and intellectual work?
2. What are the most common functions and applications of AI tools in education from the users' perspective?
3. Does the use of AI affect users' cognitive autonomy and their ability to engage in critical analysis?
4. What are users' attitudes toward the ethical dimensions of using AI systems in educational contexts?
5. What are users' expectations and predictions regarding the future role of AI in education, including desired functionalities of educational assistants?

The study was conducted in Poland using an anonymous online questionnaire distributed among secondary school students, university students, and a small group of professionally active individuals. Participants were recruited through educational communication channels and voluntarily participated in the survey. No personal identifying information was collected, ensuring respondents' anonymity throughout the study.

A total of 242 correctly completed questionnaires were included in the analysis. The respondents represented mainly secondary school and university students aged between 16 and 30 years, as this group constitutes one of the most active users of generative AI technologies in educational settings. Since the questionnaire was distributed through several educational channels, the exact response rate could not be determined. Consequently, the obtained results should be interpreted as reflecting the opinions and experiences of the surveyed group rather than being fully representative of the entire student population.

The survey, entitled "The Use of Artificial Intelligence Tools in Education and Intellectual Work", consisted of 12 closed-ended questions and 3 open-ended questions. The questionnaire examined the frequency and purposes of AI use, perceived educational benefits, influence on independent thinking and cognitive processes, ethical aspects of AI

use, perceived risks associated with AI-supported learning, and expectations regarding the future role of AI-based educational assistants.

The collected data were analysed using descriptive statistical methods, including frequencies and percentage distributions of responses. The results were subsequently interpreted in relation to the formulated research questions and discussed in the context of the existing literature. Owing to the exploratory character of the study, the findings are intended to identify general patterns of AI use and users' perceptions rather than to establish causal relationships between variables. As with all survey-based exploratory studies, the findings should be interpreted with caution, as they reflect respondents' subjective opinions and experiences rather than objectively measured cognitive performance.

3. RESULTS AND DISCUSSION

The analysis was conducted in accordance with the exploratory nature of the study and the formulated research questions. The results are presented using frequencies and percentage distributions, allowing the identification of the main patterns in the use of generative AI tools and respondents' perceptions of their educational and cognitive consequences.

Because the study was based on respondents' self-reported opinions and experiences, the findings should be interpreted as perceptions of AI influence rather than as objective measurements of changes in cognitive competence. The results were organized into four main areas: respondent characteristics, frequency and purposes of AI use, perceived effects on learning and cognitive autonomy, and ethical attitudes and expectations regarding the future use of AI in education.

3.1. Characteristics of the Respondents

A total of 242 correctly completed questionnaires were included in the analysis. The sample was dominated by young people currently participating in formal education. Respondents aged 15–19 accounted for 46.3% of the sample, while participants aged 20–30 represented 47.1%. Together, these two groups constituted 93.4% of all respondents (Table 1).

Table 1.
Characteristics of the respondents

Variable	Category	Number of respondents	Percentage
Age	15–19 years	112	46.3%
	20–30 years	114	47.1%
	31–41 years	10	4.1%
	42–52 years	3	1.2%
	53 years and above	3	1.2%
Educational status	Secondary school student	108	44.6%
	Undergraduate/Bachelor's/Engineering student	112	46.3%
	Master's student	13	5.4%
	Integrated Master's programme student	5	2.1%
	Employed/Other	4	1.7%

Source: Own research

A similar structure was observed in relation to educational status. Secondary school students represented 44.6% of the sample, while undergraduate, bachelor's, and engineering students accounted for 46.3%. Master's and integrated master's students formed a considerably smaller group. Therefore, the findings primarily reflect the experiences and opinions of secondary school and undergraduate-level students.

3.2. Frequency and Purposes of Generative AI Use

The first part of the analysis focused on the frequency with which respondents use generative AI tools and the purposes for which these technologies are applied in educational activities. The results indicate that AI has become an integral part of the learning process for the majority of respondents.

As shown in Table 2, more than two-thirds of the surveyed participants declared using AI either daily or several times a week. Only three respondents indicated that they had never used AI tools. These findings demonstrate the rapid integration of generative AI into everyday educational activities among young users.

The most common applications of AI were related to writing assignments, essays, and reports (142 responses), followed by translation and language support (88 responses), solving mathematical or technical problems (87 responses), and preparing summaries of learning materials (87 responses). Considerably fewer respondents reported using AI for study planning and work organization (54 responses). The obtained results suggest that respondents perceive generative AI primarily as a tool supporting information processing and task completion rather than long-term learning management. This finding is consistent with previous observations that students tend to use AI mainly for improving efficiency and reducing the time required to complete academic tasks (Hai-Jew, 2023; Pratschke, 2024).

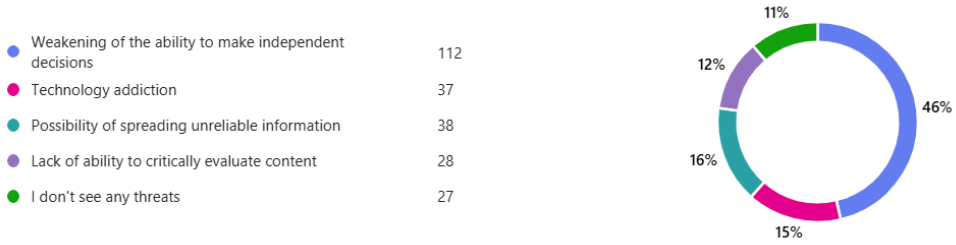
Table 2.
Frequency and purposes of generative AI use

Variable	Category	Number of respondents	Percentage
Frequency of AI use	Daily	45	18.6%
	Several times a week	123	50.8%
	Several times a month	29	12.0%
	Occasionally	42	17.4%
	Never	3	1.2%
Purposes of AI use*	Writing assignments, essays and reports	142	58.7%
	Translation and language support	88	36.4%
	Solving mathematical, technical and IT problems	87	36.0%
	Creating summaries and abstracts	87	36.0%
	Study planning and work organization	54	22.3%
	Other purposes	68	28.1%

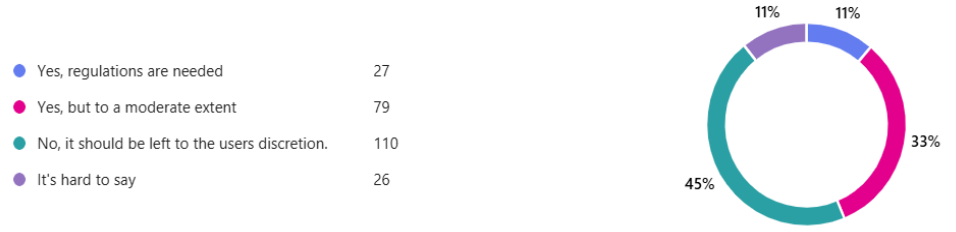
**Multiple responses were allowed.*

Source: Own research.

The dominance of AI use for text generation and information processing suggests that students mainly perceive these tools as instruments for increasing learning efficiency rather than for developing higher-order cognitive skills such as analysis, evaluation, or problem-solving.



a)



b)

Fig.1. Respondents' opinions on selected issues related to the use of generative AI in education: (a) perceived risks associated with AI; (b) opinions on the need for institutional AI policies.

The presented results support concerns raised in the literature regarding the growing tendency to use generative AI for task completion instead of active knowledge construction.

3.3. Perceived Influence of AI on Learning and Cognitive Autonomy

One of the main objectives of this study was to explore how users perceive the influence of generative AI on their learning processes and cognitive functioning. The results indicate that respondents generally recognize AI as a valuable educational support tool, while simultaneously expressing concerns regarding its potential influence on independent thinking and intellectual engagement. As presented in Table 3, most respondents declared that AI facilitates understanding of educational content. A total of 103 respondents (42.6%) stated that AI helps them better understand learning materials, whereas 114 respondents (47.1%) admitted that although AI supports their learning, they sometimes rely on ready-made content generated by these systems. Only a relatively small proportion of participants openly acknowledged that AI frequently reduces their own intellectual effort (4.1%) or that they often use AI without critical analysis (5.4%). These findings suggest that respondents generally perceive AI as a supportive educational technology rather than a replacement for learning. Nevertheless, the relatively high proportion of respondents relying on automatically generated content indicates that the boundary between educational support and cognitive dependence may gradually become blurred. Similar concerns have been reported in previous studies, which emphasize that although generative AI improves learning efficiency and accessibility of information,

excessive dependence on AI-generated answers may reduce students' engagement in higher-order cognitive processes, including analysis, evaluation, and critical reflection (Hai-Jew, 2023; Noroozi et al., 2024; Pratschke, 2024).

A similar tendency can be observed regarding independent thinking. Nearly half of the respondents reported that AI has only a minor influence on their analytical abilities, while approximately one-third did not notice any changes. However, 26 respondents (10.7%) admitted that frequent use of AI reduces their intellectual independence. Although this percentage is relatively small, it indicates that a noticeable group of users is aware of the potential negative consequences of excessive reliance on intelligent systems.

The obtained results indicate that users generally recognize the educational potential of generative AI while remaining aware of its possible limitations. This dual perception reflects the current discussion in the literature, where AI is viewed both as an effective educational assistant and as a factor that may encourage cognitive offloading and passive learning strategies. Therefore, the challenge for educational institutions is not to limit the use of AI but to develop pedagogical approaches that encourage students to use these tools critically, responsibly, and as support for independent reasoning rather than as substitutes for cognitive effort.

Table 3.
Perceived influence of generative AI on learning and cognitive autonomy

Variable	Category	Number of respondents	Percentage
Impact of AI on learning	Helps understand the material	103	42.6%
	Supports learning, but I sometimes rely on ready-made content	114	47.1%
	I often use AI without critical analysis	13	5.4%
	AI mostly reduces my own intellectual effort	10	4.1%
Impact on independent thinking	Significantly enhances analytical skills	36	14.9%
	Minor impact	101	41.7%
	I do not notice any difference	79	32.6%
	It reduces my independence	26	10.7%

Source: Own research

3.4. Ethical aspects, perceived risks, and future expectations

Beyond the educational benefits of generative AI, the survey also explored respondents' awareness of ethical issues, perceived risks, and expectations regarding the future role of AI in education. The findings indicate that respondents generally recognize the usefulness of AI while acknowledging the need for responsible and ethical use.

As presented in Table 4, most respondents considered AI to be an effective educational tool. A total of 162 respondents (66.9%) answered that AI is definitely a valuable educational resource, while 71 respondents (29.3%) believed that it should be used with certain limitations. Only a small proportion expressed negative opinions regarding its educational value.

Table 4.

Ethical attitudes, perceived risks, and future expectations regarding AI

Variable	Category	Number of respondents	Percentage
Is AI a good educational tool?	Yes, definitely	162	66.9%
	Yes, but with limitations	71	29.3%
	Hard to say	4	1.7%
	No	5	2.1%
Do you use AI unethically?	Yes, regularly	34	14.0%
	Yes, occasionally	129	53.3%
	No	79	32.6%
Perceived risks*	Weakening of independent thinking	112	46.3%
	Technology dependence	37	15.3%
	Disinformation	38	15.7%
	Lack of critical thinking	28	11.6%
	No risks	27	11.2%
Future use of AI	Yes, definitely	119	49.2%
	Yes, but with limitations	62	25.6%
	Not sure	51	21.1%
	No	9	3.7%
Preferred AI functions*	Explaining difficult topics	133	55.0%
	Example solutions with explanations	55	22.7%
	Interactive exercises	31	12.8%
	Study planning	23	9.5%
	Personalized learning support	26	10.7%

Source: Own research

At the same time, ethical concerns emerged as an important issue. More than half of the respondents admitted that they had used AI in a way that could be considered ethically questionable at least occasionally. Although these responses do not necessarily indicate academic misconduct, they demonstrate that the boundaries of acceptable AI use are often unclear to users. This finding highlights the growing need for educational guidelines and institutional policies promoting responsible AI use.

Respondents were also asked to identify the main risks associated with the increasing use of AI. The most frequently indicated concern was the weakening of independent thinking, selected by 112 respondents (46.3%). Other frequently mentioned risks included technology dependence, disinformation, and reduced critical thinking. These responses suggest that users are generally aware that AI may not only facilitate learning but also influence cognitive behaviour and decision-making processes.

Finally, respondents expressed optimistic expectations regarding the future development of AI-assisted education. Nearly three-quarters declared that they intended to continue using AI tools, while the most desirable functionality of future educational assistants was the ability to explain complex topics in an understandable way.

Considerably fewer respondents expected AI primarily to organize learning or provide interactive educational simulations.

The results demonstrate that respondents generally perceive generative AI as a valuable educational tool while simultaneously recognizing its limitations and potential risks. Particularly noteworthy is the coexistence of two seemingly contradictory attitudes. On the one hand, respondents appreciate AI for improving learning efficiency and facilitating access to information. On the other hand, many acknowledge that excessive reliance on AI-generated content may weaken independent thinking and reduce intellectual engagement.

This dual perception is consistent with recent literature emphasizing that the educational value of generative AI depends primarily on how it is used rather than on the technology itself (Kucejko and Bugdol, 2025; Noroozi et al., 2024; Płaza et al., 2025; Pratschke, 2024). When AI supports explanation, reflection, and problem-solving, it may enhance learning outcomes. Conversely, when it replaces independent reasoning, it may contribute to passive learning and cognitive offloading.

The findings also indicate an increasing awareness of ethical challenges associated with AI-supported education. The relatively high proportion of respondents admitting at least occasional unethical use of AI suggests that educational institutions should not only provide access to AI technologies but also develop clear principles for their responsible and transparent use. Strengthening AI literacy and critical evaluation skills appears to be essential for ensuring that generative AI becomes a tool supporting learning rather than replacing cognitive effort.

4. CONCLUSIONS

The findings indicate that generative AI has become an important element of contemporary educational practice, particularly among secondary school and university students. Most respondents use AI tools regularly and perceive them as valuable support for learning, especially in information retrieval, text preparation, and understanding complex topics.

At the same time, the study reveals that frequent use of AI may contribute to greater reliance on automatically generated content, potentially reducing independent thinking and critical analysis. Although respondents generally recognize the educational benefits of AI, they are also aware of the ethical and cognitive challenges associated with its inappropriate use.

The results confirm that the role of AI in education should not be limited to improving learning efficiency but should also promote the development of critical thinking, responsible decision-making, and digital literacy. Educational institutions should therefore establish clear guidelines for the ethical use of generative AI and encourage students to treat AI as a tool supporting, rather than replacing, cognitive effort. The study has an exploratory character and reflects the opinions of the surveyed group. Future studies should include more diverse populations and apply inferential statistical methods.

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