

Article

The Impact of Artificial Intelligence on Students' Learning Productivity and Human Capital Development

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Abstract: Artificial Intelligence (AI) has become a crucial part of higher education and has changed the students' way of learning, conducting research, and completing academic tasks. AI-powered platforms such as ChatGPT, Gemini, Claude AI, intelligent tutoring systems, and adaptive learning apps enable students to receive immediate feedback, efficient access to information, and personalized learning experiences. Through these technologies, it is possible to enhance learning productivity by assisting students in managing their time more effectively and comprehending difficult tasks. Also, the effective use of AI in education may contribute to human capital development by improving students' knowledge, professional skills and digital competencies. Although the possibilities which are mentioned above are good for students, there are some concerns, such as students' overreliance on AI, reduced critical thinking skills, and some cases related to academic honesty. This article discusses the influences of AI on learning productivity among students by reviewing recent studies on AI usage in higher education. The findings indicate that AI can dramatically improve the academic performance, engagement, and learning efficiency of students when used appropriately. Meanwhile, excessive dependence on AI tools may negatively impact the independent learning abilities of students. The research concludes that AI should be considered as a supportive educational assistant rather than a full replacement for traditional learning methods.

Keywords: *artificial intelligence, higher education, academic performance, learning productivity, student learning, academic integrity, AI tools, AI concerns, human capital development*

1. Introduction

Artificial Intelligence (AI) has rapidly become one of the most influential tools in modern education, mainly in higher education. Colleges and universities throughout the world are significantly combining AI-powered platforms into teaching and learning processes. Currently, students use AI-powered tools such as ChatGPT, Gemini, Claude AI, intelligent tutoring systems, and adaptive learning applications to support their academic activities. These technologies offer several opportunities to boost learning productivity by providing quick access to information, personatized tutorials, and effective learning assistance.

Learning productivity refers to the effectiveness with which students obtain knowledge and gain their educational goals while working on available resources and time efficiently. Since educational backgrounds become more digitalized, researchers has incresingly got interested in understanding whether AI contributes positively to the academic productivity of students. Several studies have reported that "AI tools can improve learning outcomes,

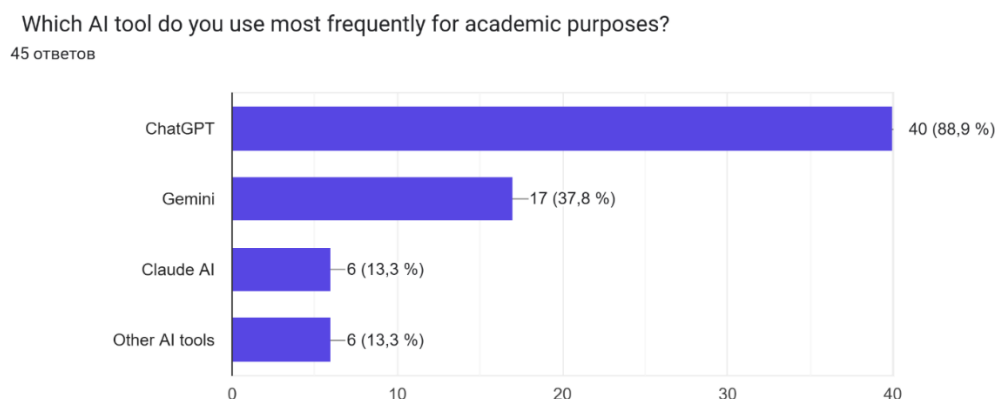
motivation, and academic performance by offering personalized learning experiences and immediate feedback” [1]. At the same time, “AI-assisted learning environments have demonstrated positive effects on student engagement and knowledge retention” [2].

Moreover, the effective use of AI in education may contribute to human capital development by improving students’ knowledge, professional skills and digital competencies. These capabilities are increasingly noticed as important for preparing a competent workforce and encouraging innovation and sustainable development.

Regardless of these benefits, concerns remain regarding the long-term impact of AI on the learning process. Some academics argue that overreliance on AI-generated contents may decrease critical thinking abilities, creativity, and problem-solving skills. Students may become dependent on technology-based tools instead of actively working on learning materials [3]. As a result, it is important to assess both the advantages and disadvantages of AI use in higher education.

This paper explains the influences of artificial intelligence on students’ learning effectiveness by examining its role in enhancing learning efficiency, improving academic integrity, mitigating potential problems related to its use in education, and finally, the effectiveness of human capital development.

Figure 1. The most popular types of AI platforms among students



Note: According to the survey results, among 45 participants, most students would rather use ChatGPT, with a percentage of 88,9% (40 of them), while a very small portion of students prefer other AI tools, such as Gemini, Claude AI, etc.

2. Methodology

This study approaches a quantitative research adoption to analyze the impact of AI on students’ learning productivity and human capital development. The paper mainly focuses on comprehending how AI systems affect learning efficiency, academic performance, problems related to AI usage, and human capital development among students of higher education.

First, a literature review was conducted using multiple peer-reviewed articles, journals, academic publications and conference papers related to AI in higher education. The analysis concentrates on finding important topics, such as academic achievement, student engagement, learning efficiency, academic honesty, and human capital development. These picked materials were published between 2023 and 2025 to make sure the relevance of the topic of the article.

Moreover, primary data were gathered through an online-based questionnaire survey from the students of Silk Road University of Tourism and Cultural Heritage. A total of 45 students were involved in this survey to complete the study. The questionnaire consisted of several MCQs (multiple-choice questions) developed to study students’ attitudes due to AI

use, thoughts of its educational advantages, particularly instant feedback, personalized explanations, and time-saving assistance, as well as some concerns relating to possible risks, such as reduced critical thinking skills, academic dishonesty, and privacy concerns.

Furthermore, a descriptive research method was conducted to examine the collected data. Answers were categorized according to the major capacity areas of the study: learning productivity, academic integrity, potential challenges, and human capital development.

Finally, the paper employs a conceptual framework as indicated by Human Capital Theory and Technology Acceptance Theory. These approaches assist in explaining how Artificial Intelligence tools support knowledge procurement, academic honesty, and ability development.

3. Discussions and results

3.1. Artificial Intelligence (AI) and Learning Efficiency

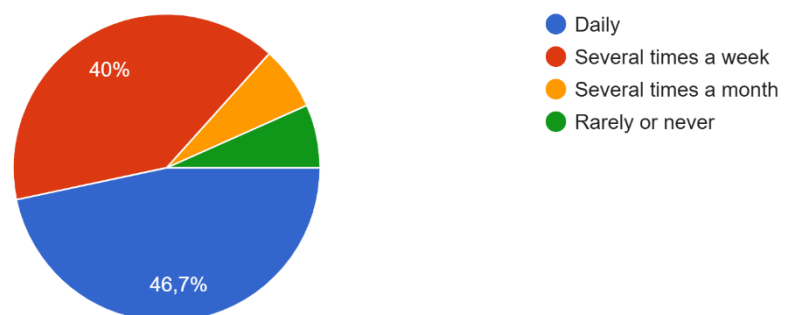
One of the most remarkable benefits of AI in education is its ability to develop learning efficiency. Traditional learning methods often necessitate students to spend significant time researching for information, organizing materials for studying, and searching for academic support. Artificial Intelligence technologies can make these processes easy by providing immediate access to relevant data and customized assistance.

Generative AI platforms, such as ChatGPT, Gemini, and Claude AI, enable students to obtain explanations of complicated topics in a matter of seconds. These quick responses can reduce the time spent to understand complex concepts and finish assignments. According to Ward et al. "students who used AI tools reported improvements in study habits, time management, and learning efficiency" [4]. The study also found that AI-based learning decreased the time spent on studying while improving academic performance.

Figure 2. The frequency of AI usage among students

How often do you use AI tools for your studies?

45 ОТВЕТОВ



Note: Most students use AI systems daily in their studies and also for their personal questions (46,7%), while several times usage in a week is slightly closer to daily use (40%). Additionally, a very small portion of participants use AI either several times in a month or very seldom.

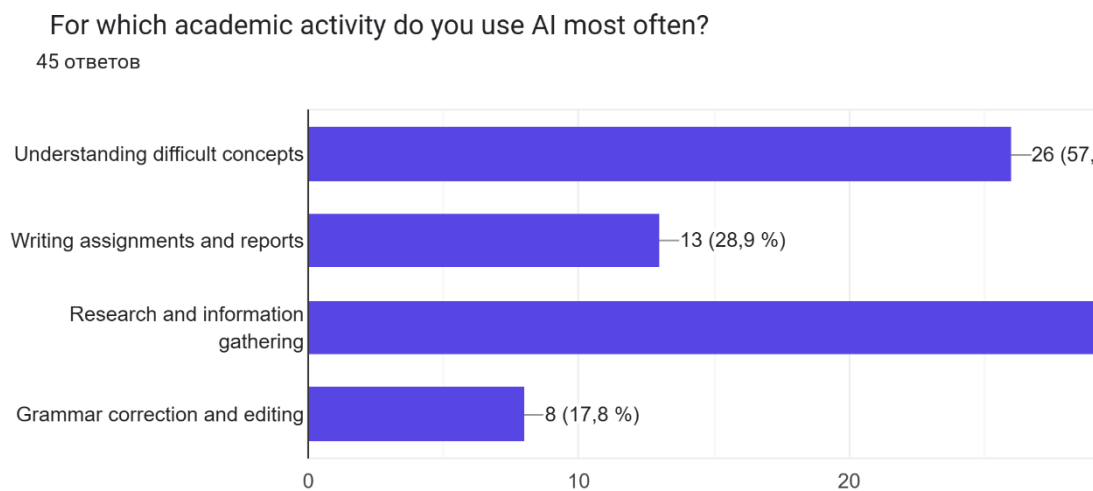
AI-powered adaptive learning systems further enhance efficiency by adjusting instructional content according to individual learning needs. Instead of presenting identical materials to all students, these systems analyze learning progress and provide customized recommendations. Adaptive learning systems, which are powered by AI, continuously improve efficiency by adapting instructional content according to individual learning needs.

Rather than demonstrating the identical information to all students, these systems explore

the learning process and give recommendations according to the preferences. “Such personalization allows students to focus on areas where they need additional support, resulting in more effective learning experiences” [5].

Over and above that, AI technologies can help students in arranging their learning activities. Some features, namely automated scheduling, progress tracking, and task prioritization, assist learners control their academic workload, such as assignments, more effectively. Therefore, students can spend more time on other meaningful activities instead of administrative tasks. Because of some research, it is found that “AI-supported learning environments increase educational efficiency by reducing barriers to information access and enabling personalized learning experiences” [6]. As a result, AI has the potential to become a vital tool for enhancing the productivity of students in higher education.

Figure 3. Types of different activities with AI among participants



Note: Most of the participants use AI mostly to research or gather information (66,7%). The second reason most participants utilize is to understand difficult topics (57,8%). A small number of those use AI for writing assignments or reports (28,9%), and for grammar correction (17,8%).

3.2. The Impact of Artificial Intelligence (AI) on Students' Academic Performance

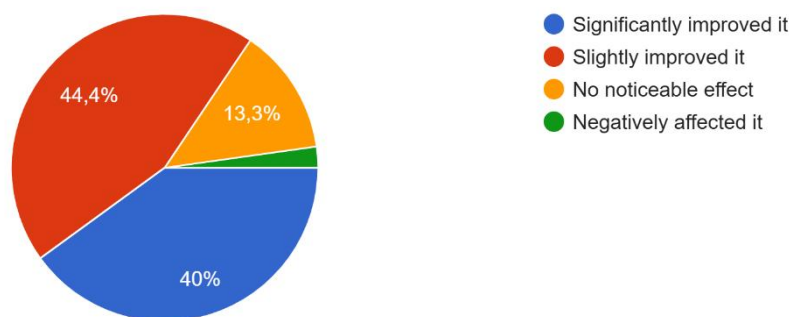
In addition to improving efficiency, AI has demonstrated a positive impact on academic performance. Numerous studies have examined whether AI tools contribute to better learning outcomes, higher grades, and improved knowledge acquisition. Besides improving efficiency, Artificial Intelligence (AI) has shown a positive influence on the academic performance of students. Several studies have examined whether AI machines lead to much better learning results, higher grades, and boosted knowledge gain.

A systematic assessment and meta-analysis conducted by García-Martínez et al. (2023) discovered that “AI-based educational technologies generally produce positive effects on student achievement across different educational settings”. The specialists concluded their research and reported the following: “AI can significantly enhance learning outcomes when integrated appropriately into teaching practices”. Furthermore, a very recent meta-research by Salem and colleagues [7] analyzed 29 empirical studies involving more than 2,600 participants and found a remarkable positive relationship between academic achievement and AI use. The findings stated that supporting AI-powered learning interventions contributes to strengthened educational performance across numerous disciplines.

Figure 4. Impact of AI on students' academic performance

How has AI affected your academic performance?

45 ответов



Note: A big number of students think after using AI tools, their academic performance has either significantly improved (40%) or slightly improved (44.4%), while 13.3% of them consider there is no noticeable effect.

AI-powered tutoring systems are especially beneficial in supporting academic performance. These platforms not only provide quick feedback, but also identify learning difficulties and offer multiple customized guidance. “Students using an AI chatbot in an information technology curriculum demonstrated improved academic performance and higher-order thinking skills compared to students who relied solely on traditional learning methods” [8].

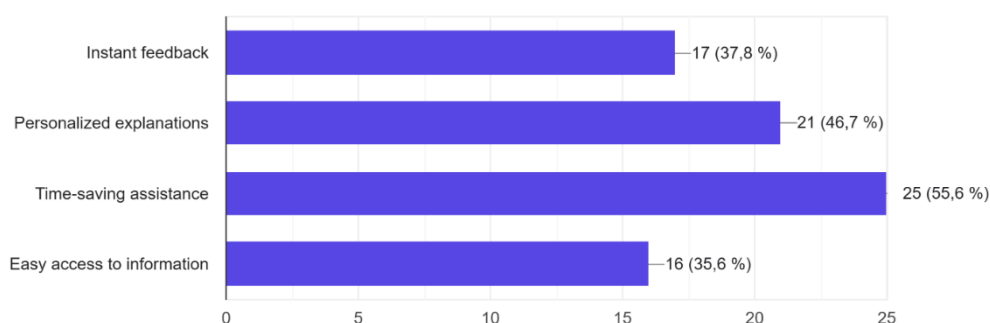
Additionally, AI-driven tools can augment student motivation and engagement. Feedback, which is given according to the personalities of students, helps them recognize weaknesses and improve comprehension of course content. “When students receive targeted recommendations and adaptive learning resources, they are more likely to remain actively involved in the learning process” [9].

Nevertheless, the relationship between academic performance and AI use is not always affirmative. Some investigations suggest that students who are addicted to AI-generated content may gain short-term success while experiencing reduced long-term learning achievement. Weeks et al. found that “students who frequently used generative AI tools scored lower on examinations than their peers, suggesting that inappropriate use of AI may hinder deep learning and knowledge retention” [10]. Hence, while artificial intelligence can enhance academic performance, its productivity largely depends on how students use these tools.

Figure 5. Reasons why students think AI is beneficial

What aspect of AI is most beneficial for your learning?

45 ответов



Note: According to the results of the questionnaire, 55.6% of participants think AI is beneficial for time-saving assistance, while usage due to instant feedback or easy access to

information is slightly the same, with 16 and 17 participants, respectively.

1.3. AI and Human Capital Development

Besides its effect on learning efficiency, artificial intelligence (AI) plays a vital role in human capital development. Human capital refers to the skills, competencies, knowledge and abilities that people obtain after studying and training and later use in the workplace. Currently, in terms of the economy, human capital is considered one of the most crucial concepts impacting the efficiency, sustainable development, and application of new methods.

AI-powered educational tools can support the development of digital literacy, problem-solving abilities, information management skills, and independent learning strategies. Through personalized learning experiences and immediate feedback, students may acquire knowledge more effectively and develop competencies that are increasingly demanded in the labour market. As a result, AI-assisted learning can contribute not only to academic success but also to the preparation of a highly skilled future workforce.

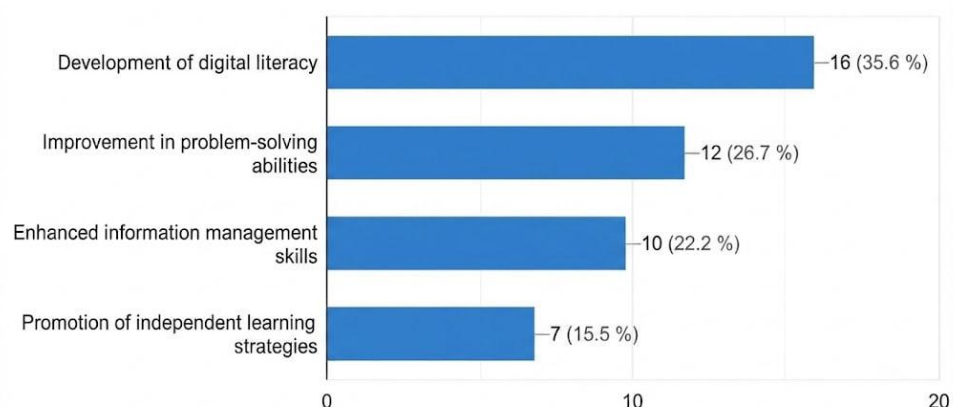
According to a way of looking at management, organizations increasingly search for labourers who have the ability to use advanced technologies and adjust to the fast-changing digital spheres. Students who are capable of utilizing AI technologies during their education might be better equipped to meet these anticipations. Additionally, while using AI, the responsible usage can inspire learning in the long term, which is important to maintain competitiveness in knowledge-based economies.

Nonetheless, the contribution of AI to human capital development is contingent on its balanced and responsible use. While Artificial Intelligence can improve in learning knowledge, overreliance on technology may limit critical thinking development and decision-making skills independently. For that reason, educational associations should encourage effective use of AI as well as promote it ethically to ensure that technological advantages provide long-term human capital development rather than replace fundamental cognitive skills.

Figure 6. Benefits of AI usage in human capital development

What is the primary benefit of AI for human capital development?

45 Responses



Note: Most of the participants chose development of digital literacy as a main benefit for human capital development, with the percentage of 35,6%, while 7 of them think that its advantage is the promotion of independent learning strategies (15,5%).

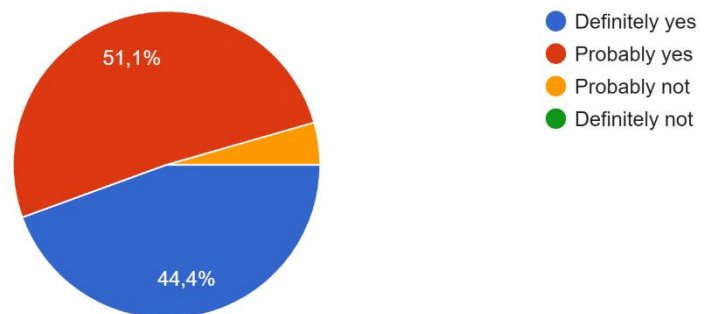
1.4. Challenges and Risks of Artificial Intelligence (AI) in Student Learning

Despite the numerous benefits AI offers, its integration into education presents notable challenges. One of the huge concerns of Artificial Intelligence is excessive dependence of students on it. When students use AI to generate responses without thinking critically and

evaluating the information provided, they may turn into passive learners and diminish their engagement with educational materials. Scientists have informed that overreliance on AI can badly influence problem-solving and critical thinking skills. Learning necessitates active cognitive participation, which means students should actively think, process information, and engage their minds while learning. Additionally, learning requires reflection and independent reasoning as well. “If students consistently rely on AI-generated solutions, they may miss valuable opportunities to develop these essential skills” [11].

Figure 7. Opinions of participants on the overreliance of students while using AI

Do you think students may become overly dependent on AI tools?
45 ОТВЕТОВ



Note: Most of the students consider that due to AI use, students probably may become overly dependent on AI (51,1%), while most of the rest think that users will be 100% dependent on AI, which is given in the chart as blue and written as definitely yes (44,4%).

Academic honesty is another, and meanwhile, very important problem. AI technologies can generate essays, summaries for books, works, articles, provide solutions to problems, and answer to questions. As these tasks are mainly given to students to evaluate their problem-solving and critical thinking abilities. But by always generating ready answers and solutions with AI, students' original student work will not be fulfilled. “While these technologies can support learning, they may also encourage plagiarism and unethical academic behavior if used improperly” [12].

Moreover, some responses and summaries generated by AI are not always as accurate as desired. Generative Artificial Intelligence sometimes generate incorrect or misleading information, which is known as “hallucinations”. Students who receive AI-produced answers without confirmation may learn imprecise topics and make mistakes in academic tasks. As a consequent of it, digital literacy and critical assessment skills stay important when utilizing AI platforms [13].

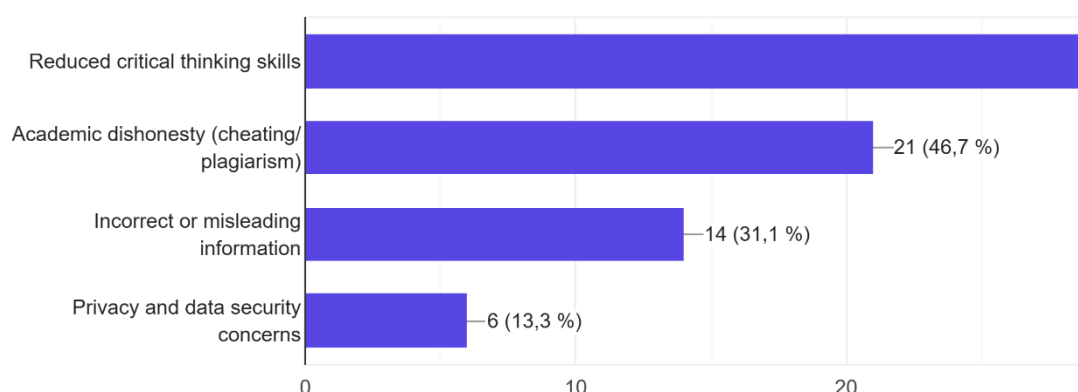
Data security and privacy issues must be considered as other essential problems in using AI. Many AI-powered technologies gather user-generated data to intensify performance and personalization. Educational institutions, such as universities and colleges, must ensure that student information is secured and that Artificial Intelligence obeys ethical and legal standards regarding the use of data [14].

Although there are several challenges mentioned above, most academics agree that the results are not to refuse AI entirely but to use it appropriately and responsibly. Higher education should offer guidance on legal and ethical AI use and motivate students to combine AI help with traditional learning practices and independent thinking [15].

Figure 8. Possible Risks of AI in Education

What do you consider the biggest risk of AI in education?

45 ОТВЕТОВ



Note: Possible risks due to AI usage considered by many participants are reduced critical thinking skills (64,4%), academic dishonesty (46,7%), incorrect or misleading information (31,1%), and Privacy and data security concerns (13,3%).

4. Conclusion

Artificial Intelligence (AI) has become a dominant part of modern higher education and proceeds to alter the way students learn. The proof reviewed in this paper illustrates that AI can dramatically improve learners' learning productivity by maximizing learning efficiency, giving personalized support, and raising academic performance, namely academic integrity. AI-driven systems assist students access immediate information, receive feedback quickly, and manage their learning environments more successfully. These advantages contribute to enhanced educational results and higher student engagement.

Besides that, the widespread adoption of Artificial Intelligence in terms of education raises essential concerns. Excessive reliance on AI tools can be a cause to diminish the students' skills, particularly critical thinking, independent learning, and long-term retention. Academic honesty problems, the accuracy of information challenges, and privacy concerns further demonstrate the need for responsible AI implementation.

The overall findings showcase that AI should not be considered as a full replacement for traditional education but instead as a complementary system that encourages students. When AI is used appropriately, it can boost students' efficiency and success in the academic sphere while maximizing the crucial role of human judgment, critical thinking and creativity. Since Artificial Intelligence technologies continue to develop, future research has to focus on determining best practices for merging AI into modern higher education, as well as minimizing possible concerns. A balanced method that includes technological innovation through AI with traditional educational approaches will enable students to make a benefit from Artificial Intelligence.

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