

RESEARCH ON THE GENERATING MECHANISM AND TRAINING PATH OF INNOVATIVE LITERACY FOR TECHNICAL AND SKILLED TALENTS

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Abstract

In the current context of economic globalization and innovation driven development, technical and skilled talents are an important force for social progress and industrial upgrading, and the cultivation of their innovative literacy is particularly important. Based on innovation theory, vocational education development theory, and empirical research methods, we found that there is a close relationship between the innovation literacy of technical skilled talents and multiple factors such as their personal traits, educational background, work environment, and organizational culture. Technical and skilled individuals with open thinking, curiosity, and adventurous spirit are more likely to exhibit higher levels of innovation literacy. Systematic education, training, and rich practical experience also play a crucial role in enhancing innovation literacy. In addition, the study also revealed differences in innovation literacy among technical skilled talents in different industries and regions. This study not only enriches the theoretical system of innovative literacy for technical and skilled talents, but also provides useful insights for talent cultivation in practice. We have proposed a series of specific training paths and suggestions on how to enhance the innovation literacy of technical skilled talents.

Keywords: Skilled talents; Innovation literacy; Generation mechanism; Cultivation path

Introduction

This study aims to systematically explore the formation mechanism and effective cultivation strategies of innovative literacy in technical skilled talents. In the context of rapid changes in the current socio-economic environment, technical and skilled talents, as the core force driving technological innovation and industrial upgrading, have important strategic significance in cultivating their innovation literacy for personal career development, organizational innovation ability, and national competitiveness enhancement.

In recent years, with the rapid progress of technology and the deepening trend of globalization, technical and skilled talents are facing increasingly complex and changing challenges and opportunities. Innovation literacy has become a key ability for technical and skilled talents to adapt to the development requirements of the new era and respond to future challenges,

attracting attention from the academic and industry circles. However, although there have been in-depth studies on innovation literacy, there is still insufficient research on the formation mechanism and cultivation path of innovation literacy for technical skilled talents.

On the basis of reviewing previous research, we found that although there have been studies exploring innovation literacy from multiple perspectives, there are still many unresolved questions. For example, what internal and external factors influence the formation of innovative literacy among technical and skilled talents? How do these factors interact and jointly shape their innovation literacy? In addition, can the existing training methods effectively promote the improvement of innovative literacy of technical and skilled talents? How to develop personalized training strategies based on different backgrounds and needs?

Therefore, this study aims to comprehensively apply various research methods and theoretical frameworks on the basis of previous research to conduct in-depth analysis of the above issues. Through empirical research methods, combined with various means such as questionnaire surveys, in-depth interviews, and case studies, a systematic analysis is conducted on the innovation literacy of technical and skilled talents. At the same time, drawing on relevant theories such as innovation theory and talent cultivation theory, providing solid theoretical support for revealing the formation mechanism and cultivation path of innovative literacy. Firstly, through literature review, a systematic review and evaluation of previous research is conducted to clarify research questions and hypotheses. Secondly, using quantitative research methods, data is collected through large-scale questionnaire surveys to deeply analyze the current situation and influencing factors of innovation literacy among technical and skilled talents. At the same time, combining qualitative research methods, through in-depth interviews and case studies, we will delve into the formation process of innovative literacy of technical and skilled talents, as well as the successful experiences and existing problems in the cultivation practice.

This study aims to reveal the dynamic process and influencing factors of the formation of innovative literacy among technical skilled talents, and provide new ideas and insights for the academic and practical fields. Through the results of this study, we hope to provide useful guidance for the improvement of the vocational education system and the development of innovative talent cultivation strategies, contribute new strength to the cultivation and development of technical and skilled talents, and inject new vitality into promoting social progress and industrial development.

Literature review

In the 21st century, innovation has become an indispensable and important quality for talents, and has a crucial core competitiveness for the sustainable development of countries, organizations, and individuals. Primitive innovation is the key to promoting the development of new productive forces, and cultivating top-notch innovative talents is the core element to achieve primitive innovation. At present, the whole society has reached a consensus to attach importance to and strengthen the cultivation of talent innovation literacy. Innovation literacy, as an important component of the development of core competencies for Chinese students, is the mission of

higher education to cultivate innovative literacy for technical and skilled talents. Improving the innovation literacy of technical skilled talents is the only way for China to address technological bottlenecks and achieve technological innovation.

Improving innovation literacy and cultivating high-level talents with innovative spirit and practical ability is the historical mission of universities. The cultivation of innovation literacy requires the construction of an extracurricular training plan content system composed of social practice, scientific research practice, level exams, campus cultural activities, professional expansion, exchange and visiting, etc. (Fu Kun, 2019); Innovation consciousness, innovative thinking, innovative behavior, and innovative self-efficacy have a direct positive impact on creativity. Innovation personality mediates innovation consciousness and innovative thinking to have a positive impact on creativity. Innovation support perception mediates innovation behavior and innovative self-efficacy to have a positive impact on creativity. Innovation personality and innovation support perception, as internal and external motivations of innovation literacy, jointly influence creativity through interaction (Zhang Rui, 2019); The cultivation of innovative literacy requires first conducting education on innovative spirit, guiding students to face the diverse possibilities of innovation and entrepreneurship, fully mobilizing and cultivating their innovative consciousness, encouraging students to actively explore diverse growth directions, and truly achieving the goal of integrating innovation and entrepreneurship education with the cultivation of student knowledge and practical skills. (Yang Jujie, 2021); Innovation literacy is the foundation of "technological competition" and the root of "new generation". There are several problems in the cultivation of innovation literacy, such as "fragmented" tendency, "intermittent" tendency, and "vocational skill oriented" tendency. In the cultivation of innovation literacy, it can move from "fragmented cultivation" to "systematic cultivation", from "intermittent cultivation" to "sustained cultivation", and from "vocational skill oriented cultivation" to "life quality oriented cultivation" (Mo Fan, 2022); Innovation literacy is a diverse, comprehensive, and complex system engineering that requires the introduction of collaborative innovation theory into the field of university student innovation literacy evaluation from an open perspective, the inclusion of scientific practice in talent training programs, and the interaction with an open evaluation system (Guo Shanshan, 2022); To cultivate the innovative literacy of preschool education teacher trainees, it is necessary to clarify the theoretical connotation and constituent elements of the innovative literacy of preschool education teacher trainees, and take the human development ecology as the theoretical perspective. Starting from the micro system, intermediate system, external system, and macro system, we should construct a teacher education reform system based on "practical" media, which is a school local collaboration and a sports person. We should strengthen the role demonstration value of teacher educators, attach importance to the process construction of problem-solving classroom ecology, and give full play to the demonstration power of teachers' "teaching without teaching" to activate the internal driving force of teacher trainees' self growth (Li Fei, 2022; Cai Yun, 2024); Inheriting the digital technology concept and gamified design thinking, the educational metaverse presents the characteristics of immersive virtual real interaction experience, highly integrated diversified

technology, and interesting exploration. It has significant advantages in promoting the cultivation of innovation literacy among engineering students and further improving the evaluation mechanism of student innovation literacy (Hou Haoxiang, 2023); The early cultivation of top-notch innovative talents can be achieved through promoting educational culture, creating a good environment for curriculum construction, improving institutional supply, consolidating the foundation of curriculum construction, strengthening technology research and development, enhancing teacher competence, and strengthening the technology of curriculum construction (Zhang Shanchao, 2024). The cultivation of innovative literacy is a systematic project that requires multiple efforts. A diversified extracurricular training plan content system should be established, focusing on the cultivation of students' innovative consciousness and thinking. By guiding students to face the diverse possibilities of innovation and entrepreneurship, fully mobilizing and cultivating their innovative consciousness, emphasizing the systematic and continuous cultivation of innovative literacy, avoiding the tendency of "fragmentation" and "discontinuity", and introducing collaborative innovation theory into the field of university student innovation literacy evaluation, interacting with open evaluation systems.

In recent years, with the continuous innovation of research methods and the advancement of data collection technology, more and more empirical studies have begun to focus on the cultivation path of innovative literacy of technical skilled talents, and have deeply explored how to effectively improve the innovative literacy of technical skilled talents. Some studies have proposed specific training strategies and suggestions, such as optimizing the education and training system, creating a good innovation atmosphere, and encouraging cross-border cooperation and exchange. Early research mainly focused on defining and characterizing the concept of innovation literacy, providing a preliminary theoretical framework for subsequent research. With the deepening of research, scholars have begun to explore the generation mechanism of innovative literacy of technical skilled talents from multiple perspectives, including personal traits, educational background, work environment, organizational culture, and other influencing factors. Some scholars have emphasized the crucial role of personal traits in the generation of innovative literacy.

However, although some research has achieved certain results, the generation mechanism and cultivation path of innovative literacy for technical and skilled talents are still a complex and diverse issue. Open thinking, curiosity, and adventurous spirit are important foundations for technical and skilled talents to possess innovative literacy. At the same time, educational background is also considered a key factor affecting innovation literacy, including systematic educational training and accumulation of practical experience. The work environment and organizational culture have also been proven to have a significant impact on the innovation literacy of technical and skilled talents. A positive work environment and a cultural atmosphere that encourages innovation can effectively stimulate the innovation potential of technical and skilled talents.

Research question

The core question of this study is: "What is the mechanism for generating innovative literacy of technical and skilled talents, and how to design effective training paths to enhance their innovation ability?". From a theoretical perspective, by delving into the constituent elements, generation mechanisms, and internal connections and interactive relationships between the cultivation paths of innovative literacy of technical and skilled talents, existing theories on technological innovation and talent cultivation can be enriched and developed; From a practical perspective, the research findings can provide targeted recommendations for educational institutions, enterprises, and policy makers to more effectively address the current problem of insufficient innovation literacy of technical and skilled talents, and promote technological innovation and industrial upgrading.

In order to comprehensively explore the core research questions, this study has refined them into the following four specific research sub questions:

(1) What are the constituent elements of innovative literacy for technical and skilled talents? This question aims to clarify the specific connotation and characteristics of innovation literacy, providing a theoretical framework and basic data for subsequent research.

(2) What is the mechanism for generating innovative literacy among technical and skilled talents? This sub question focuses on the formation process of innovative literacy in technical skilled talents, including internal motivation, external environmental factors, and the interaction between the two, in order to reveal the deep-seated reasons for the generation of innovative literacy.

(3) How to effectively cultivate the innovative literacy of technical skilled talents? This sub question explores from the perspective of educational practice how educational institutions and enterprises can improve the innovative literacy of technical and skilled talents through targeted approaches such as curriculum design, teaching methods, and practical training.

(4) What are the challenges and obstacles in the process of cultivating innovative literacy among technical skilled talents? This sub question focuses on the difficulties and problems that may be encountered during the training process, in order to propose corresponding strategies and suggestions to ensure the smooth implementation of the training path.

These research sub questions revolve closely around the core research question, and they are both independent and interrelated. The first sub question focuses on the constituent elements of innovation literacy, providing theoretical support and basic data for subsequent research; The second sub question delves into the generation mechanism of innovative literacy, providing theoretical basis for the design of training paths; The third sub question considers how to effectively cultivate innovation literacy, which is the core objective of this study; The fourth sub question focuses on the challenges and obstacles in the cultivation process, making the research more comprehensive and in-depth. By comprehensively exploring these four sub questions, this study aims to reveal the generation mechanism of innovative literacy of technical skilled talents and propose practical and feasible training paths.

Theoretical framework

In order to better understand how innovation literacy is shaped and developed at the individual, educational, and societal levels, this study adopts the theories of innovation ability development and vocational education as theoretical frameworks. The theory of innovation ability development has a wide range of applications and a profound theoretical foundation in explaining how individuals develop their innovation ability through the interaction of internal and external factors, while vocational education theory focuses on how the education system effectively responds to society's demand for technical and skilled talents, making it suitable for this study.

The theory of innovation capability development was proposed by scholars in the fields of psychology and management. Its core viewpoint is that innovation literacy is not only derived from individual talent and learning, but also includes a comprehensive application of various factors such as social and cultural environment, educational system, enterprise support, and personal life experience. This theory has unique advantages in explaining the formation and development of individual innovation ability. By applying the theory of innovation capability development, we can deeply analyze the reasons, development process, and influencing factors of the innovative literacy of technical and skilled talents.

This study applies the theory of innovation capability development to the study of innovation literacy of technical and skilled talents. Specifically, we will analyze the formation mechanism, cultivation strategies, and policy environment of innovative literacy from the perspective of this theory. By constructing this theoretical framework, we can better understand the essence and laws of innovative literacy of technical and skilled talents.

Based on the theory of innovation capability development and the framework of vocational education theory, this study proposes the following hypotheses:

H1: Educational intervention can significantly enhance the innovation literacy of technical and skilled talents.

H2: The participation and support of enterprises will enhance the practical application ability of technical and skilled talents in innovative literacy.

H3: The social and cultural environment and policy orientation play a crucial role in promoting or inhibiting the cultivation of innovative literacy among technical and skilled talents.

H4: An individual's psychological state and motivation affect the level of development of their innovative literacy.

These assumptions are closely linked to the core viewpoint of the theory of innovation capability development, providing clear directions for our subsequent research. By constructing a theoretical framework based on this theory, it helps to deepen the understanding of the mechanism for generating innovative literacy of technical skilled talents, and provides new perspectives and methods for research in related fields. It can also provide theoretical basis and guidance for policy formulation and practical intervention.

Research method

This study adopts a combination of multiple research methods to comprehensively and deeply explore the generation mechanism and cultivation path of innovative literacy of technical and

skilled talents. In terms of data collection, two main methods were used: questionnaire surveys and in-depth interviews. The questionnaire survey aims to collect quantitative data on the understanding and opinions of technical and skilled talents from different backgrounds and fields on innovation literacy through standardized questions. In depth interviews focus on in-depth communication with representative samples to understand their specific experiences, feelings, and suggestions for generating and cultivating innovative literacy, in order to obtain richer and more in-depth qualitative data.

In terms of sample selection, emphasis is placed on representativeness and universality. We selected technical and skilled talents from different industries, regions, and development stages as the survey subjects to ensure that the sample can comprehensively reflect the overall situation of the technical and skilled talent group. We invited experts and scholars from relevant fields to participate in in-depth interviews to obtain more professional opinions and suggestions.

In terms of data analysis, this study adopted a combination of quantitative and qualitative analysis methods. Quantitative analysis mainly uses statistical analysis software to process and analyze questionnaire survey data, in order to reveal the general laws of the generation mechanism and training path of innovative literacy of technical and skilled talents. Qualitative analysis focuses on encoding, classifying, and extracting themes from in-depth interview data to reveal the specific manifestations and influencing factors of the generation mechanism and training path of innovative literacy of technical and skilled talents.

In addition, this study also focuses on the collection and organization of literature materials. By consulting academic works, journal articles, and policy documents in relevant fields, we can understand the research status and development trends of innovative literacy of technical and skilled talents, providing theoretical support and reference basis for this study.

Although this study employed a combination of multiple methods, there are still some limitations. For example, due to time and resource constraints, the sample size may not be large enough to fully cover all types and levels of technical skilled talents. In addition, the results of questionnaire surveys and in-depth interviews may be influenced by subjective factors of the respondents, resulting in certain biases. Therefore, when interpreting and applying research results, these limitations need to be carefully considered.

In the research process, the principles of science, objectivity, and impartiality were always followed, and the collected data was strictly managed and kept confidential to ensure the credibility and reliability of the research. The research methods were constantly reflected and revised to improve the accuracy and effectiveness of the research.

Research results

Research has found that the innovation literacy of technical skilled talents is generated by the combined effects of multiple factors, and is influenced by individual characteristics, educational experiences, work environment, and social culture. Specifically, technical skilled individuals with higher cognitive abilities, positive emotional attitudes, and rich practical experience are more likely to demonstrate higher levels of innovation literacy.

Firstly, this study found that individual internal factors play a crucial role in the generation of innovative literacy. The cognitive ability of technical skilled talents, including innovative thinking, problem-solving ability, etc., is an important component of their innovative literacy. Meanwhile, their emotional attitudes, such as their attitude towards innovation and self-confidence, directly affect the formation of innovation literacy. In addition, the accumulation of practical experience has a significant impact on the improvement of innovation literacy of technical and skilled talents. Through continuous exploration and experimentation in practice, they can continuously enhance their innovation ability.

Secondly, external environmental factors also have a significant impact on the generation of innovative literacy among technical and skilled talents. The educational environment provides technical and skilled talents with the basic knowledge and skills to cultivate innovative literacy, while the work environment provides them with opportunities and platforms for practical innovation. In addition, the social and cultural environment also has a subtle impact on the innovative literacy of technical and skilled talents. An open and inclusive social and cultural atmosphere helps to stimulate the innovative potential of technical and skilled talents.

In addition, this study also found that the improvement of innovation literacy of technical skilled talents is closely related to their career development. Technical and skilled talents with high innovation literacy are more competitive in career development and more likely to achieve outstanding innovative results. This provides a basis for us to develop more targeted career development plans and incentive measures.

The results of this study indicate that the cultivation of innovative literacy in technical skills talents requires a comprehensive consideration of both individual internal and external environmental factors, and the construction of a systematic talent cultivation system. This suggests that when formulating training strategies, we should pay attention to individual differences, teach students according to their aptitude, and strengthen the combination of education and practice, providing sufficient opportunities for innovative practice for technical and skilled talents.

Research discussion

The results of this study are consistent with existing research to a certain extent, indicating that the generation of innovative literacy in technical and skilled talents is influenced by both individual internal and external environments. However, this study has expanded and deepened in the following areas:

Firstly, this study adopts a comprehensive theoretical framework and combines multiple research methods to collect and analyze data, revealing more accurately the generation mechanism and cultivation path of innovative literacy for technical and skilled talents. We have delved into how individual internal factors such as cognitive ability, emotional attitude, and practical experience, as well as external environmental factors such as educational environment, work environment, and social culture, interact with each other to jointly influence the formation and development of innovative literacy.

Secondly, this study adopted more rigorous and comprehensive methods in sample selection and data analysis. We selected technical and skilled talents from different industries, regions, and development stages as the survey subjects to ensure the representativeness and breadth of the sample. We conducted in-depth mining and interpretation of the collected data, which improved the reliability and effectiveness of the research.

The results of this study make significant contributions to the development of theory. We further confirm that innovation literacy is a multidimensional concept, which not only includes innovative thinking and innovation ability, but also involves multiple aspects such as individual emotional attitudes and practical experience. We also reveal the mechanisms and paths of different factors affecting innovation literacy, providing us with deeper insights and understanding.

Based on the results and discussion of this study, we propose the following future research directions:

Firstly, further exploration can be conducted on the relationship between innovation literacy and other related competencies of technical skilled talents, such as team collaboration literacy, leadership literacy, etc., in order to gain a more comprehensive understanding of the quality structure and development needs of technical skilled talents.

Secondly, more in-depth and specific research can be conducted on different types of technical skilled talents, such as those in traditional manufacturing, emerging industries, and other fields, to reveal the unique mechanisms and training paths for their innovative literacy generation.

Finally, further attention can be paid to the practice of cultivating innovative literacy of technical and skilled talents, exploring effective training strategies and methods, and providing more powerful support for the cultivation and development of technical and skilled talents.

Conclusion

Firstly, the generation of innovative literacy among technical and skilled talents is a complex and diverse process, influenced by both individual internal factors and external environment. Specifically, an individual's cognitive ability, emotional attitude, and practical experience play a crucial role in the generation of innovative literacy, while external factors such as educational environment, work environment, and social culture provide important support and conditions.

Secondly, this study found that the innovation literacy of technical skilled talents is closely related to their career development. Technical and skilled talents with high innovation literacy are more competitive in career development, and can better adapt to and respond to constantly changing work environments and technical requirements.

In addition, this study also found that the current training system for technical skilled talents has certain shortcomings and limitations in the cultivation of innovative literacy. Therefore, we propose the suggestion of building a systematic and personalized talent cultivation system to better promote the improvement and development of innovative literacy of technical and skilled talents.

In terms of theory and practice, this study fills the knowledge gap on the mechanism and training path of innovative literacy generation for technical skilled talents, providing new perspectives

and ideas for research in related fields. In particular, our research emphasizes the need to pay attention to individual differences, tailor teaching to individual needs, and strengthen the integration of education and practice, providing ample opportunities for innovative practice for technical and skilled talents.

Based on the above findings, we suggest that relevant departments and institutions should fully consider the cultivation and enhancement of innovative literacy when formulating policies and practical measures for cultivating technical and skilled talents. By optimizing curriculum design, improving teaching methods, and strengthening practical training, we aim to create a better growth environment and conditions for technical and skilled talents, in order to promote their comprehensive development of innovative literacy. We also look forward to more research in the future focusing on the cultivation and development of innovative literacy among technical and skilled talents, providing more support and guidance for the theoretical and practical development in related fields.

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Author Introduction

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