Multidisciplinary Journal of Thought and Research
https://mujoter.intischolar.id/index.php/mujoter

Artificial Intelligence in the Development of the Theory and Practices of Self-Directed Learning

Gulzhaina K. Kassymova[1], Yerassyl K. Talgatov[1], Mariam R. Arpentieva[2], Assylkhan R. Abishev[1], Petr V. Menshikov[3]
[1]Abai Kazakh National Pedagogical University, Kazakhstan
[2]Financial University under the Government of the Russian Federation, Russian Federation
[3]Tsiolkovskiy Kaluga State University, Russian Federation
g.kassymova@abaiuniversity.edu.kz *

Article Information:
Received September 18, 2025
Revised October 22, 2025
Accepted November 17, 2025

Keywords: *Artificial Intelligence (AI), self-directed learning (SDL), digital technology, education, personalized learning experiences*

Abstract

This study examined the effectiveness of using Artificial Intelligence (AI) in strengthening self-directed learning using the flipped classroom model. The problem of the study was the small amount of evidence of the effectiveness and impact of artificial infection on the process of self-directed learning, especially in primary school. The purpose of the study was to study the impact of artificial intelligence on autonomy, involvement and knowledge acquisition by students. During the study, an experimental design was conducted with the participation of fifth-grade students, the results of which were supported by teachers' survey. The results of the study showed that students using artificial intelligence in the process of acquiring knowledge demonstrate a higher level of independence, motivation, and long-term knowledge retention compared to students in traditional forms of education. However, teacher feedback was ambivalent, pointing to both the capabilities of artificial intelligence and the problems existing in the process of implementing artificial intelligence, which can cause excessive dependence on artificial intelligence. The results of these studies confirmed the theory of self-directed learning, demonstrating the possibility of its application in an educational environment supported by artificial intelligence, which in turn provides the opportunity to improve the level of intelligence in primary education and increase accessibility to digital learning tools.

INTRODUCTION

The emergence of information and communication technologies (ICT) and the intersection of artificial intelligence (AI) and education have brought about transformative changes in educational practices and theories, particularly in the field of self-directed learning (SDL). As educators and researchers explore the possibilities of AI technologies, it has become clear that these tools can significantly enhance the learning experience by personalizing education, simplifying the learning process, and supporting student autonomy. AI also offers an inclusive environment for all those who want to develop their professional knowledge.

How to cite: Kassymova, G. K., Talgatov, Y. K., Arpentieva, M. R., Abishev, A. R., Menshikov, P. V. (2025). Artificial Intelligence in the Development of the Theory and Practices of Self-Directed Learning. *Multidisciplinary Journal of Thought and Research,* 1(3), 66-79.

E-ISSN: 3109-0966
Published by: https://intischolar.id/

Research conducted over the past decade has proven that artificial intelligence-based technologies and digital technologies in general that have the ability to create personalized educational programs and recommendations can significantly increase the independence and involvement of students in the context of higher education. Historical, technological progress has created the opportunity for educational theorists to move to new methods and forms of learning, an example of which is the creation of distance learning and modern interactive systems. Although recent studies emphasize the capabilities of artificial intelligence, most empirical studies focus on higher education and adult learning. There is little experimental data and research on how artificial intelligence affects the process of acquiring knowledge and contributes to the development of quality students.

Research data on artificial intelligence in the process of self-directed learning in fifth-grade students using the flipped classroom model. The results of the study are based on the conducted Experimental design and teacher surveys. Based on these results, it evaluates how artificial intelligence affects the above qualities.

The introduction of computers and the Internet paved the way for the introduction of artificial intelligence into education, where early systems focused on programmed responses and basic functions; The study by Rohde et al., (2023) clearly demonstrates how digital learning programs can be made more personalized using data processing tools from a pedagogical perspective (Rohde et al., 2023). With the advent of advanced artificial intelligence tools, modern technologies such as ChatGPT represent a breakthrough in educational activities, offering interactions that are difficult to distinguish from human interactions, a user-friendly learning environment, and a personalized approach to learning (Lo, 2023). This reflects a significant evolution in the role of AI in education, reflecting the trend of technology taking on more interactive and adaptive roles in pedagogical practice (Tlili et al., 2023).

Personalised recommendation systems, adaptive learning platforms, and intelligent tutoring systems are examples of AI technologies at the heart of these shifts. By analysing big data, these technologies can provide a comprehensive report on students' preferences, strengths, and weaknesses, allowing them to create personalised learning programs for each student. Some learning platforms, such as Khan Academy and Magic School AI, have used artificial intelligence technologies to provide unique opportunities for students. They are leaders in providing good AI tools for teachers and students around the world. As a result, learning on these platforms is now more effective and engaging (Awaluddin et al., 2025; Dengen & Budiawan, 2025; Luckin et al., 2019). Another advantage of using AI in SDL is that, in the past, some students faced some difficulties in accessing quality education, namely, geographical restrictions, financial difficulties, economic inequality, and language barriers. Today, due to the availability of the Internet and digital technologies, the use of artificial intelligence technology has become an opportunity for open access to educational resources and access to quality education. This democratisation of education has wide-ranging implications for lifelong learning, especially at a time when the pace of technological breakthroughs requires continuous learning and skill development (Holmes et al., 2019; Khusnadin et al., 2025).

This article explores the interaction between artificial intelligence and self-directed learning and how artificial intelligence can transform the educational experience. By analysing the current situation and emerging issues in the process of

integrating ICT, the authors aim to explain how AI affects the educational experience and how to combat it. It also synthesises the main findings of various studies on AI applications in educational settings, highlighting their potential to facilitate self-directed learning.

Many studies support the emergence of AI applications in education as a positive, useful teaching and learning tool, emphasizing the possibilities of personalizing the learning experience and supporting self-directed learning. The Concept of the Development of Preschool, Secondary, Technical and Vocational Education of the Republic of Kazakhstan for 2023-2029 (https://adilet.zan.kz/rus/docs/P2300000249) emphasizes the digitalisation of education, which means that the contribution of AI to the education sector will be at a high level in the future. Thus, AI is now widely used in the education sector and has attracted the attention of scientists and educators worldwide. The analysis of AI in education from the Clarivate Analytics (Web of Science) database shows upward trends year by year (figure 1).

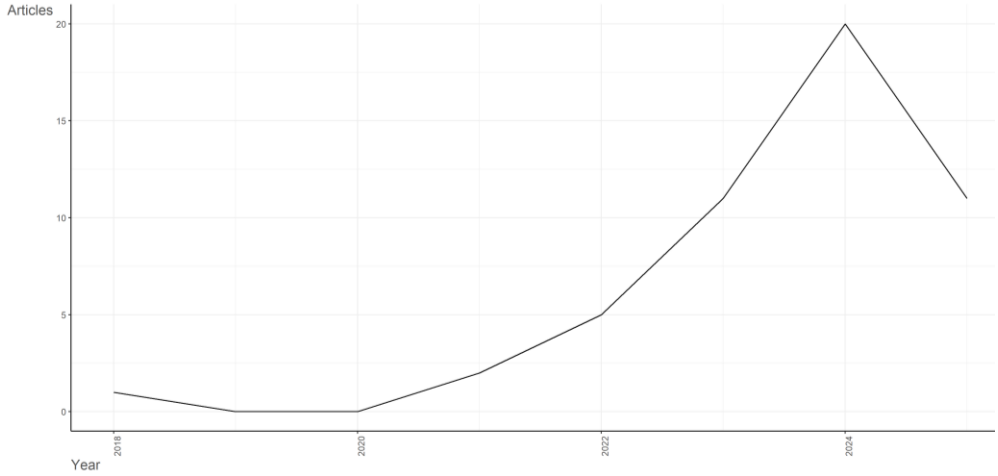

Fig 1. Annual Scientific Production analysed by RStudio

Zawacki-Richter et al., (2019) provide a systematic review of AI applications in higher education, noting that personalised learning experiences through adaptive systems and intelligent tutoring systems allow students to manage their learning journeys. Similarly, in 2021, J. Hawkins wrote: "As computers transformed the twentieth century, intelligent machines will transform the twenty-first century" (Hamzah et al., 2025; Hawkins & Dawkins, 2021). This is fully relevant to the issues of transforming education and self-education. Self-directed learning is a key component of lifelong learning. All self-directed learners are obliged to control the learning process. With the advent of artificial intelligence, a new paradigm has emerged that challenges traditional models of self-directed learning and creates opportunities for completely new learning experiences. This section of the study reviews the main theories of self-directed learning, including the fundamental models and framework of PPC (Person, Process, and Context) (Garrison, 1997). The models and frameworks that this section discusses also show how artificial intelligence transforms SDL realities, demonstrating the multidimensional nature of self-directed learning.

Education is one of the key areas where AI shows significant potential for transformation. AI systems can personalization the learning and teaching process, automate administrative (managerial) tasks, and provide new opportunities for assessment/reflection of knowledge. AI helps teachers by providing

personalization learning experiences, automating administrative tasks, offering real-time feedback, facilitating professional development, improving teaching strategies, and promoting inclusion in education. AI helps create adaptive curricula for children with special educational needs, ensuring equal opportunities for learning. AI helps create personalization curricula that take into account the student's strengths, weaknesses, interests, and learning goals. This allows everyone to move at their own pace, focusing on the aspects that require the most attention. The use of machine learning and deep learning techniques in education is nothing new. Adaptive exams (e.g) tests that adjust to the student's capabilities, such as correct answers triggering more difficult test questions, and incorrect answers triggering easier test options) and models that automate the checking and grading of student work have been around for many years. Using AI in the learning process helps students develop the following skills: workflow organization, reflection or critical thinking, and fact-checking. Instead of creating content from scratch, students learn to delegate tasks to performers, which are technologies. Critical thinking skills and fact-checking are necessary for evaluating the results of neural networks and analyzing the relevance and timeliness of these results. Overreliance on AI for problem-solving can hinder students from developing critical thinking skills and independent learning skills. There are several key use cases for artificial intelligence in education: personalization of learning, including assistance to students with special needs, resource planning and forecasting of learning outcomes, curriculum development and other forms of automation of routine teacher tasks, administration of the learning process, and ongoing assistance during learning (Duggan, 2020).

First, let us look at the D. R. Garrison model. Garrison's model defined three dimensions that show the effectiveness of self-directed learning (Garrison, 1997). These are self-management, self-control, and motivation. D. R. Garrison also emphasised the context of strong control of cognitive responsibility and intrinsic motivation of students, which are necessary for effective learning through self-directed learning (Garrison, 1997).

In turn, G. Grow's model shows the stages of self-directed learning, where students move from dependence on the teacher to complete autonomy in the learning process. The peculiarity of G. Grow's model is that he defines the role of the teacher as key in guiding this process and changing depending on the stage. In his works, Gerald Crow emphasizes that students are not able to begin their process of self-directed learning without guidance from the teacher (Grow, 1991).

In the structure of scientists A. Silamut and S. Petsangsri, self-directed learning was combined with knowledge management. According to the authors, this strategy contributes to the development of digital literacy skills. The authors believe that educational management processes, such as knowledge discovery and application, can be combined with the structured steps of Self-directed learning (Silamut & Petsangsri, 2020). Depending on the educational context, the D.W. Mocker and G. E. Spear's Leadership Model places self-directed education within a matrix of control, under the joint leadership of students and educational institutions (Lowry, 1989; Mocker & Spear, 1982).

In the structure of scientists A. Silamut and S. Petsangsri, self-directed learning was combined with knowledge management. According to the authors, this strategy contributes to the development of digital literacy skills. The authors believe that educational management processes, such as knowledge discovery and

application, can be combined with the structured steps of Self-directed learning (Silamut & Petsangsri, 2020). Depending on the educational context, the D.W. Mocker and G. E. Spear's Leadership Model places self-directed education within a matrix of control, under the joint leadership of students and educational institutions (Lowry, 1989; Mocker & Spear, 1982).

The PPC model emphasises the interaction between individual attributes (Person), learning activities (Process), and the environment or situational factors (Context). This model gives us a holistic view of SDL, concluding that "A person" has individual differences such as prior knowledge, motivation and self-discipline that significantly influence SDL performance. During the learning Process, we use learning strategies, goal setting, and reflective practices, which are the procedural core of SDL. Finally, "Context (external factors, including technological tools and social environment)" that either enables or constrains SDL.

The PPC model aligns well with AI-driven SDL paradigms as AI has several opportunities: Personalising learning processes based on learner profiles; Facilitating adaptive processes through real-time feedback and intelligent tutoring systems; and integrating contextual data to create appropriate learning environments.

AI technologies are fundamentally changing SDL by introducing intelligent systems that increase learners' autonomy. Adaptive learning systems are at the forefront of this transformation. AI-powered tools personalize learning materials according to the level of preparation and capabilities of students. For example, intelligent tutoring systems adjust difficulty levels based on the current state of learning ability [18], promoting deeper engagement and significantly improving learning outcomes. AI often automates a number of processes, including knowledge retrieval and synthesis, which in turn allows students to efficiently access the resources they need. Artificial intelligence not only saves time but also increases the depth of understanding by presenting learner-tailored resources (Silamut & Petsangsri, 2020). Contrary to popular belief, artificial intelligence supports cognitive motivational improvement. In self-paced learning. Resources such as gamification, mood analysis, instant feedback, and removal of routine tasks in knowledge search and retrieval support engaged learners, ensuring that they remain motivated throughout the long learning process (Gureckis & Markant, 2012). Thus, the integration of artificial intelligence into self-directed learning is the era of transformation in education. Based on SDL models and the PPC framework, artificial intelligence enables learners to receive personalized, process-oriented, and context-based education. This trend highlights the potential of artificial intelligence not only as a tool that can support self-directed learning but also to redefine its practices.

Russian researchers note that the traditional didactic cycle of "mastering new knowledge – consolidation – monitoring and evaluation" in the era of AI will inevitably transform, bringing it closer to a model of problem-based learning based on independent discovery, understanding and overcoming the "gap" between existing knowledge and teachings – and their inadequacy for solving new types of problems. The new didactic logic, having not so much a cyclical, but rather an open and continuous character, takes the following form (Capinding & Dumayas, 2024; Kryuchkova, 2023), focusing (defining the topic, idea, project concept, based on the achieved educational level and based on current educational deficits); problematization (highlighting the problem within the framework of a previously

defined topic, assessing its significance); goal setting (transforming the problem into a task or a set of tasks); information search, during which a value attitude towards socially and personally significant information is built; developing a solution to the problem (or a set of alternative solutions), taking into account the collected information; checking the functionality of solutions (experiment, expert assessment, etc.); reflexive after-action (assessment, self-assessment of the progress and results of work with the participation of AI); return to a certain stage of this cycle, to the previous cycle or transition to a new cycle (depending on the results of the reflexive after-action).

In the axiologically oriented, non-linear personal didactic model of self-education (Kucheriavyi, 2023), there is no teaching process; the teacher and the student in one person are the student himself, provided that the teacher provides competent pedagogical support for this process at the initial stages of self-education. The teaching function, which mainly involves managing the student's educational activities, must be consciously assumed by the student. To do this, he must master a number of skills that are very important for independent learning. The first of them is the ability to build personal information models of knowledge representation as its subjective image in the form of concepts, skills, identified connections, and patterns. The second important skill necessary for independent learning is the ability to apply the self-study method based on the "self-study algorithm", which corresponds to the project-technological type of activity organization culture. The third important skill is the ability of an individual to overcome difficulties during self-learning, which we have defined as the ability to manage the development of one's personality (Kryuchkova, 2023).

Voronin et al., (2020); Yarmakeev et al., (2021) writes that only by adhering to the principle of "two-dimensionality" of self-education, i.e. focusing on the implementation of both processes of self-education and self-training, can one achieve a long-term result and form an educated person capable of changing themselves and the world around them for the better through constant self-improvement (Talgatov et al., 2024).

Transformation of the information foundations of pedagogical activity, which make up the learning process, inevitably causes other profound changes. Taking on the tasks of teaching, AI opens up the opportunity for the teacher to focus on the tasks of education and the personal development of students. A teacher becomes necessary for a student as an image of a mature personality, “successful adulthood” and “successful professional”, demonstrating effective strategies of learning and self-education.

METHODS

The theoretical basis of the study is modern theory of self-education (Garrison, 1997; Mocker & Spear, 1982; Silamut & Petsangsri, 2020), theory and methodology of informatization of educational activities and designing and implementing electronic teaching aids (Baroud et al., 2025; Engkizar et al., 2025; Hawkins & Dawkins, 2021; Holmes et al., 2019; Neuendorf, 2018; Putra et al., 2020; Markhmadova et al., 2025). To evaluate the effectiveness of these technologies, the method of theoretical analysis of existing studies of the problem was used.

During the study, several research methods were used, including qualitative and quantitative, as well as theoretical and practical methods. To conduct a comprehensive analysis of the influence of Intelligence on the educational process,

the following methods were used.

The first, analysis and synthesis. To determine the theoretical basis for the study, a systematic review and analysis of the existing literature was conducted. Peer-reviewed articles, books, and technical reports were analysed to explore key trends, challenges, and opportunities in the application of AI for self-directed learning. Data sources included academic repositories such as Clarivate Analytics (Web of Science), ResearchGate, SpringerLink, and Google Scholar.

The second, survey. A survey of teachers was conducted on the topic of student motivation and academic results associated with the use of AI. There were 24 teacher of different subjects, who took part in the survey (n=24). Teachers exchanged knowledge and opinions on blocks of questions related to: i) student motivation and involvement; ii) related to student independence in the process of completing assignments; iii) related to student academic performance.

The third, experimental design. This study employed a quasi-experimental design with two groups: an experimental group that received AI-supported flipped classroom instruction and a control group that followed traditional teaching methods. The total sample consisted of 30 fifth-grade students from one primary school, divided evenly between the groups (n = 15 each).

The experiment was carried out over two weeks with daily lessons. Students in the experimental group engaged with AI-based tools to study new material independently at home before class. During classroom sessions, they worked in groups to solve problems, discuss the material, and apply their knowledge, while the teacher provided guidance and corrective feedback when necessary. The control group followed the conventional approach, with the teacher presenting new material during class and students completing tasks individually.

Instruments included formative assessments of student learning and a teacher survey. The formative assessments evaluated students' comprehension, retention, and ability to apply concepts. The teacher survey addressed three main domains: i) student engagement with assignments, ii) independence in completing tasks, and iii) motivation and academic progress (table 1). The teacher survey measurement tool was reviewed for content validity by a panel of experts, yielding a Content Validity Ratio (CVR) of 0.78 with Cronbach's Alpha reliability = 0.71.

RESULT AND DISCUSSION

During the experiment using the flipped classroom technology, the following results were obtained:

The students in the experimental group were involved in the learning process much more than the control group. During the learning process, the students in the experimental group showed higher learning outcomes and higher rates of understanding the material. This is primarily because during the experiment, the students in the experimental group not only gained knowledge but also transferred it. The students in the experimental group first learned new information about the upcoming topic, the teacher's material, and the teacher's instructions on using artificial intelligence at home on their own. After thoroughly familiarizing themselves with the material, during the learning process in the classroom, the children first discussed the material they had covered with their peers, discussing and analyzing the upcoming topic, thereby filling in the gaps. During the discussion, the teacher rarely took an active position but was sure to intervene in the discussion process if the students discussed incorrect information or were mistaken in their

beliefs. When using this approach, students become more involved in the learning process and show high results in knowledge retention across the knowledge pyramid, 50% and 90% of the discussion and teaching others, respectively, compared with the 5% of the lecture (figure 2, educational pyramid).

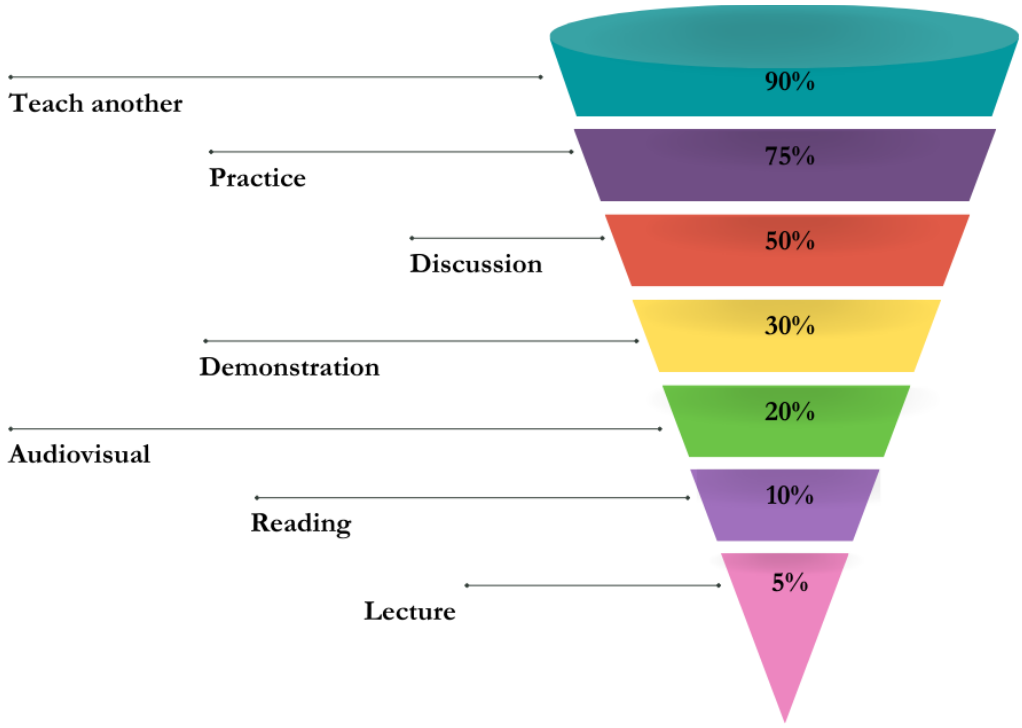

Fig 2. Education pyramid

The use of this technology allowed the teacher to involve all students in the learning process, while in the control group, students who used a traditional frontal survey were able to involve only a third of the students. This is primarily since during the discussion, all students openly shared their opinions not directly with the teacher but with their peers in the same team with them, even more significant is the fact that when using artificial intelligence, students received feedback of a different nature. Considering the fact that artificial intelligence tries to generate responses that are different from others generated at each request, students receiving feedback from artificial intelligence had different types of answers compared to the information received from the book, which in turn involved students in arranging a discussion due to the presence of different points of view. The subject of the discussion was ways to solve mathematical problems, since the experiment was conducted in a mathematics lesson.

Constant repetition of information and independent solutions to the tasks played a role in determining the retention of knowledge and academic performance of students in the experimental group. Although the students experienced difficulties in the first days of the experiment, the results of the experiment later showed the level of retention of students' knowledge. As the result, based on the results T-test shows ($t(14) = 0.34$, $p = 0.736$) small difference between groups with $M = 7.11$ for experimental and $M = 7.18$ for control group. Independent work with mastering the material had an effect on long-term memory than repeating what the teacher said. Based on this factor, during formative assessment, students in the

experimental group showed higher results in the long term compared to students in the control group (figure 3).

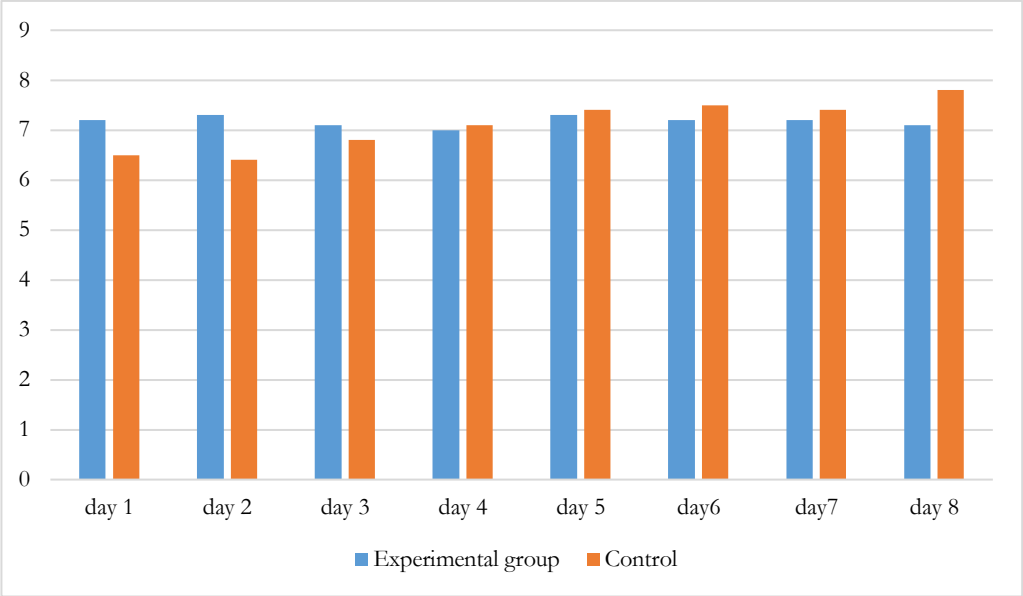

Fig 3. Formative assessment of groups

A survey of teachers who used artificial intelligence in the learning process showed the following results (table 1):

Students who used artificial intelligence in the learning process, according to teachers, showed greater involvement than using traditional methods. Although the opinion of teachers is generally moderate, compared to the use of traditional methods, we can see clear advantages. The opinion of teachers was also divided on the issue of independent completion of the task using artificial intelligence tools. Half of the teachers agreed that artificial intelligence increases the ability of students to complete tasks independently. While the other half of the teachers for what level remained unchanged that artificial intelligence, on the contrary, reduced the ability of students. The opinion of teachers is related to the fact that artificial intelligence, as a chatbot, can increase the effectiveness of independent work, and reduce the efficiency of work when automatically completing tasks if the student is not interested in completing. As noted above, to complete the use of artificial intelligence, it is necessary to follow the principles developed during the experimental activity.

Table 1. Teachers' survey results

Question	Likert scale (1st q 1=never, 5= always; 2nd q 1=Significantly hinder, 5 = Significantly improve; 3rd q 1 = Very negative, 5 = Very positive)				
How often do you observe students engaging more with assignments when they use AI tools compared to traditional methods?	8.3%	0%	41.7%	33.3%	16.7%
To what extent do you believe AI tools improve or hinder students' ability to complete assignments	25%	8.3%	16.7%	25%	25%

independently?					
Overall, how do you perceive the impact of AI tools on students' motivation and academic progress?	0%	16.5%	42%	16.5%	25%

The overall result of the survey showed that teachers still underestimate the effectiveness of artificial intelligence in improving the motivation and academic success of students. When asked how much artificial intelligence affects the improvement of the motivation of the academic process of students, only 41% of teachers answered positively. This factor is due only to the fact that teachers to a greater extent, do not have coefficients in the field of application of artificial intelligence as an effective tool in the educational environment. This once again proves the need to apply and manage the process of implementation of artificial intelligence in educational institutions. The issue of motivation and academic progress of students is not only one of the most important criteria but also a determining factor in their future success. The use of artificial intelligence is still a complex issue because participants in the educational process do not have sufficient opportunities and knowledge for the targeted and local application of artificial intelligence.

Previous research findings have highlighted the need for a balanced approach in which AI tools are used as a complement to teachers, rather than as a replacement; digital technologies can be used to develop learners' critical thinking and motivation (Muthatahirin et al., 2025; Talgatov et al., 2024). Based on the results of this study on the factors influencing the perception of artificial intelligence in independent education, we can note that the management of the process of introducing artificial intelligence into independent education is possible if many factors are observed. It is necessary to take into account the existing differences between the concerns associated with the use of artificial intelligence and the high rates and effectiveness of learning with the help of artificial intelligence. The findings of this study demonstrate that artificial intelligence (AI) can function as an effective tool to support self-directed learning (SDL) when integrated thoughtfully into the educational process. These results are in line with (Zawacki-Richter et al., 2019), who emphasize the role of AI in personalizing learning experiences, and with the PPC framework, which highlights the interaction between learner attributes, processes, and context. This study not only sheds light on the possibilities of artificial intelligence as a separate tool, but also on the process of independent learning with moderate use of artificial intelligence as an effective assistant.

During the experiments and management of the educational process using artificial intelligence, it was found that, firstly, it is necessary to train the teachers themselves to use principles of artificial intelligence. During the experiment using the flipped classroom method with a mathematics teacher, preparations were made for two weeks to implement unbiased research results. The mathematics teacher who experimented completed a refresher course on the topic of using artificial intelligence in school. All of the above is a response to existing concerns about the use of artificial intelligence. A large-scale retraining program for teachers is necessary, as well as the process of using artificial intelligence in the classroom, whether within the framework of independent education or in the process of

educational context, teachers are required to wear and accept artificial intelligence as an assistant in obtaining knowledge. However, the results also differ from the findings of Albshkar et al., (2025); Engkizar et al., (2024); Rohde et al., (2023) which focus on digital learning personalization in higher education, whereas this study examined basic education contexts. This suggests that while AI can enhance motivation, engagement, and independent learning, its effectiveness may vary depending on educational level, the technological literacy of teachers, and the structure of the learning environment. Teachers and administrators responsible for the educational process must understand that the use of artificial intelligence is impossible in elementary school, since the use of artificial intelligence technology from elementary school has the right to implement all the concerns that exist about the use of artificial intelligence. To manage education with artificial intelligence and self-directed education, it is necessary to conduct more in-depth research on the influence and determining factors in the education process.

CONCLUSION

This study exemplifies how AI can transform self-directed learning by providing personalized recommendations and increasing learner engagement and autonomy. By complementing teacher guidance, AI enables learners to have adaptive learning and self-direct their learning process. However, there are challenges characterized by inequalities in access to digital technologies and related ethical issues of physical data privacy and the necessary teacher training to effectively integrate AI into the educational process. In order to maximize the benefits of AI, there is a need to focus on ensuring equal access and implementing teacher training programs and adequate data privacy policies for the use of AI. Further research should include larger and more diverse samples in terms of age and level of knowledge, and longer periods of intervention. For more effective interaction, it is proposed to use multi-subject studies implementing a program of interdisciplinary integration. This will help to obtain the necessary knowledge and results on the assessment of long-term impact of artificial intelligence on learning outcomes and other factors that SDL and educational programs are aimed at developing.

ACKNOWLEDGEMENT

We would like to express our deepest gratitude to everyone who contributed to the success of this research.

DECLARATIONS

Author contribution

Gulzhaina K. Kassymova: data curation, writing-original draft preparation, **Yerassyl K. Talgatov & Mariam R. Arpentieva:** conceptualization, **Assylkhan R. Abishev:** methodology, visualization, **Petr V. Menshikov:** editing, analysis.

AI Statement

The data and the grammatical structure in this article have been validated and verified by English language experts and no AI-generated sentences are included in this article.

Funding statement
The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest
The authors declare that this research was conducted without any conflict of interest in the research.

Ethical clearance
The research company has agreed to carry out the research and is willing if the results of this research are published.

Publisher'sand Journal's Note
Researcher and International Islamic Studies Development and Research Center (IISDRC) as the publisher and Editor of Multidisciplinary Journal of Thought and Research state that there is no conflict of interest towards this article publication.

REFERENCES

Albshkar, H. A., Alouzi, K. M., Numan, M., Anuar, K. A. B. A., & Domdom, C. B. (2025). Five Activities to Enhance Spiritual and Emotional Intelligence in International Students. *Journal of International Affairs and Students Mobility*, *1*(1), 29–40. https://jiasmy.intischolar.id/index.php/jiasmy/article/view/3

Awaluddin, A., Annas, F., & Yuspita, Y. E. (2025). The Use of Artificial Intelligence for Marketing Community Economic Products in West Sumatra. *International Journal of Multidisciplinary Research of Higher Education (IJMURHICA*, *8*(2), 220–231. https://doi.org/10.24036/ijmurhica.v8i2.303

Baroud, N., Ardila, Y., Akmal, F., & Sabrina, R. (2025). Opportunities and Challenges for Islamic Education Teachers in Using Artificial Intelligence in Learning. *Muaddib: Journal of Islamic Teaching and Learning*, *1*(2), 1–11. https://muaddib.intischolar.id/index.php/muaddib/article/view/6

Capinding, A. T., & Dumayas, F. T. (2024). Transformative Pedagogy in the Digital Age: Unraveling the Impact of Artificial Intelligence on Higher Education Students. *Problems of Education in the 21st Century*, *82*(5), 630–657. https://doi.org/10.33225/pec/24.82.630

Dengen, A., & Budiawan, B. (2025). Integrating Artificial Intelligence in Malaria Mosquitoes: A Bibliometric Analysis for Species Identification and Automated Detection. *International Journal of Multidisciplinary Research of Higher Education (IJMURHICA*, *8*(2), 251–265. https://doi.org/10.24036/ijmurhica.v8i2.336

Duggan, S. (2020). Change at the Speed of Learning. In *UNESCO IITE Policy Brief*. http://en.unesco.

Engkizar, E., Alhadi, M., & Akyuni, Q. (2024). Indonesian International Student Mobility Awards Program: Chances and Challenges. In *JIASMY Journal* (Vol. 1, Issue 1, pp. 41–56). https://jiasmy.intischolar.id/index.php/jiasmy/article/view/4

Engkizar, E., Jaafar, A., Alias, M., Guspita, B., & Albizar, R. (2025). Utilisation of Artificial Intelligence in Qur'anic Learning: Innovation or Threat? *Journal of Quranic Teaching and Learning*, *1*(2), 1–17. https://joqer.intischolar.id/index.php/joqer/index

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly*, *48*(1), 18–33. https://doi.org/10.1177/074171369704800103

Grow, G. O. (1991). Teaching learners to be self-directed. *Adult Education Quarterly*, *41*(3), 125–149. https://doi.org/10.1177/0001848191041003001

Gureckis, T. M., & Markant, D. B. (2012). Self-Directed Learning: A Cognitive and Computational Perspective. *Perspectives on Psychological Science*, *7*(5), 464–481. https://doi.org/10.1177/1745691612454304

Hamzah, M. I., Fakhruddin, F. M., Mokhtar, M. M., Langputeh, S., & Syafrimen, S. (2025). Six Office of International Affairs Programs to Achieve World Class Universities. *Journal of International Affairs and Students Mobility*, *1*(1), 1–16. https://jiasmy.intischolar.id/index.php/jiasmy/article/view/1

Hawkins, J., & Dawkins, R. (2021). A thousand brains : a new theory of intelligence. In *Riva*. Basic Books.

Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. The Center for Curriculum Redesign, Boston, MA. In *Journal of Computer Assisted Learning* (Vol. 14, Issue 4). Center for Curriculum Redesign. https://www.researchgate.net/publication/332180327_Artificial_Intelligence_in_Education_Promise_and_Implications_for_Teaching_and_Learning

Khusnadin, M. H., Hasan, M., Mulyani, F. A., Mardiana, P. D., & Khopipah, T. S. (2025). Impact Analysis of Using Artificial Intelligence on Student Skill Development. *International Journal of Multidisciplinary Research of Higher Education (IJMURHICA*, *8*(3), 605–621. https://doi.org/10.24036/ijmurhica.v8i3.351

Kryuchkova, O. N. (2023). Multimedia Tools for Implementing Multiplicative Approach in Teaching Foreign Languages To Pre-Service Teachers. *Kryuchkova, O. N.*, *2 (64*(2(64)), 83–94. https://doi.org/10.25688/2072-9014.2023.64.2.08

Kucheriavyi, O. H. (2023). Methodological platform for the professional training model of the future teacher of the pedagogical university in the conditions of digitalization. *Edukacja Zawodowa i Ustawiczna*, *8*, 155–177.

Lo, C. K. (2023). What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature. *Education Sciences*, *13*(4), 410. https://doi.org/10.3390/educsci13040410

Lowry, C. M. (1989). Supporting and Facilitating Self-Directed Learning. In *ERIC Digest* (Issue 93, pp. 1–6).

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2019). *Intelligence unleashed: an argument for AI in education. Resource document*. https://discovery.ucl.ac.uk/id/eprint/1475756/

Markhmadova, Z. K., Duisenbayeva, S. S., & Dasrizal, D. (2025). Exploratory Analysis of Challenges for international Students Studying in Muslim-Majority Countries. *Journal of International Affairs and Students Mobility*, *1*(1), 57-70. https://jiasmy.intischolar.id/index.php/jiasmy/article/view/5

Mocker, D. W., & Spear, G. E. (1982). *Lifelong learning: Formal, nonformal, informal, and self-directed*. the Ohio State University.

Muthatahirin, M., Hanjit, C., Aminudin, W. S. A. B. W., & Nasir, A. A. B. A. (2025). Exploring Activities of International Dormitory Students to Advance Social Intelligence. *Journal of International Affairs and Students Mobility*, *1*(1), 17–28. https://jiasmy.intischolar.id/index.php/jiasmy

Neuendorf, K. A. (2018). *Content analysis and thematic analysis. In Advanced research methods for applied psychology*.

Putra, A. E., Rukun, K., Irfan, D., Engkizar, Wirdati, K, M., Usmi, F., & @Ramli, A. J. (2020). Designing and Developing Artificial Intelligence Applications Troubleshooting Computers as Learning Aids. *Asian Social Science and Humanities Research Journal (ASHREJ)*, *2*(1), 38–44. https://doi.org/10.37698/ashrej.v2i1.22

Rohde, N., Flindt, N., Rietz, C., & Kassymova, G. K. (2023). How E-Learning Programs Can Be More Individualized With Artificial Intelligence – a Theoretical Approach From a Pedagogical Point of View. *Muallim Journal of Social Science and Humanities*, 1–17. https://doi.org/10.33306/mjssh/240

Silamut, A. acha, & Petsangsri, S. (2020). Self-directed learning with knowledge management model to enhance digital literacy abilities. *Education and Information Technologies*, *25*(6), 4797–4815. https://doi.org/10.1007/s10639-020-10187-3

Talgatov, Y., Kassymova, G. K., & Nurtanto, M. (2024). AI in the Classroom: A Boon or a Threat to Pedagogical Practices? *Materials of International Scientific-Practical Internet Conference "Challenges of Science*, *61*, 128–134. https://doi.org/10.31643/2024.19

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, *10*(1), 15. https://doi.org/10.1186/s40561-023-00237-x

Voronin, D. M., Saienko, V. G., & Tolchieva, H. V. (2020). Digital Transformation of Pedagogical Education at the University. *International Scientific Conference "Digitalization of Education: History, Trends and Prospects" (DETP 2020*, 757–763. https://doi.org/10.2991/assehr.k.200509.135

Yarmakeev, I., Pimenova, T., & Abdrafikova, A. (2021). Remote Teaching in Russia Under Covid-19 Lockdown: Pros and Cons. *INTED2021 Proceedings*, *1*, 1356–1368. https://doi.org/10.21125/inted.2021.0314

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, *16*(1), 1–27. https://doi.org/10.1186/s41239-019-0171-0