Proceedings of ICEIPI 2026 Symposium: School Psychology, Trauma-Informed Practice and Sustainable Learning Environments
DOI: 10.54254/2753-7048/2026.PE37093

Artificial Intelligence and Learning in High School Education: A Literature Review

Yudan Zhao

University of California, Davis, USA
18457565637@163.com

Abstract. Artificial intelligence has recently become an important part of high school learning, which facilitates the learning process by providing students with viable alternative learning sources, feedback, and news. Today, the issue of the impact of artificial intelligence-based learning units, along with rapidly evolving learning-unit systems and content, on adolescent cognitive skills is emerging. This paper reviews literature on artificial intelligence-based high school learning, discussing the effects of these learning units on cognitive off-loading, motivation to learn, and self-regulated learning in order to bring out both the advantages and disadvantages associated with high school education. It maintains that artificial intelligence contains advantages of optimising learning and coming out with useful information when utilised as an assistant to a human being, however, the danger of human-critical thought development, built-in intrinsic motivation, and depending on the AI to provide solutions to social issues is there because of extreme reliance on artificial intelligence. In a nutshell, this review implores the stakeholders- high schools and students- to provide the requisite guidelines for AI exploration, and critical thinking development.

Keywords: AI-assisted learning, secondary school students, cognitive dependence, learning motivation, self-regulated learning

1. Introduction

Artificial Intelligence(AI) has become a key part of modern education, especially with the recent development of intelligent tutoring systems, adaptive learning systems, and generative AI. In high school, AI-assisted learning provides personalised explanations, real-time feedback, and adaptable academic assistance tailored to diverse learners [1]. Systematic reviews of kindergarten through 12th-grade (K–12) education have highlighted the growing adoption of AI tools, which facilitate improvements in writing, problem-solving, language learning, and science education—a trend that fundamentally reshapes interactions among students, instructors, and instructional materials [2].

However, the increasing penetration of AI in education raises new questions about adolescents' growth. Students in grades 9-12 are not fully developed in executive control, self-directed learning, and academic motivation. The use of AI as simply a way to get answers may allow students to slowly offload the responsibility of thinking for themselves. The literature on cognitive offloading has found that externalising some information will lessen the load on cognition and memory [3]. In

© 2026 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2753-7048/2026.PE37093

addition, motivation theory supports that the outcome could depend on whether the student studied because they wanted to or for external factors, such as rewards [4].

This literature review focuses on the current research concerning AI-driven learning among high school students and its influence on their psychological well-being. It is important to note that key issues include being cognitively dependent, exercising autonomy, self-controlled learning, and the different modes of using artificial intelligence. This question is timely, as proper use of AI allows learners to integrate such help into their work without undermining their autonomy and self-motivation.

2. Current status of AI-assisted learning among secondary school students

Artificial-intelligence-assisted learning has been deeply integrated into middle school teaching practices. The early practice carriers of artificial intelligence in K-12 basic education are mainly intelligent tutoring systems, immersive intelligent learning environments, automatic marking and learning analysis platforms. The above-mentioned technical tools have three core functions: accurately evaluating students' knowledge mastery, providing scaffolding teaching guidance, and combining with each learner's learning feedback to push personalized learning resources suitable for their learning situation [1]. Apparently, generative AI and chatbot-like systems have tremendously opened up the frontiers of AI-assisted learning. It is possible for students to ask the AI or chatbots for clarifications, paraphrasing, examples, grammar verification, and tutoring [2].

The implementation of AI in high school education is correlated with the demand for customized learning. In traditional classroom teaching, it is difficult for teachers to meet the needs of students with different learning styles and learning speeds. Teachers will design teaching according to most academic situations in the class. AI can partially help overcome this barrier for a diverse group of students by providing rapid responses and feedback, enabling additional practice outside the classroom. Novel educational opportunities can also be enabled by large language models in this context, as the models can interpret natural language instructions and provide flexible, context-aware explanations [5].

However, the current trend of learning with AI is not without its limitations. Students can interact with AI in a fundamentally different way. Some students use AI to interpret complex concepts, compare different explanations of a phenomenon, and improve their essays after independent processing. It can be different for other learners who may use AI to just obtain ready-made answers, finish assignments more quickly, or avoid addressing difficult logic-based tasks. Studies of ChatGPT in education highlight that while AI can offer real-time and tailored instruction, it may raise some concerns about the reliability of information, academic integrity, and over-reliance on the technology [6].

Another key feature of the present situation is that secondary school students are still developing their academic judgement. Unlike adult learning, adolescents may have limited experience in assessing whether an AI-generated answer is accurate, biased, incomplete or suitable for solving the problem. Therefore, the AI-assisted learning of high school students should be seen as a hybrid educational process. It has the potential to increase educational opportunities and simultaneously transform studying practices. The fundamental challenge lies in how students learn to use AI — as a substitute for thinking, rather than as a support for learning.

DOI: 10.54254/2753-7048/2026.PE37093

3. Psychological and cognitive developmental impacts

Adolescence is a critical and sensitive period for adolescents' cognitive growth and self-identity. The middle school students at this stage are in the development stage of formal operations as Piaget said, and gradually establish their own way of thinking, self-control habits, stable learning concepts and fixed learning rhythm, and the ability of abstract logical reasoning and hypothesis deduction is also rapidly formed during this period. AI learning tools can simplify lessons and reduce the burden of thinking. Therefore, the cognitive and psychological impact of such learning methods ultimately depends to a large extent on students' dependence on AI, learning drive, self-control and independent thinking level.

AI learning tools can split difficult knowledge, provide reference cases, sort out logical errors, and rely on hierarchical assistance to alleviate students' learning pressure. This kind of scaffold effectively reduces academic pressure and the difficulty of learning tasks. However, excessively reducing self-directed cognitive input introduces two intertwined development risks unique to young learners. First of all, students constantly rely on AI output before trying independent reasoning, which deprives them of the opportunity to practice abstract analysis and hypothetical reasoning repeatedly and hinders the long-term development of formal operational thinking. Second, excessive dependence changes students' learning mode from active cognitive elaboration to passive knowledge assimilation, which undermines self-discipline and the cultivation of intrinsic learning motivation in this formative stage.

3.1. Cognitive dependence and the weakening of independent thinking

Cognitive dependence means that a student is dependent on external tools to perform cognitive tasks — functions that he or she is able to do independently. Additionally, cognitive dependence refers to cognitive offloading, which is the use of an external physical or digital cognitive surrogate to reduce cognitive load or cognitive demand [3]. However, cognitive offloading is not necessarily negative in itself. The use of calculators, notes and search engines can be very useful to students when needed. The only problem is they substitute the students' own thinking.

When learning with the help of AI, it could become a case that students use AI not only for finding facts but also for interpreting data, constructing reasoning, creating writing plans, and problem-solving algorithms. At the onset, students will use AI only to verify answers or get associated explanations. Eventually, some students may first ask AI tools to solve problems and then attempt the tasks themselves. This could reduce the amount of mental labour needed for these tasks in particular.

The Google effect research has demonstrated that exposure to triggered information can affect memory and cognitive functions as people recall where they got the information, not what they gleaned from it [7]. Although the student assistance in the form of a search engine is not strictly AI, the concern persists. The information that is available on demand can undermine on students' genuine motivation to hold, apply, and process knowledge.

Independent thinking could also suffer when students accept answers produced by AI without questioning. Most responses produced by AI are presented confidently and coherently, even though they present oversimplification or distorted information. Senior students may lack the necessary background knowledge to evaluate them. If the students blindly take AI-generated answers as true, they will miss opportunities to apply critical thinking and use evidence effectively to tackle complex challenges.

DOI: 10.54254/2753-7048/2026.PE37093

However, cognitive dependence does not necessarily result from using AI. The same tool can promote autonomy when used more intentionally. For example, students might ask the AI for help with a task, compare its responses with their own or even to explain why their answer is wrong. These actions do not drop students out of the cognitive work.

3.2. Declining learning motivation

AI-assisted learning can also influence students' motivation. Motivation plays an important role in secondary school, as it determines students' drive and persistence, as well as their approach to study. According to self-determination theory, strong intrinsic motivation is more likely to occur when the needs for autonomy, competence, and relatedness are satisfied [4]. In AI-assisted learning, these needs may be facilitated or thwarted.

AI can participate in increasing motivation through the development of students' sense of competence. Providing it with real-time feedback, well-explained tasks, and personalised drills can help reduce their frustration by making them feel in control. On the other hand, for students who shy away from asking questions in the classroom, AI can provid solutions with low-stakes opportunities [8].

Simultaneously, AI might actually lessen the students' motivation to learn if the educational tasks lose their significance. If students mostly depend on AI in order to just quickly finish their homework assignments, those students might be writing the answers just for completion without real learning to go with it.

When a large number of students' work is generated using AI, this phenomenon becomes more evident. Students' motivation to learn is cultivated through the freedom to solve problems independently. When AI systems are overused, students may complete their assignments with less long - term confidence and self - assurance.

4. Psychological factors influencing the effectiveness of AI use

The success of learning with the help of AI is influenced by several factors of a psychological nature. The same AI tool can bring fruitful results for one student and unsatisfactory results for the other. This effect can be explained by a student's ability for self-regulated learning, cognitive level and motivation type. These factors determine the nature in which AI functions as either a learning support or a learning bypass.

4.1. Self-regulated learning ability and cognitive level

Self-regulated learning is the learner's ability to set goals, choose strategies, monitor, evaluate and adjust the learning that will occur [9]. This is important because it gives students more control over their learning. A student with good self-regulation will use AI to clarify their weaknesses, challenge their learning, plan revision and step back from confusion. A student with poor self-regulation will use AI to understand something that they were too weak to do, or simply use it to get the answer instead of thinking.

Effective learners are active, as opposed to passive learners [9]. This is particularly relevant to the use of AI, which can provide information but cannot replace students' self-regulation. Students still need to learn what they want to ask, how to interpret given answers, how to contextualize an explanation, and how to measure if learning has taken place. Without adequate skills, AI will only make students look busy even if they are actually not.

DOI: 10.54254/2753-7048/2026.PE37093

Cognitive level affects the use of AI. High school students differ in their prior knowledge, reasoning skills, and metacognitive abilities. Students with stronger prior knowledge are better able to identify errors in AI-generated responses. As a result, AI may widen the achievement gap. Higher-achieving students can use AI to deepen their learning, whereas lower-achieving students may become overly dependent on AI for quick answers.

New studies of ChatGPT-facilitated self-regulated learning in science education have shown that chatbots can improve science knowledge, motivation, and self-regulation when the educational design includes planning, tutoring, and reflection [10]. This implies that AI is only useful when incorporated as a part of a deliberate educational cycle.

4.2. Intrinsic and extrinsic motivation

Intrinsic and Extrinsic motivation are other important factors that are affected by AI-assisted learning. Intrinsic motivation is learning 'for an end in itself ', for example, interest, curiosity, or personal value, meanwhile, extrinsic motivation is learning 'for other ends', such as rewards, grades, or pressure [4]. Intrinsic and Extrinsic motivation can be applied in learning at school, but in AI interaction,it is different.

Students who are high on intrinsic motivation are prone to further their inquiry with AI. They can ask more questions, compare perspectives, and validate their understanding with AI. Conversely, students who are highly extrinsically motivated may use AI to hasten their submissions or attain grades without effort.

Research shows that highly extrinsic motivators lower intrinsic motivation, especially when people regard them as being coercive [11]. In the situation of using AI in education, a coinciding case occurs when learners resort to AI to meet external expectations and conditions. When the ultimate purpose is simply the completion of assignments, then students lacks involvement and ownership when using AI.

5. Response strategies

The disadvantages of AI enabled learning can be reduced with coordinated efforts among schools and students. As the AI resources are widely accessible, a complete ban on the technologies is impossible and ineffective. AI literacy that communications on expectations and responsible usage can guide the students.

5.1. School-level strategies

Aiming at the academic anomie caused by the abuse of AI on campus, this paper puts forward three feasible governance paths. First, the school should issue clear norms to define the boundaries of AI use, clarify compliance standards, rules for handling academic violations and AI content labeling norms, and help students establish clear codes of conduct.

Second, systematically cultivate students' AI literacy, which covers the core dimensions of recognizing the advantages and disadvantages of AI, judging the deviation of generated content and rationally using tools [12], and can be incorporated into the digital literacy teaching system in middle school.

Thirdly, the task of classroom learning should be reconstructed, with emphasis on process inquiry, logical analysis and reflective homework, and the requirement of a single standard answer should be weakened. For example, students are required to explain the problem-solving ideas, check

DOI: 10.54254/2753-7048/2026.PE37093

the AI viewpoint against the teaching materials, and explore the influence of algorithm output on their own cognition, so as to enhance the transparency of AI use and promote deep learning.

The existing research on intelligent chat robots confirms that teacher guidance can significantly adjust students' learning motivation and the development of AI practical ability [8]. Teachers can demonstrate and standardize the use process, teach AI content verification methods, and guide students to regard artificial intelligence as a learning aid feedback tool, rather than a substitute for independent thinking.

5.2. Student-level strategies

This study constructs four student-centered systematic strategies to guide the responsible application of artificial intelligence in learning. To begin with, learners ought to finish independent pre-learning tasks before turning to AI tools, which helps them sort out their preliminary ideas and identify knowledge deficiencies. Second, students can leverage AI for targeted auxiliary support—such as explanatory prompts, illustrative examples and textual feedback—rather than relying on it to complete assignments in full. Third, all outputs generated by AI need to be cross-verified against textbooks, academic papers and other authoritative materials so as to foster learners' critical thinking capacity. Finally, students should conduct post-use reflective reviews to measure their knowledge progress and consciously distinguish between productive AI-assisted learning and unhelpful over-reliance on algorithms.

6. Conclusion

AI-supported education is relevant for reforming high school education, including intelligent tutorial systems, adaptive systems, and generative AI. In the review of literature presented above, the trends in portions of students applying AI in high school were described, and the consequences for cognition and psychology were discussed. The consequences for students when using convenient AI technology may be both safe and scary, it provides personalized justifications, non-intrusive and personalized guidance, and an option to self-study. These positive effects might be useful, especially for practising more prosocial behaviours or getting quick help at home.

Nevertheless, there is a significant number of deficiencies in the application of AI in the process of teaching and learning. Reliance on AI-based answers inhibits good cognitive activity, creates low levels of independent thought, and lessens intrinsic motivation. Young adults are more likely to be affected negatively because their learning strategies and critical thinking skills are not yet fully developed. AI is likely to be employed as a mere talking device by many teenagers, which would not help them to learn the underlying concepts that the school intends to teach.

The importance of the application of AI basically depends on many psychological aspects such as self learning, cognitive abilities, intrinsic and extrinsic motivation, and ways of application. AI embraces learning in the sense that students use it by asking questions with prompts, receiving meta-knowledge feedback, comparing human to AI, and generalizing. AI does not imply that learning is supposed to occur when it is processed without thinking and ditracted from the tasks.

Hence, partnerships between schools and students are crucial for the responsible development and implementation of AI-based learning. Schools have to lay out clear rules, introduce the right way to use AI to the class, provide tasks that encourage processes. Learners must initiate the task, seek AI assistance rather than uncritically accept its outputs, and reflect deeply on their own knowledge acquisition. However, these strategies should be the means by which AI offers a helping hand to the learning process rather than supplant the person. Maintaining responsible conduct and

DOI: 10.54254/2753-7048/2026.PE37093

protecting the environmental integrity of learning processes will be the keys to the middle school AI future.

References

[1] Shin, D. (2020). Artificial intelligence in primary and secondary education: A systematic review. *Journal of Educational Research in Mathematics, 30*(3), 531–552. DOI: 10.29275/jerm.2020.08.30.3.531.

[2] Zhang, P., & Tur, G. (2024). A systematic review of ChatGPT use in K-12 education. *European Journal of Education, 59*(2), e12599. DOI: 10.1111/ejed.12599.

[3] Risko, E. F., & Gilbert, S. J. (2016). Cognitive offloading. *Trends in Cognitive Sciences, 20*(9), 676–688. DOI: 10.1016/j.tics.2016.07.002.

[4] Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. DOI: 10.1037/0003-066X.55.1.68.

[5] Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., et al. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences, 103*, 102274. DOI: 10.1016/j.lindif.2023.102274.

[6] Farrokhnia, M., Banihashem, S. K., Noroozi, O., & Wals, A. (2024). A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innovations in Education and Teaching International, 61*(3), 460–474. DOI: 10.1080/14703297.2023.2195846.

[7] Sparrow, B., Liu, J., & Wegner, D. M. (2011). Google effects on memory: Cognitive consequences of having information at our fingertips. *Science, 333*(6043), 776–778. DOI: 10.1126/science.1207745.

[8] Chiu, T. K. F., Moorhouse, B. L., Chai, C. S., & Ismailov, M. (2024). Teacher support and student motivation to learn with artificial intelligence-based chatbot. *Interactive Learning Environments, 32*(7), 3240–3256. DOI: 10.1080/10494820.2023.2172044.

[9] Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice, 41*(2), 64–70. DOI: 10.1207/S15430421TIP4102_2.

[10] Ng, D. T. K., Tan, C. W., & Leung, J. K. L. (2024). Empowering student self-regulated learning and science education through ChatGPT: A pioneering pilot study. *British Journal of Educational Technology, 55*(4), 1328–1353. DOI: 10.1111/bjet.13454.

[11] Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*(6), 627–668. DOI: 10.1037/0033-2909.125.6.627.

[12] Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 1–16. DOI: 10.1145/3313831.3376727.