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The Double-Edged Sword Effect of Generative Artificial Intelligence In Influencing The Innovation Ability of Talents In Higher Vocational Education

Hang Chen, Lingzhao Deng*, Chunyan Wang

Faculty of Cross-Border E-Commerce, Shenzhen Polytechnic University, Shenzhen, China

*Corresponding author

Abstract

This paper explores the dual impact of generative artificial intelligence (GenAI) on the innovation ability of students in higher vocational education. While GenAI enhances creativity by stimulating novel ideas, providing diverse perspectives, and reducing cognitive barriers, it also poses risks such as creative homogeneity and dependency on technology. The research identifies how GenAI tools can inspire innovation through intelligent data analysis, but also cautions against over-reliance, which can stifle independent thought and originality. Additionally, individual factors such as cognitive ability, learning motivation, and digital literacy significantly influence the relationship between GenAI use and innovation. Teachers' roles are also pivotal in shaping the creative potential of students, with those promoting process-oriented teaching encouraging deeper engagement with GenAI. The paper emphasizes the need for a balanced approach to integrating GenAI in vocational education, ensuring that it fosters innovation without compromising critical thinking and originality.

Keywords

Generative Artificial Intelligence; Higher Vocational Education; Innovation Ability.

1. Introduction

In recent years, the effective application of artificial intelligence and its impact on education and teaching have become hot topics in academic research[1]. Since OpenAI launched the ChatGPT generative artificial intelligence (GenAI) tool in 2022, GenAI has gradually penetrated into various industries, especially in the field of education and scientific research, showing great application potential and influence. With its outstanding performance in text question answering, code generation, image and video creation, GenAI is promoting a profound change in the education and teaching model[2]. However, with the rapid development of technology, how to effectively embed GenAI tools into teaching practice and evaluate their impact on students' learning outcomes has become a key challenge that needs to be urgently addressed in the current education field. Therefore, exploring the embedding methods of GenAI tools and evaluating their impact on teaching outcomes have become important topics in educational research.

China has built the world's largest vocational education system, training about 10 million high-quality technical and skilled talents each year, providing strong human support for promoting high-quality economic and social development. As an important component of core literacy, students' innovation ability has always been highly valued, especially in higher vocational colleges. The official government regards the cultivation of top innovative talents as the key direction of building a strong country through education, which reflects the importance of innovation ability to individuals, the country and society. However, from the perspective of overall quality, there is still a certain gap between the innovation ability of students in higher

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vocational colleges and the needs of the country's comprehensive development. At the same time, the existing evaluation system of innovation ability of higher vocational colleges lacks systematic theoretical support.

While technology brings about the digital transformation of education, it also brings ethical and practical challenges. The education industry believes that GenAI should be used cautiously and creatively to better serve the cultivation of students' innovation ability. Although some studies have explored the impact of GenAI on individual creativity , there is still a lack of in-depth research on how to specifically influence students' innovation ability through GenAI in the special educational context of higher vocational colleges.

2. Literature Review

2.1. Application Scenarios of GenAI In Higher Vocational Education

With the rapid development of generative artificial intelligence (GenAI) technology, its application in the field of vocational education is driving the deep reconstruction of teaching models. At present, the academic community's exploration of GenAI in vocational education teaching, the existing research results mainly focus on the expansion of application scenarios. A large number of studies are carried out around how technical tools can innovate curriculum design and assist teachers in teaching. Studies have shown that GenAI can effectively optimize the presentation of teaching content, innovate teaching methods, and improve the teaching effect evaluation system with its functions such as automated task processing, intelligent tutoring system, and collaborative learning support[3]. These studies mostly start from different perspectives of technology application and elaborate on the application scenarios of GenAI in various aspects of vocational education teaching. However, there are obvious deficiencies in current research. Few studies put students at the core and deeply analyze the multiple usage modes of GenAI in the teaching process, as well as the impact of these modes on students' learning process and ability improvement[4]. Overall, existing research focuses more on the development of GenAI technical functions and the continuous exploration of application scenarios, and there is still a lack of systematic research centered on teaching effects.

2.2. Research on The Innovation Ability of Students In Higher Vocational Education

Innovation, as a key component of core literacy and the highest level of Bloom's cognitive teaching objectives, has always been a focal topic in the field of educational research[5]. In the higher vocational education system, as a key position for cultivating technical and skilled talents, its innovation ability training path is significantly different from that of ordinary colleges and universities. However, at present, the field of higher vocational education has not yet formed a complete and standardized theoretical system for measuring students' innovation ability. Most of the existing studies on the innovative practical ability of vocational college students are based on subjective judgment and practical observation, resulting in a relatively vague definition of the concept of innovation ability, and the corresponding evaluation system is also in urgent need of improvement. This situation not only restricts the development of teaching innovation activities based on real situations, but also seriously affects the process of accurately improving the quality of talent training in higher vocational education. Therefore, it is urgent to establish a scientific and rigorous innovation ability evaluation index system. Only in this way can we provide strong support for the innovation of teaching methods and the optimization of curriculum development, and promote the high-quality development of higher vocational education.

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2.3. Research on GenAI and Individual Innovation Ability

At present, generative artificial intelligence (GenAI) is an emerging tool to stimulate human creative potential[6], and the overall research is still in its infancy. Existing research focuses on its role in corporate innovation performance and explores how GenAI drives business model innovation and product iteration[7]. A large number of studies have confirmed that the impact of GenAI on creativity is complex and multidimensional: on the one hand, it shows great potential in expanding the boundaries of human cognition, assisting knowledge construction, and promoting the achievement of high-level learning goals. Through intelligent dialogue, creative inspiration and automated task processing, GenAI can break through the limitations of human thinking, provide learners with a variety of knowledge perspectives, and help achieve Bloom's cognitive goals in the cultivation of high-level abilities such as analysis, evaluation and creation.

However, with the popularization of GenAI technology, its potential risks have also caused widespread concern in academia and society. People are worried that over-reliance on GenAI may weaken human active thinking ability, leading to the convergence of creative content and increased thinking inertia. At the same time, the homogenized content generated by technology may inhibit real innovative inspiration and gradually weaken original thinking. For higher vocational education, innovation ability is a key component of the core literacy of technical and skilled talents, but the impact of GenAI on the innovation ability of higher vocational students has not yet received sufficient attention. Its complex mechanism of action and dual-sided impact urgently need to be systematically explored through empirical research, so as to clarify the application boundaries and optimization paths of GenAI in the cultivation of innovation ability in vocational education, and provide theoretical and practical basis for building a scientific and efficient education and teaching model.

3. The Impact Path of GenAI on Innovation Ability of Higher Vocational Students

The research subjects of this project are students and teachers who use GenAI tools to assist learning and teaching in higher vocational education, with a special focus on the development of students' innovative ability. As GenAI tools are gradually introduced into the classroom, students begin to use these tools to complete tasks and solve problems in their studies. In recent years, higher vocational education has faced the need to effectively integrate GenAI into the learning process, and students' learning methods have transitioned from traditional models to GenAI-supported models. The way students use GenAI and the application orientation of teachers may have a profound impact on students' long-term innovative ability. By studying the development of innovative ability in this context, this project aims to provide theoretical support and practical suggestions for the application of GenAI in higher vocational education classrooms.

3.1. The Positive Impact of GenAI on Innovation Ability of Higher Vocational Students

3.1.1. Stimulate Innovation Potential

Generative artificial intelligence (GenAI) has become an effective tool to stimulate individual creative potential with its powerful data analysis and pattern generation capabilities. In the early stages of creation, creators often face the dilemma of lack of ideas and exhaustion of inspiration. GenAI can quickly integrate massive amounts of data, analyze the potential patterns and connections therein, and then generate a large number of novel ideas and inspirations. Taking artistic creation as an example, when a painter conceives a work, GenAI can provide him with a variety of creative directions based on the analysis of ancient and modern Chinese and

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foreign artistic styles, color matching, and composition forms, such as suggestions for combining traditional ink painting techniques with modern abstract art elements, to help painters break through the inherent thinking framework and open up new creative ideas.

Research also shows that this "external stimulation" can effectively awaken the individual's potential creative thinking[8]. The multiple perspectives and creative inspiration provided by GenAI prompt individuals to reintegrate and process their own cognition and experience, and promote their innovation abiltiy to a higher level. When individuals are exposed to the unique ideas generated by GenAI, they will be inspired and create secondary works based on them, making the leap from imitation to innovation and gradually unleashing their own creative potential.

3.1.2. Reduce Innovation Barriers

In the creative process, individuals are often limited by their own cognitive boundaries and fixed thinking patterns, and it is difficult to break through the constraints of conventional thinking, which becomes an important obstacle to innovation abiltiy. Generative artificial intelligence can help individuals break through the limitations of thinking by providing rich and diverse creative outputs. When copywriters are stuck in a creative bottleneck, GenAI can generate diverse copywriting content from different narrative angles and expressions to inspire creators and help them break away from inherent creative routines.

innovation abiltiy output by GenAI can prompt individuals to reflect on their own thinking limitations and re-examine the creative theme. By drawing on the novel viewpoints and forms of expression provided by GenAI, individuals can break through the original cognitive framework and broaden their creative vision and dimensions. In the field of product design, designers use the unique styling and functional design solutions generated by GenAI to break the constraints of traditional design thinking and create more innovative and practical products, effectively reducing the negative impact of creative barriers on the creative process.

3.2. The Negative Impact of GenAI on Innovation Ability of Higher Vocational Students

3.2.1. The Problem of Homogeneity

Although generative artificial intelligence can provide individuals with rich innovation abiltiy and inspiration, it also inevitably leads to the risk of creative homogeneity. The operation of GenAI relies on a large amount of existing data and preset algorithm models, and the content it generates is essentially the analysis and integration of these data. When many creators use GenAI to assist in creation, due to the similarity of input data and the consistency of algorithm logic, the innovation abiltiy obtained by different creators is likely to be similar in theme, expression method, structural framework, etc. In the field of short video creation, many creators use GenAI to generate scripts and ideas, resulting in a large number of short videos tending to be similar in plot settings and shooting styles, lacking unique personality and innovation abiltiy. This phenomenon of creative homogeneity not only weakens the uniqueness and attractiveness of the work, but also inhibits the creator's personalized expression, affecting the innovation and diversity of the entire creative field. Long-term reliance on similar ideas generated by GenAI will gradually weaken the independent thinking and innovation ability of creators, forming a vicious circle, which is not conducive to the healthy development of the creative field.

3.2.2. Overly Dependent on Technology

With the widespread application of generative artificial intelligence in the field of creation, the problem of individuals' over-reliance on technology has become increasingly prominent. GenAI can quickly and efficiently generate various creative ideas and content, saving creators a lot of time and energy. Under such convenient conditions, some creators gradually develop a

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dependent mentality, habitually handing over creative tasks to GenAI, and lack the enthusiasm for active thinking and exploration. In academic research, some researchers over-rely on GenAI to generate research ideas and paper frameworks, and no longer conduct in-depth literature research and independent thinking, resulting in a lack of depth and innovation in research. Over-reliance on GenAI causes individuals to gradually lose the ability to analyze and solve problems independently, and the motivation for innovation is also weakened. When encountering problems that GenAI cannot solve, creators are often helpless. Long-term reliance on technology-generated innovation abiltiy will make individuals' thinking rigid, making it difficult to actively tap their own innovation abiltiy and hindering the development of individual innovation capabilities. Therefore, how to guide individuals to use GenAI reasonably, avoid over-reliance, and maintain independent thinking and innovation motivation is an important issue that needs to be solved urgently.

4. Analysis of Personalized Influencing Factors

Individual differences among students significantly regulate the relationship between GenAI and innovation ability. From the perspective of cognitive ability, students with high cognitive levels can better understand the complex information provided by GenAI and transform it into innovative ideas. For example, in design courses, they can use the multiple solutions generated by GenAI to optimize their own innovation abiltiy. While students with low cognitive levels are easily disturbed by the massive amount of information in GenAI, making it difficult to extract effective content, which inhibits the development of innovation ability. In terms of learning motivation, students with strong intrinsic motivation regard GenAI as an exploration tool, and actively use it to inspire inspiration, verify ideas, and improve their innovation ability; students dominated by extrinsic motivation only rely on GenAI to complete tasks, lack active thinking, and have limited improvement in innovation ability. In addition, digital literacy is also crucial. Students with high digital literacy are proficient in controlling GenAI functions and deeply tapping its potential; students with low digital literacy find it difficult to play the role of GenAI in promoting innovation ability due to their lack of proficiency in operation.

Teachers' teaching orientation plays a key regulatory role in the relationship between GenAI and innovation ability. Result-oriented teachers focus on students using GenAI to quickly produce results that meet standards. Students often follow established patterns to use GenAI, which limits the free play of innovative thinking. Although they can complete the task, it is difficult to break the routine and achieve innovation. Process-oriented teachers encourage students to boldly try and explore different paths in the process of using GenAI, and guide students to think critically and deeply about the content generated by GenAI, which helps to cultivate students' innovative awareness and ability. In addition, teachers' attitudes and ability to use GenAI will also have an impact. Teachers who actively accept and skillfully use GenAI can better integrate it into teaching and create an innovative atmosphere for students; otherwise, it may hinder the role of GenAI in cultivating innovative ability.

Different teaching scenarios significantly regulate the relationship between GenAI and innovation ability. In theoretical teaching scenarios, GenAI can help students understand abstract concepts by providing rich cases and expanding knowledge boundaries, laying the foundation for innovative thinking, but limited by the classroom format, students have few opportunities for actual innovation practice. In practical teaching scenarios, GenAI can directly participate in project design, problem solving and other links, and students can quickly transform their ideas into practical solutions, greatly promoting the development of innovation ability. For example, in engineering practice, students use GenAI simulation tests to optimize design solutions. In online teaching scenarios, GenAI's intelligent interactive function breaks the limitations of time and space, and students can get personalized guidance at any time, but

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the lack of face-to-face communication may affect the collision and stimulation of innovative thinking. In offline group cooperation scenarios, GenAI helps the team to divide the work and cooperate, and combines the innovation abiltiy of members to achieve complementarity, which is more conducive to the improvement of innovation ability.

5. Conclusion

The integration of generative artificial intelligence (GenAI) in higher vocational education offers significant opportunities for enhancing teaching and learning. Educators can leverage GenAI tools to analyze student performance, provide real-time feedback, and design tailored learning paths, addressing diverse educational needs and enhancing the learning experience. This shift enables teachers to move from traditional knowledge dissemination to facilitating critical thinking and AI interactions, preparing students for a workforce that increasingly relies on AI-driven tools.

However, the adoption of GenAI requires a reevaluation of curricula and teaching methods to ensure the effective integration of AI competencies. This transformation is crucial to equip students with the skills necessary for the digital economy. Moreover, the rise of GenAI in vocational education raises ethical and security concerns, particularly regarding data privacy and the responsible use of AI. Institutions must implement clear policies to address these challenges and maintain ethical standards while leveraging AI's benefits.

In conclusion, GenAI's role in vocational education offers transformative potential, but its implementation must be approached with careful consideration of both its advantages and risks. By promoting a balanced approach that encourages critical thinking, ethical AI use, and continuous adaptation of teaching practices, GenAI can support the development of innovative, skilled talent capable of thriving in an AI-enhanced future.

6. Funds Projects

1. Shenzhen Polytechnic Quality Engineering Teaching and Research Project: Research on the impact mechanism of generative AI embedding on the development of innovation ability of students in higher vocational colleges. Project No.: 7025310568

2. Guangdong Provincial Philosophy and Social Sciences Co-construction Project: "Digital Economy Empowers Common Prosperity Goals: Research on Mechanisms, Paths and Policy Optimization. Project No.: GD23XYJ92

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