



Research on the Influencing Factors of Students' Autonomous Learning Ability in Higher Vocational Colleges and Universities in the Context of Artificial Intelligence

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Abstract

With the rapid advancement of artificial intelligence technology, its applications in the educational sector have become increasingly widespread. Higher vocational institutions, as pivotal centers for cultivating applied talent, are undergoing profound transformations in their teaching methods and students' learning approaches. Artificial intelligence, through intelligent learning systems and online education platforms, provides students with more personalized and flexible learning resources and pathways, significantly enhancing their potential for autonomous learning. However, despite the numerous opportunities presented by artificial intelligence, the self-directed learning abilities of students in higher vocational institutions are influenced by various factors. These include individual differences among students, the role of teachers, and the support provided by the learning environment and available resources. This paper aims to explore the multiple factors affecting the autonomous learning capabilities of students in higher vocational institutions within the context of artificial intelligence, offering theoretical support and practical guidance for optimizing teaching strategies and enhancing students' self-directed learning abilities. By reviewing existing literature and analyzing empirical research, it reveals the actual effects of artificial intelligence in education and its specific impact on students' autonomous learning capabilities.

Keywords

Artificial Intelligence; Higher Vocational Institutions; Independent Learning Ability; Influencing Factors

1. Introduction

The advancement of artificial intelligence technology has brought revolutionary changes to the educational sector. Higher vocational institutions, as pivotal in cultivating skilled professionals, are undergoing profound transformations in their teaching methods due to AI. The introduction of intelligent teaching systems, virtual laboratories, and online learning platforms has provided students with abundant learning resources and personalized educational experiences. Self-directed learning, as a crucial ability for students to effectively acquire knowledge and solve problems in an information-rich environment, has become increasingly important. Self-directed learning extends beyond traditional self-study; it encompasses a range of complex cognitive and behavioral processes, including proactive planning of learning activities, self-

monitoring of progress, and adjustment of learning strategies. Artificial intelligence plays a significant supporting role in this process, as personalized recommendations and real-time feedback from intelligent learning tools enable students to engage in more targeted learning, enhancing both efficiency and effectiveness. Moreover, AI technology has a profound impact on students' motivation, boosting their interest and enthusiasm for learning. However, the factors influencing students' self-directed learning capabilities are multifaceted, including the students' own learning abilities, motivation, and habits, as well as the teaching methods and support provided by educators, and the resources and technological infrastructure of the learning environment. A comprehensive understanding of these factors is crucial for improving the self-directed learning capabilities of students in higher vocational institutions, holding significant theoretical and practical implications.

2. The current status of the application of artificial intelligence in education

Amidst the wave of artificial intelligence, the field of education is undergoing an unprecedented transformation. The application of AI technologies not only introduces a myriad of tools for teaching but also opens new avenues for the development of students' self-directed learning abilities. Through intelligent tutoring systems, students are able to receive personalized learning pathways and immediate feedback, which enhances learning efficiency and motivation to some extent. Furthermore, AI technology, through data analysis, can identify students' learning habits and preferences, thereby providing more precise learning resources and strategies that further foster self-directed learning. However, the enhancement of self-directed learning capabilities is not achieved overnight. The integration of AI technology in education must align with students' cognitive development and psychological characteristics to ensure its effectiveness and appropriateness. Additionally, the role of teachers has evolved in this process, shifting from traditional knowledge transmitters to facilitators and guides of the learning journey. The introduction of AI provides teachers with more opportunities to focus on students' individualized needs, while also necessitating continuous improvement in their technological proficiency and teaching strategies (Xingyang Wang et al., 2023). The application of artificial intelligence in education offers new possibilities for enhancing students' self-directed learning abilities but also presents new challenges. Finding a balance between technology and education to ensure effective integration is a pressing issue that requires thorough exploration within the current educational landscape.

3. The concept and importance of independent learning ability

The ability to learn autonomously refers to a student's capacity to independently plan, execute, and evaluate their learning process without external compulsion. This encompasses the self-directed setting of learning objectives, the selection of appropriate learning strategies, the regulation of the learning process, and the self-assessment of learning outcomes. In the context of contemporary education, particularly with the growing prevalence of artificial intelligence technologies, the importance of autonomous learning skills has become increasingly prominent. Students who possess these abilities are not only better equipped to handle the rapidly changing demands for knowledge and skills but also to sustain their learning motivation and capacity in an era of information overload. For students in higher vocational institutions, cultivating autonomous learning skills is particularly crucial, as it affects not only their academic performance during their studies but also their future career development and competitiveness. By fostering these skills, students can more adeptly navigate the professional transformations brought about by artificial intelligence and automation, becoming high-caliber individuals with innovative thinking and complex problem-solving capabilities. The development of this ability relies not only on advanced technological methods but also on educators' conscious guidance and support throughout the teaching process, thereby creating a positive learning environment and mechanism. Therefore, understanding and emphasizing the significance of autonomous learning skills holds profound implications for enhancing educational quality and students' overall competencies.

4. The impact of artificial intelligence on students' self-directed learning ability

4.1 Use of intelligent learning tools

The utilization of intelligent learning tools has profoundly impacted students' autonomous learning abilities. These tools offer a more flexible and efficient learning experience by designing personalized learning paths and providing real-time feedback mechanisms. Adaptive learning platforms, for instance, dynamically adjust learning content and difficulty based on the students' progress and comprehension levels, tailoring the learning process to individual needs. This personalized approach significantly enhances students' capacity for self-directed learning, allowing them to craft reasonable study plans according to their interests and capabilities, and continuously refine and optimize their learning strategies throughout the

process. Intelligent learning tools also aid students in promptly identifying their knowledge gaps through real-time data analysis, offering corresponding remedial measures. Such immediate feedback mechanisms enable students to engage in ongoing self-assessment and adjustment, progressively improving learning outcomes (Chen Chao, 2022). Concurrently, these tools furnish educators with detailed learning data and analytical reports, allowing for a more precise understanding of students' learning conditions and targeted guidance and support. In higher vocational institutions, the application of intelligent learning tools not only augments students' autonomous learning abilities but also cultivates their information literacy and technical skills, crucial for lifelong learning and skill enhancement in future careers. Intelligent learning tools serve not merely as aids in instruction but as vital mediums for fostering students' self-directed learning abilities. By utilizing these tools, students can engage more proactively in the learning process, developing habits and capabilities for self-directed learning, thereby laying a solid foundation for future educational and professional endeavors. Future educational practices must continually innovate and optimize the application of intelligent learning tools to better serve students' learning needs and development goals. Educators should actively explore and employ advanced intelligent learning tools, fully leveraging their potential to enhance students' autonomous learning abilities and drive the continuous improvement of educational quality.

4.2 Data analysis and feedback

Data analysis and feedback play a pivotal role in enhancing students' autonomous learning abilities. Leveraging artificial intelligence technology, educators can amass and scrutinize students' learning data, thereby gaining profound insights into each student's learning status. This big data-based analysis not only unveils students' learning habits and patterns but also precisely identifies the challenges and obstacles they encounter in the learning process. In practical applications, data analysis tools can monitor students' learning progress, engagement, and performance variations, generating comprehensive learning reports. These reports provide real-time reflections of students' learning conditions, assisting them in discovering their strengths and weaknesses (Wenwen Chen, 2024). By interpreting this data, students can strategically adjust their learning approaches and optimize their study time allocation, thereby enhancing learning efficiency. This data-driven learning model significantly bolsters students' self-directed learning awareness and capability, enabling them to take more proactive control over their learning journey. Feedback mechanisms are an integral component of data analysis. Timely and effective feedback helps students continually refine and improve throughout their learning process. Intelligent feedback systems, by analyzing students' assignments, tests, and daily performance, offer personalized suggestions and guidance, aiding students in better understanding and mastering the learning material. This not only improves students' learning outcomes but also boosts their confidence and motivation. In higher vocational education, the application of data analysis and feedback mechanisms is particularly crucial. Vocational education emphasizes the development of practical skills, which often require repetitive practice and timely correction. Through intelligent data analysis, educators can accurately pinpoint each student's skill acquisition level, providing targeted guidance and support to ensure that each student achieves the desired learning objectives. In summary, data analysis and feedback have an irreplaceable role in enhancing students' autonomous learning capabilities. They not only help students better understand their learning status, and formulate and adjust learning plans but also provide educators with a scientific basis for decision-making, thereby advancing the quality of education and the development of students' comprehensive competencies.

4.3 Motivation and engagement

Artificial intelligence technology enhances student engagement and involvement in the learning process through personalized learning paths, intelligent recommendation systems, and interactive teaching tools. This technology not only customizes learning content based on student's interests and needs but also stimulates their enthusiasm and interest through gamified learning and virtual reality. Personalized learning paths are pivotal in boosting students' motivation. Traditional teaching models often struggle to cater to each student's unique needs, whereas AI technology, through data analysis, understands students' learning preferences and progress, offering tailored learning plans. This individualized approach helps students experience personalized and exclusive learning, thereby enhancing their intrinsic motivation. Intelligent recommendation systems also play a crucial role in increasing student engagement. By analyzing students' learning behaviors and historical data, these systems can promptly suggest relevant learning resources and activities, aiding students in acquiring knowledge more effectively. Such timely and precise recommendations not only improve learning efficiency but also amplify students' interest, making them more eager to actively participate in the learning process. Interactive teaching tools, such as virtual and augmented reality technologies, provide students with immersive learning experiences. These technologies, through vivid visual effects and interactivity, make abstract knowledge concrete and comprehensible, significantly boosting students' learning interest and motivation. Moreover, this interactivity increases student involvement, making them more engaged and focused during their learning journey. Students in higher vocational institutions

often face challenges due to the practical nature and rapid evolution of knowledge. By employing these AI-driven methods, not only are students' motivation and engagement enhanced, but their ability for autonomous learning and innovative thinking is also fostered. In the future of education, leveraging artificial intelligence to further enhance student motivation and engagement will be a crucial direction for advancing educational reform and improving educational quality (Guo Meng, 2023).

5. Other factors affecting self-directed learning ability

5.1 Individual student differences

Individual differences among students hold significant implications for their autonomous learning capabilities. Each student exhibits notable variances in learning ability, interests, motivation, background knowledge, and cognitive styles, which consequently influence their performance and needs when confronted with identical learning tasks. Cognitive style differences are crucial factors affecting autonomous learning abilities. Students have distinct preferences for information processing, problem-solving, and learning strategies. Some may excel in understanding and retaining knowledge through visual means, while others might rely more on auditory or kinesthetic approaches. This necessitates that educators adopt diverse teaching methods when designing content and selecting tools to accommodate the varied needs of students. Differences in background knowledge and learning experiences also markedly impact a student's autonomous learning capacity. Students with rich background knowledge and learning experiences typically grasp new information more swiftly and apply it effectively to real-world problems. They often leverage their existing knowledge and experience to devise effective learning strategies when faced with difficulties. Conversely, students with limited background knowledge require more guidance and support to gradually develop autonomous learning skills. Variations in motivation and interest play a pivotal role in autonomous learning abilities. Students with strong motivation and keen interest generally exhibit higher levels of autonomous learning. They actively explore and resolve learning challenges and maintain a high level of engagement. In contrast, students lacking motivation and interest may display lower enthusiasm and commitment to autonomous learning. Therefore, stimulating students' motivation and cultivating their interest are crucial for enhancing autonomous learning abilities. Emotional and psychological factors must also be considered. Students with high self-confidence and emotional stability typically demonstrate greater perseverance and resilience in autonomous learning. They manage stress and challenges effectively and maintain a positive learning attitude. However, students with unstable emotions and low self-confidence may be prone to giving up or experiencing negative emotions when faced with learning difficulties, which can adversely affect their autonomous learning outcomes.

5.2 Teacher support and guidance

In the context of artificial intelligence, the self-directed learning abilities of students in higher vocational institutions rely not only on their own efforts and capabilities but also closely on the support and guidance of their teachers. Educators play an irreplaceable role in the learning process, and their guidance and encouragement are crucial for fostering students' autonomous learning skills. Teacher support is first reflected in the innovation of teaching methods. The introduction of artificial intelligence technology provides educators with an abundance of teaching tools and resources, enabling them to design more personalized and interactive teaching plans tailored to individual students' differences and learning needs. This approach not only stimulates students' interest in learning but also helps them to better understand and master knowledge, thereby enhancing their self-directed learning abilities. Furthermore, teachers should focus on cultivating students' critical thinking and problem-solving skills during the guidance process. While artificial intelligence can offer a wealth of learning resources and data analysis, effectively utilizing these resources still requires the guidance of educators. By encouraging independent thinking and self-directed exploration, teachers can help students develop good study habits and increase their autonomy and initiative in learning (Jennifer Sullivan Sulewski et al., 2021). Additionally, teachers' feedback and evaluations have a profound impact on students' self-directed learning abilities. Timely and specific feedback helps students understand their learning progress and shortcomings, and it enhances their motivation and confidence. Educators should adeptly use the data analysis results provided by artificial intelligence to offer targeted feedback and suggestions, assisting students in continuously adjusting their learning strategies and overcoming difficulties. Emotional support and encouragement from teachers are equally significant. Students in higher vocational institutions inevitably face various challenges and setbacks during their studies, and teachers' encouragement and care can greatly boost their confidence and perseverance. By establishing a positive teacher-student relationship and creating a supportive learning environment, teachers can inspire students' intrinsic motivation, enabling them to continually advance and grow through self-directed learning. In the era of artificial intelligence, although the role of teachers has undergone certain changes, their importance remains undiminished. Teachers are not only conveyors of knowledge but also guides and

supporters in the learning process. Through innovative teaching methods, the cultivation of critical thinking, effective feedback, and emotional support, educators can significantly enhance students' self-directed learning capabilities.

5.3 Learning environment and resources

The learning environment and available resources play a pivotal role in determining the autonomous learning capabilities of students in higher vocational institutions. In the context of artificial intelligence, the optimization of learning environments and the judicious allocation of educational resources not only enhance students' learning efficiency but also significantly improve their capacity for self-directed learning. A high-quality learning environment stands as one of the critical factors that ignite students' motivation for independent study. An exemplary learning environment encompasses not merely the comfort and convenience of physical spaces but also the accessibility of digital resources. In higher vocational institutions, classrooms, laboratories, and libraries equipped with modern technology and innovative facilities can provide students with conducive settings for learning. Meanwhile, the proliferation of online learning platforms and the advent of virtual reality technologies have empowered students to engage in self-directed learning anytime and anywhere. This remarkable flexibility greatly amplifies students' enthusiasm and initiative in their academic pursuits. A rich and diverse array of learning resources serves as a vital foundation for autonomous learning. The infusion of artificial intelligence in education has introduced an abundance of resources, including online courses, e-books, academic articles, and various learning software. The widespread accessibility of these resources enables students to select the most suitable materials tailored to their individual learning needs, facilitating personalized educational experiences. This variety of resources not only addresses the diverse requirements of learners but also promotes their independent inquiry and the extensive assimilation of knowledge. Furthermore, the social learning environment is an equally significant aspect that warrants attention. A favorable learning atmosphere encompasses not merely physical and digital domains but also a vibrant social milieu. Through study groups, online discussion forums, and collaborative projects, students can mutually inspire and support one another, sharing insights and resources throughout their academic journeys. Such social interactions not only bolster students' motivation to learn but also cultivate their teamwork abilities and communication skills.

6. Conclusion

Research findings indicate that artificial intelligence is assuming an increasingly pivotal role within the realm of higher vocational education, significantly advancing the development of students' autonomous learning capabilities through intelligent educational tools and personalized data analysis. However, the enhancement of students' autonomous learning capacity does not solely depend on technological means; it also necessitates a holistic consideration of individual student differences, the effective guidance of educators, and the support of learning environments and resources. It is imperative to respect and cater to the personalized needs and learning styles of students, while also recognizing the critical importance of the transformative role of educators in technology application and the innovation of pedagogical strategies. Furthermore, a conducive learning environment and adequate resource allocation serve as foundational pillars in ensuring the autonomy of student learning. In future educational practices, it is advisable to focus on multifaceted collaboration, optimizing the application of artificial intelligence technologies while integrating humanistic care and educational philosophy, thereby comprehensively enhancing the autonomous learning capabilities of students in higher vocational institutions, thereby providing a robust support system for cultivating innovative and applied talents.

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