

Original Paper

Exploring the Cultivation Model of Graduate Students' Innovation Awareness and Practical Abilities Driven by Scientific Research Projects

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Abstract

This paper aims to review studies on the cultivation model of graduate students' innovation awareness and practical abilities driven by scientific research projects. By examining relevant literature, it analyzes the significance of research projects in enhancing graduate students' innovation awareness and practical abilities, identifies current challenges, and proposes strategies for constructing an effective cultivation model. The findings indicate that research projects provide a practical platform and opportunities for innovation, but issues such as insufficient mentorship guidance and uneven resource allocation persist during implementation. Building a scientific and rational cultivation model requires efforts in optimizing project topic selection, strengthening mentorship guidance, and improving incentive mechanisms to effectively enhance graduate students' innovation awareness and practical abilities, thereby providing insights for improving the quality of higher education and fostering innovative talent.

Keywords

Graduate Research, Innovation Capability, Cultivation Model Introduction

General Secretary Xi has emphasized that science and technology are the primary productive forces, and innovation is the foremost driver of development. In the face of the current challenging external environment, cultivating innovative talent across various industries is a critical responsibility and mission of Chinese higher education. Among its components, graduate education is the most vital part of fostering innovative talent in higher education. The cultivation of graduate students' scientific research and innovation capabilities is the key to determining the quality of graduate education and is a fundamental requirement for China's strategies of "rejuvenating the nation through science and education" and "building a talent-strong country." With the advent of the knowledge economy era, innovation has become the core driver of social progress. As a critical reserve force for high-level innovative talent, the cultivation of graduate students' innovation awareness and practical abilities is of paramount importance. Scientific research projects, as a crucial component of graduate education, not only enable students to deeply explore specialized knowledge but also provide an effective platform for enhancing their innovation awareness and practical abilities. Exploring a cultivation model for graduate students' innovation awareness and practical abilities driven by scientific research projects is of great significance for improving the quality of graduate education and meeting society's demand for innovative talent.

1. Current Issues in Cultivating Graduate Students' Innovation Awareness and Practical Abilities through Research Projects

1.1 Insufficient Mentorship Guidance

In recent years, the scale of graduate education in China has continued to expand, with steady improvements in training quality. According to data from the Ministry of Education, as of 2023, the number of graduate students enrolled nationwide has exceeded 3 million, with over 10 million students currently enrolled, indicating that graduate education has entered a phase of massification (Ministry of Education of the People's Republic of China, 2023). This reflects the growing national demand for high-level talent and the achievements of educational reforms. Mentors play a pivotal role in graduate education, serving as guides for students' academic growth and exerting significant influence on their research direction, academic literacy, and innovation capabilities. However, some mentors, burdened by heavy research tasks and administrative duties, have limited time and energy to guide graduate students in research projects. This results in students receiving insufficient or untimely guidance when encountering challenges during project implementation, which hinders the cultivation of their innovation awareness and practical abilities. Additionally, some mentors adopt traditional guidance approaches that lack emphasis on fostering students' innovative thinking, thus failing to stimulate their creative potential. It is recommended to establish a practice-oriented quality assurance mechanism for developing the capabilities of mentors for professional degree graduate students, enhance mentors' digital guidance skills, promote innovation in mentor selection and management systems based on differentiated training models, and encourage collaborative efforts to advance mentors' capabilities

(Zhang & Wang, 2022).

1.2 Uneven Resource Allocation

Against the backdrop of China's ongoing efforts to promote the high-quality development of graduate education, the efficiency of educational resource allocation has become a key focus in academia. With the largest education system in the world, China issued the Opinions on Accelerating the Reform and Development of Graduate Education in the New Era in September 2020, jointly released by the Ministry of Education, the National Development and Reform Commission, and the Ministry of Finance. This document mandates training institutions to increase investment in graduate education in accordance with national regulations, coordinating resources such as fiscal funding, research grants, tuition revenue, and social donations to ensure support for graduate teaching, research, and financial aid (Ministry of Education, National Development and Reform Commission, & Ministry of Finance. (2020)). However, resources required for research projects—such as experimental equipment, research funding, and data—are unevenly distributed across disciplines and projects. Popular disciplines or key projects often receive ample resource support, while other disciplines or less prominent projects face resource shortages. This limits the ability of graduate students involved in under-resourced projects to fully exercise their innovation capabilities and engage in effective practical exploration. It is suggested to strictly control the quality and quantity of resource inputs, establish a scientific, rational, and efficient quality evaluation mechanism, continuously optimize the internal and external environments and foundational conditions for graduate education, and promote a scientifically sound, efficient, and transparent resource allocation system to support China's transition from a major graduate education nation to a global leader (Li & Chen, 2021).

1.3 Inappropriate Project Topic Selection

Selecting appropriate research topics is a prerequisite for successful project applications. Inspiration often stems from real-world practice, and effective topic selection is closely tied to practical experience. Mentors should not only teach students fundamental research skills but also inspire their research creativity through daily work and teaching. Currently, some research project topics are outdated, lacking innovation and cutting-edge relevance, making it difficult for graduate students to cultivate innovation awareness during participation. Additionally, some topics are disconnected from practical needs, overly focused on theoretical research, which prevents students from applying their knowledge to real-world applications, thus reducing the effectiveness of practical ability development. Furthermore, the difficulty level of topics is often poorly calibrated—either too simple, failing to challenge students, or too complex, exceeding their capabilities, which hinders meaningful progress in projects.

1.4 Imperfect Assessment and Evaluation Systems

The cultivation of graduate students' innovation capabilities is a critical component of graduate education, and evaluating their research output is a common method for assessing their scientific research and practical innovation abilities. However, current assessment systems for graduate students'

participation in research projects often emphasize the quantity of research outputs, such as the number of published papers or patent applications, while insufficiently evaluating innovation awareness and practical abilities. This output-centric evaluation approach may lead students to prioritize quantity over the development of innovative thinking and practical skills. Research indicates that graduate students' research and innovation capabilities vary and require further improvement. Factors such as individual attributes, mentor guidance, curriculum design, and institutional support all significantly influence the evaluation of graduate students' innovation capabilities, with individual factors having the greatest impact, a finding that has passed robustness tests. Further studies reveal heterogeneity in the impact of gender, graduate program type, and institution type on students' research and innovation capabilities (Zhao & Liu, 2023). Additionally, the evaluation process often lacks dynamic tracking and assessment of students' performance during project implementation, making it difficult to identify and address issues in their innovation and practical processes in a timely manner.

2. The Importance of Research Project-Driven Cultivation of Graduate Students' Innovation Awareness and Practical Abilities

In recent years, China's annual investment in scientific and technological research and development has exceeded one trillion yuan, with most funding allocated through research projects. As the backbone of national scientific research and technological development, university faculty, particularly graduate student mentors, undertake the majority of these projects. Graduate students, as a reserve force for national technological innovation, have the responsibility and obligation to play a more significant role in these projects. Moreover, active participation in research projects significantly contributes to the development of students' foundational research skills and innovation capabilities (Chen & Zhang, 2021). Research projects typically focus on cutting-edge disciplinary issues or practical challenges, allowing graduate students to engage with the latest research trends and ideas. Solving project-related problems requires continuous thinking and exploration of new methods and approaches, thereby fostering innovation awareness. For instance, in interdisciplinary research projects, students must integrate knowledge from different fields, which often sparks new innovative ideas.

Research projects serve as a bridge between theoretical knowledge and practical application. During project execution, graduate students engage in experimental design, data collection and analysis, and model construction, among other practical activities. Through these activities, students can translate theoretical knowledge into practical problem-solving skills, enhancing their practical abilities. Many research projects are large-scale and require close collaboration with mentors and team members. In this collaborative process, students learn to listen to others' opinions, leverage their strengths, and collectively address challenges. Communication and interaction with team members and other researchers broaden their academic perspectives and enhance their communication and teamwork skills, which are equally essential for innovative practical activities.

3. Strategies for Building a Research Project-Driven Model for Cultivating Graduate Students' Innovation Awareness and Practical Abilities

3.1 Optimizing Project Topic Selection

Innovation is the cornerstone of scientific research and the starting point of research activities (Liu, 2019). First, emphasis should be placed on innovation and cutting-edge relevance. Mentors should stay informed about disciplinary frontiers and societal needs, guiding students to select innovative and forward-looking topics. Encouraging participation in interdisciplinary project topics can break down disciplinary barriers, promote knowledge integration, and create more opportunities for innovation.

Second, topics should align with practical needs, enabling students to apply theoretical knowledge to real-world problems and enhance their practical abilities. For example, engineering disciplines could select topics based on industry demands, while humanities and social sciences could focus on pressing societal issues.

Third, topic difficulty should be appropriately calibrated based on students' knowledge reserves and abilities. For lower-year graduate students, moderately challenging projects can serve as an entry point to build experience and skills gradually. For senior students, more complex topics can be introduced to challenge them with higher-level innovation tasks.

3.2 Strengthening Mentorship Guidance

Graduate students are independent individuals with their own ideas and creativity. They are the primary agents of innovation, and their interests should be respected rather than suppressed under the guise of "for their own good." Interest is the best teacher, and when interest is lacking, it should be nurtured. Universities and mentors should fully respect students' agency in education, providing opportunities for autonomy and creativity, harmonizing mentors' guidance with students' initiative to foster divergent thinking and achieve positive educational outcomes (Yang, 2022). First, mentors' time and energy for guidance should be enhanced. Universities should rationally allocate mentors' research and administrative responsibilities to ensure sufficient time for student guidance. A quality supervision mechanism for mentorship should be established, with regular evaluations to ensure mentors fulfill their responsibilities.

Second, mentors should adopt modern guidance approaches, emphasizing the cultivation of students' innovative thinking and independent learning abilities. Inspirational and discussion-based methods should be used to encourage students to propose their own ideas, think independently, and solve problems. Additionally, mentors should regularly organize academic discussions to broaden students' academic perspectives.

3.3 Rational Resource Allocation

With the rapid development of artificial intelligence, education informatization has entered the 2.0 era, transforming talent education models and giving rise to smart campuses. This necessitates the thorough implementation of rational resource allocation in universities (Zhou & Li, 2023). First, universities and research institutions should establish scientific and equitable resource allocation mechanisms,

distributing resources fairly based on disciplinary needs, project significance, and the number of participating graduate students. Projects with high innovation potential, especially interdisciplinary ones, should receive appropriate resource prioritization.

Second, resource acquisition channels should be expanded. Graduate students should be encouraged to participate in industry-academia-research collaboration projects to secure additional resources from enterprises and external institutions. Universities and research institutions should also strengthen collaborations with domestic and international research entities to share resources such as experimental equipment and data, providing broader platforms for students' research activities.

3.4 Improving Assessment and Evaluation Systems

A diversified evaluation system should be established, focusing on innovation awareness and practical abilities. Beyond the quantity of research outputs, assessments should evaluate students' innovative thinking, practical skills, teamwork capabilities, and ability to address real-world problems. For instance, evaluations could assess the originality of students' research ideas, experimental designs, and data analyses, as well as their hands-on abilities and practical outcomes during project implementation. Mentors should view students as individuals in a developmental process, conducting dynamic tracking and evaluation of their project participation. Regular progress checks should identify issues promptly and provide guidance. A research project portfolio for each student should be maintained, documenting their performance at various stages as a key basis for final evaluations. Additionally, timely feedback should be provided to help students recognize their strengths and weaknesses in innovation and practice, enabling them to adjust their learning and research strategies accordingly.

4. Conclusion

Cultivating graduate students' innovation awareness and practical abilities through research projects is a critical approach to improving the quality of graduate education. Despite challenges such as insufficient mentorship guidance, uneven resource allocation, inappropriate project topic selection, and imperfect assessment systems, strategies such as optimizing topic selection, strengthening mentorship, rationalizing resource allocation, and improving evaluation systems can establish a more scientific and effective cultivation model. As higher education reforms deepen, further research and practice should focus on refining research project-driven models for cultivating graduate students' innovation awareness and practical abilities, continuously exploring innovative approaches to lay a solid foundation for training high-level, innovative talent that meets societal demands.

References

- Chen, M., & Zhang, R. (2021). The Role of Research Projects in Cultivating Graduate Students' Innovation Capabilities. *Science and Technology Management Research*, 41(6), 88-94.
- Li, X., & Chen, H. (2021). Resource Allocation Efficiency in Graduate Education: Challenges and Strategies. *Educational Research*, 42(3), 15-22.

- Liu, X. (2019). Innovation as the Starting Point of Scientific Research. *China Higher Education Research*, 40(4), 33-38.
- Ministry of Education of the People's Republic of China. (2023). *National Statistical Report on Education Development*.
- Ministry of Education, National Development and Reform Commission, & Ministry of Finance. (2020). *Opinions on Accelerating the Reform and Development of Graduate Education in the New Era*.
- Wang, J. (2020). The Role of Mentors in Inspiring Graduate Students' Research Creativity. *Modern Education Management*, 36(7), 45-50.
- Yang, F. (2022). Respecting Graduate Students' Agency in Education: A Path to Innovation. *Educational Theory and Practice*, 42(8), 56-61.
- Zhang, L., & Wang, Y. (2022). Research on the Quality Assurance Mechanism for Professional Degree Graduate Mentors. *Journal of Higher Education Research*, 43(5), 23-30.
- Zhao, Q., & Liu, T. (2023). Factors Influencing Graduate Students' Research and Innovation Capabilities: An Empirical Study. *Journal of Graduate Education*, 39(2), 12-19.
- Zhou, S., & Li, D. (2023). Resource Allocation in the Era of Education Informatization 2.0. *Journal of Educational Technology*, 39(1), 29-35.