

The Influence of AI-Assisted Instruction on College Students' learning Psychology

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Abstract. This paper systematically reviews the dual effects of artificial intelligence-assisted instruction on College Students' learning motivation, learning strategy selection, and cognitive load, and puts forward optimization suggestions. It argues that in terms of learning motivation, artificial intelligence technology can not only enhance learning motivation by meeting students' basic psychological needs and providing external driving, but also weaken motivation due to overemphasizing results, reducing interaction and overuse. In terms of learning strategy selection, artificial intelligence technology can promote deep learning and enhance metacognitive strategies, but it may also make students' learning strategies remain at a superficial stage or weaken their metacognitive ability. In terms of cognitive load, artificial intelligence technology can effectively regulate cognitive load, but it may also cause abnormal load. Based on this, the artificial intelligence for teaching should be optimized from the three aspects of technology development, teaching practice and students' training, so as to balance the technical efficiency and students' psychological needs.

Keywords: Artificial Intelligence Assisted Instruction, Learning Psychology, Learning Motivation, Cognitive Load

1. Introduction

In recent years, with the rapid development of Artificial Intelligence (AI) technology, its application in the field of education is increasingly in-depth, especially in higher education, showing broad prospects. At present, artificial intelligence technology has been widely used in many aspects, such as personalized learning paths, intelligent correcting homework, analyzing data to provide teaching insights, helping with classroom management, and constructing immersive learning scenes. AI-assisted teaching forms such as intelligent tutoring systems, adaptive learning platforms and intelligent evaluation tools have gradually reshaped the teaching mode and learning ecology of higher education [1]. As a generation growing up synchronously with the digital age, college students have a rich knowledge base and strong learning ability, and have a high degree of acceptance and willingness to explore emerging technologies. Driven by the actual learning needs, college students are more likely to be affected by AI tools, and their learning process is more likely to change due to technological intervention. Therefore, the application of artificial intelligence in higher education is particularly noteworthy.

In this context, learning psychology, as a key factor affecting the learning process and determining learning effectiveness, is increasingly attracting researchers' attention. It not only relates to students' learning engagement, but also directly affects their academic achievement and long-term development. Learning motivation is the core driving force of learning behavior, learning strategy selection determines the effectiveness of learning methods, and cognitive load reflects the consumption of psychological resources in the learning process. These three together constitute the key dimensions affecting college students' learning psychological state. Therefore, taking it as the research object can more comprehensively reveal the mechanism of AI-assisted teaching on College Students' learning psychology.

However, most of the existing studies focus on the impact of AI-assisted instruction on students' academic performance, but the in-depth discussion and systematic carding of its corresponding learning psychological mechanism are slightly insufficient. Focusing on college students, this paper systematically reviews the impact of AI-assisted instruction on College Students' learning motivation, learning strategies, and cognitive load, aiming to reveal the relationship between the application of AI technology and college students' learning psychology, and provide psychological theoretical support for the optimization of AI education tools or systems and teaching practice.

2. The influence of AI-assisted instruction on college students' learning motivation

Learning motivation refers to the internal psychological process or dynamic tendency to stimulate individuals to carry out learning activities, maintain the learning activities that have begun, and guide behaviors towards specific learning goals [2]. AI technology has an impact on College Students' learning motivation by combining teaching scenes.

2.1. Positive impact

AI-assisted instruction helps to meet the three basic psychological needs (autonomy, competence, and sense of belonging) emphasized by self-determination theory (SDT), to effectively stimulate students' learning motivation [3, 4]. First of all, due to the wide coverage and accurate analysis of AI technology data, it can efficiently adapt to individual differences, push appropriate learning tasks and resources according to students' knowledge level, dynamically adjust learning content and progress, make students get rid of the unified classroom rhythm of the traditional classroom, and enhance students' Autonomy in learning. This kind of autonomy meets the requirement of "autonomy demand" in SDT and can stimulate students' intrinsic motivation [4]. Secondly, through real-time feedback and dynamic difficulty adjustment, the AI system enables students to continue to experience a sense of achievement and avoid frustration or slackness caused by too difficult tasks. In the sense of belonging dimension, some AI-assisted teaching systems help students establish learning connections by building virtual learning communities. Especially for online learning college students, this virtual interaction effectively alleviates loneliness, enhances group belonging, and strengthens internal learning motivation [5].

At the same time, the intelligent tutoring system can provide instant feedback on students' homework, tests, and other behaviors, not only correct errors, but also analyze the causes of errors and provide targeted suggestions [6]. This instant and accurate feedback avoids the problem of feedback lag in traditional teaching, enables students to quickly obtain a sense of achievement or clarify the direction of improvement, and strengthens the enthusiasm for learning [6]. Not only that, the intelligent tutoring system strengthens college students' achievement goal orientation and task

awareness through clear goal decomposition and quantitative feedback, and further improves students' approach motivation.

2.2. Potential challenges

2.2.1. Overemphasis on results and reliance on risk

When the AI system assists students in learning, it may overemphasize the result orientation (for example, overemphasize the improvement of scores and the rise and fall of rankings), resulting in students' viewing learning as completing tasks, ignoring the value of knowledge itself and the learning process, which also weakens students' intrinsic learning motivation. In addition, over-reliance on the tips and help of intelligent systems may lead to the reduction of students' active thinking and the weakening of their willingness to explore. In the long run, this may lead to cognitive degradation and the externalization of learning motivation

2.2.2. Social loss and reduced sense of belonging

Pure AI-driven learning scenarios may reduce teacher-student interaction and peer collaboration, while college students' learning motivation partly depends on the sense of group belonging. If AI tools replace the necessary interpersonal communication, such as discussion, question answering, or group cooperation, it may cause students to feel lonely and indirectly affect their learning engagement and motivation.

3. The influence of AI-assisted instruction on college students' learning strategy choice

Learning strategies are the sum of plans, methods, and control measures that learners actively adopt to improve learning efficiency and achieve goals. AI-assisted instruction affects college students' tendency of strategy select strategies through resource push, path guidance and strategy tips.

3.1. Promotion and limitations of deep learning

The resource presentation of AI technology directly affects the strategy selection. When the system tends to push fragmented knowledge points and a question bank, students are more likely to adopt a surface strategy and deal with the examination through repeated practice; On the contrary, if the system provides case analysis and interdisciplinary related materials, it can guide students to adopt deep strategies. In practice, the AI system analyzes the actual learning data, pushes the corresponding information, guides students to associate new and old knowledge, and promotes deep learning.

However, the current AI assisted instruction also has obvious limitations: First, the AI system places too much emphasis on the test oriented training platform and recommends more exercises and test site summaries, which may make students more dependent on surface strategies; Second, the AI system will push fragmented knowledge that lacks structural integration, which is easy to make students form surface processing habits; Third, some AI systems are solidified and single, which may lead students to mechanically apply the recommended methods, weakening the flexibility of strategy conversion [7].

3.2. Promotion and limitation of metacognitive strategies

Metacognitive strategy is the core ability of College Students' autonomous learning, and AI-assisted teaching can help effectively improve this ability. The AI system generates reports by recording and analyzing data such as learning duration and distribution of wrong questions to help students identify vulnerabilities and adjust time allocation. Research shows that students who use AI learning analysis tools have better learning plan rationality and execution monitoring ability than traditional groups. At the same time, some AI tutoring systems use a problem-driven design process to guide students to disassemble complex problems and monitor the thinking process [8].

However, AI assisted instruction also has limitations on Metacognitive Strategies: first, the systematic monitoring of the thinking process through AI may lead to rebellious psychology, leading to students' resistance to the application of metacognitive strategies; Second, the optimal learning plan recommended by the AI system may replace students' autonomous thinking and weaken the autonomous development of metacognitive ability [9].

4. The impact of AI-assisted instruction on college students' cognitive load

Cognitive load refers to the total consumption of psychological resources that individuals bear in the process of information processing, which reflects the cognitive pressure of the brain when processing tasks [10]. It is mainly divided into internal load, external load, and related load [10]. AI-assisted instruction affects cognitive load by optimizing information transmission, presentation, and task design.

4.1. Reducing external load: technical advantages and design risks

The external load of College Students' cognitive load mainly comes from the improper presentation of teaching materials, unreasonable design of teaching activities and other external factors unrelated to the difficulty of learning content itself. AI assisted instruction reduces the external load in the teaching process by accurately adapting learners' cognitive state, optimizing information presentation logic, reducing ineffective cognitive consumption, personalized design combined with individual learning preferences, and visualization and situational means, so that learners can put more cognitive resources into the understanding and internalization of knowledge, and ultimately improve students' learning efficiency [11]. In addition, empirical research also supports this view. Sixteen weeks of experimental study between East China Normal University and homework gang in Chongqing Renhe Street Primary School in 2024 confirmed that the use of AI adaptive presentation and adjustment of teaching content can reduce the students' external cognitive load (the AI learning machine system can reduce the students' external cognitive load caused by strangeness by 2% per week by dynamically adjusting the video duration and content complexity).

However, poorly designed AI systems can backfire. First, if the interactive interface is too fancy, it will distract students' attention and increase the external load; Secondly, if the AI system interface is complex and the operation is cumbersome, students need to spend extra energy on learning tools, which will increase students' cognitive load; Moreover, the information pushed by some systems is too complex, which may cause students to fall into the dilemma of information selection and aggravate the consumption of psychological resources. Therefore, in the future, the application of AI-assisted instruction needs to consider the scientificity of system design more, with user experience and effect as the core.

4.2. Adjusting related loads: a double-edged sword to promote deep learning

Correlation load refers to the effective psychological resources invested by learners to realize the in-depth understanding and meaning construction of knowledge [10]. Its level directly affects the persistence and transfer ability of learning, and is the key index to measure the quality of in-depth learning.

The impact of AI assisted instruction on related loads is realized through multiple technical paths: capturing learning data, locating cognitive thresholds and pushing adaptive content based on learning analysis technology; With the help of multimodal presentation technology to simplify complex concepts and reduce psychological consumption; With the instant feedback mechanism, the task complexity is reduced when learners are stagnant, and the challenge is upgraded when they are proficient, to adjust the load rhythm [12].

However, if AI task design is beyond the ability of students, the related load may turn into cognitive overload, leading to learning anxiety. On the contrary, if the task is too simple, the relevant load will be insufficient and it is difficult to form a deep understanding [12].

4.3. Adjustment of internal load: advantages and disadvantages of content disassembly

The internal load is a cognitive load determined by the complexity of learning content and students' knowledge base [10]. AI-assisted instruction can affect it through content disassembly and knowledge cohesion [11]. In the face of complex content, an AI system can be disassembled and presented step by step according to logic, reducing the internal load of students' initial contact. At the same time, the AI system can also build a bridge between old and new knowledge based on students' existing knowledge base, reduce the understanding difficulties caused by knowledge fault, and then adjust the internal load level.

There are problems with this adjustment. On the one hand, excessive disassembly makes it easy to make students to understand fragmentation and increases the burden of subsequent comprehensive application [11]. On the other hand, if the judgment of AI on students' knowledge base is biased, the bridge between new and old knowledge may not be practical, which can not effectively adjust the internal load. In addition, the one-click answer function of the over-intelligent AI system will also reduce students' active thinking, lead to low internal cognitive load, and weaken their deep processing ability for a long time [11].

5. Suggestions

Given the dual impact of AI assisted instruction on College Students' learning psychology, it is now necessary to optimize the three aspects of technology development, teaching practice and students' training, to amplify the positive effects and avoid potential risks, realize the dynamic balance between technical efficiency and psychological needs, and provide support for the improvement of the quality of higher education.

At the technical level, it should balance the technical advantages and students' psychological needs to avoid the AI algorithm paying too much attention to the examination or pushing too much fragmented knowledge. Instead, it should design more interdisciplinary resources and problem-driven tasks to guide students' deep learning strategies [13]. At the same time, AI system-assisted teaching should allow students to adjust the feedback frequency and provide students with time for adaptation and development [13].

In teaching practice, it is necessary to establish a human-computer cooperation mode, retain the links that are difficult to be replaced by AI, such as teacher-student interaction and group discussion, prevent over reliance on technology to weaken interpersonal interaction, and regularly optimize and modify AI algorithms to ensure that AI system assists teachers to carry out teaching activities in strict accordance with teaching objectives.

In terms of student training, teachers are supposed to help students understand the limitations of AI logic through relevant courses, strengthen students' concept of critical use of AI, and guide them to use the data analysis provided by AI as a reference for self-regulation, rather than the only basis, to avoid the inhibition of metacognition development [13].

6. Conclusion

The influence of AI-assisted instruction on College Students' learning psychology is twofold. In the aspect of learning motivation, AI assisted instruction can enhance students' learning motivation by satisfying students' autonomy, competence and sense of belonging, and using instant feedback and emphasis on goal orientation, but it may also weaken students' learning motivation due to excessive emphasis on results, reducing interpersonal interaction and excessive use; In the choice of learning strategies, AI technology can promote deep learning and the application of metacognitive strategies, but it also has the limitations of inducing surface strategies, limiting the flexibility of strategies and weakening metacognitive ability; In terms of cognitive load, AI technology can adjust the external, related and internal load, but it may also cause the risk of abnormal load.

Therefore, future research can be deepened from the following two aspects. The first is to focus on the different effects of different AI technology types on College Students' learning psychology. The second is to develop "psychologically friendly" AI-assisted education tools in close combination with psychological theories (such as self-determination theory and cognitive load theory), to find a balance between technical efficiency and students' psychological needs, and truly realize the people-oriented nature of educational technology.

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