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# Exploration of the Education and Teaching Mode for Professional Master's Students in Electronic Information

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**Abstract:** Postgraduate education is a higher-level stage in higher education. This paper discusses the problems and solutions in the education and teaching training of professional master's students in electronic information from the perspectives of the reform of the curriculum, ideological and political education mode, the exploration of training approaches balancing professional practice and scientific research, and the collaborative mechanism for the reconstruction of tutors' roles and improvement of their abilities.

**Keywords:** Postgraduate education; Curriculum, ideological and politics; Education and teaching reform

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## 1. Introduction

Postgraduate education represents a higher stage of higher education, bearing the important responsibility of cultivating high-quality, high-level creative talents for the country's modernization drive [1]. Under the new situation of continuous expansion in postgraduate enrollment, ensuring the quality of talent cultivation has become a core issue in the high-quality development of higher education.

Currently, various educational institutions are building a full-cycle quality assurance system [2]. On one hand, they strive to improve internal quality assurance mechanisms, forming a closed-loop management system through measures such as optimizing training program design, strengthening process-based assessment, and establishing dynamic systems for student selection and elimination [3]. On the other hand, they continue to enhance external supervision systems. In accordance with the requirements of the Overall Plan for Deepening the Reform of Educational Evaluation in the New Era, innovative regulatory measures are being implemented, including the promotion of double-blind review systems, strengthening the quality monitoring of dissertations, and establishing academic integrity archives [4]. This paper takes the construction of a postgraduate education quality assurance system in the context of the popularization of higher education as its research starting point, focusing on the field of postgraduate education in electronic information-related majors. By systematically analyzing the structural

contradictions and practical dilemmas in the current training system, it explores key issues such as the reform of the "curriculum-based ideological and political education" model, the exploration of training approaches balancing professional practice and scientific research, and the collaborative mechanism for the reconstruction and capacity improvement of supervisors. The aim is to provide theoretical references and practical paths for the cultivation of outstanding engineers in the new era.

## 2. Problems in the education and teaching of professional master's students in electronic information-related majors

### 2.1. Practical dilemmas in the collaborative education of "Ideological and Political Education in Courses" and "Ideological and Political Courses"

Postgraduate education, as the core carrier of the national strategy for innovative talents, shoulders the era's mission of cultivating virtuous and talented socialist builders and successors. Currently, the reform of ideological and political education in courses is faced with three practical dilemmas: Firstly, there is a structural contradiction between value guidance and knowledge imparting. Some teachers cannot transform political discourse into professional discourse, making it difficult to organically embed core socialist values into complex algorithmic deductions or engineering ethics analysis. Secondly, the mechanical superposition of ideological and political elements with course content leads to alienation phenomena such as "labeling" and "patchwork". Thirdly, the imbalance between teaching logic and cognitive laws causes a breakdown in students' acceptance chain of "value cognition-emotional identification-practical consciousness". These problems not only weaken the teaching effectiveness of professional courses, but also may lead to the suspension risk of the collaborative education goal of "ideological and political education in courses" and "ideological and political courses" [5]. It is urgent to carry out systematic reforms from the dimensions of educational goal reconstruction and teaching design innovation.

### 2.2. Balancing professional practice and research achievements for professional master's degree students

Against the backdrop of the continuous expansion of postgraduate education in China, the scale of cultivation for engineering-oriented professional master's degrees has shown a significant growth trend. Different from academic degrees, this professional category features a distinct engineering orientation, practical innovation, and technical application in its training positioning, and the reform of its training model has become a key issue in higher education. Taking the three-year training cycle as an example, the current training programs generally adopt a phased structure of "1 year of theoretical courses + 1 year of professional practice + 1 year of dissertation writing". It is worth noting that although the National Engineering Professional Degree Graduate Education Steering Committee clearly requires that dissertation research should be organically integrated with professional practice, there are still significant deviations in specific implementation. This structural contradiction has led to two typical dilemmas: on the one hand, excessive emphasis on laboratory research weakens the cultivation of engineering practice capabilities; on the other hand, too much energy is invested in industrial practice, which squeezes the time for dissertation research, resulting in insufficient workload or lack of innovation in dissertations. Particularly noteworthy is that under the background of the "breaking the five-only" reform, some universities still maintain rigid requirements on postgraduates' academic achievements. This institutional requirement, conflicting with the time allocation in the training process, has become a key constraint affecting the training quality of engineering master's students. A direct reflection of this is that in recent years, the blind review

failure rate of engineering master's theses has been slightly higher than that of academic master's theses.

### 2.3. The construction of the supervisor team has a long way to go

Postgraduate supervisors, as the primary responsible subjects for postgraduate training quality, have a decisive impact on the academic growth of postgraduates. With the acceleration of the popularization of higher education, the scale of the supervisor team has expanded significantly. There is a significant alienation tendency in the current supervisor selection mechanism: the selection criteria rely on explicit quantitative indicators such as research performance (e.g., output of SCI/SSCI papers, funds for vertical projects), while lacking systematic evaluation of qualitative factors such as teaching competence, effectiveness of teacher-student interaction, and developmental guidance for students [6]. There is a gap in guidance experience among new supervisors, and some supervisors have not yet completed the role transformation from researchers to educators, which is specifically manifested in shortcomings such as vague planning of training paths, fragmented process guidance, and lack of mechanisms for cultivating innovative capabilities.

A deeper institutional contradiction stems from the instrumental rationality orientation of the academic evaluation system. Under the current teacher title evaluation system, most domestic universities take research output as the core promotion indicator, leading to the phenomenon among supervisors of alienating postgraduate training into a tool for transforming research achievements. This guiding tendency is specifically characterized by: over-emphasizing the output of high-level papers while ignoring the construction of academic thinking; adopting a pressure-transmission management model, simply decomposing research KPIs to individual students, while paying little attention to students' career development needs and mental health status [7]. A small number of supervisors are deficient in cross-cultural communication skills and emotional support techniques, which may make it difficult to build a teacher-student academic community and may induce conflicts between supervisors and students.

## 3. Reform ideas for the education and teaching model of professional master's students in electronic information

### 3.1. Reform of the curriculum ideological and political education model

Under the background of higher education reform in the new era, the organic integration of professional courses and ideological and political education has become a key proposition for implementing the fundamental task of fostering virtue through education. A dynamic balance mechanism between professional knowledge and ideological and political content can be constructed from the following aspects:

#### 3.1.1. Reconstruction of educational goals

With "fostering virtue through education" as the core, a dual-helix goal system of "professional ability + family and country feelings" is built to deeply integrate value guidance with knowledge imparting [8]. Through the path of content reconstruction, a three-level ideological and political mapping framework of "concept-principle-application" is established: systematically exploring Marxist standpoints, viewpoints, and methods within the professional knowledge system [9]. For example, in the postgraduate course "Machine Learning", taking the cultivation of the "spirit of exploration" as a case, efforts are made from both ideological and practical aspects. Through the idea of algorithm iteration, students are guided to establish the concept of striving for excellence. Relying on projects such as data-driven industrial intelligence in "Made in China 2025", students' spirit of

exploration is cultivated [10].

### 3.1.2. Innovation in teaching design

A three-stage progressive model of "knowledge acquisition-value internalization-practical innovation" is constructed [11]. For instance, in electronic information majors, through teaching the development history of 5G technology, students are guided to understand the strategic significance of independent and controllable key technologies; by learning knowledge about various recommendation algorithms and data mining-related algorithms, students are guided to think about the benefits brought by the continuous improvement of artificial intelligence recommendation algorithms and the threats such as data privacy and security, based on the phenomenon that shopping platforms and short video platforms can infer the items or videos that users may be interested in through the click rate of items or the types of videos liked and collected. An innovative problem-oriented teaching model is adopted to transform practical issues, such as tackling "bottleneck" technologies, into teaching cases, to cultivate students' feelings for their country while solving engineering problems [12]. For example, through the dispute over the source of Huawei's chip technology, students can learn that China has improved chip manufacturing processes through continuous high-intensity technological research and development and investment, avoiding the situation where foreign countries contain the iterative upgrading of China's high-tech industry. This enables students to understand the correctness of China's adherence to the strategy of building a strong country through science and technology, and establish the awareness of continuously improving technological research and development capabilities and achieving self-reliance and self-improvement in science and technology. Another example is the invasion of the space elevator in the movie The Wandering Earth 2, which introduces issues such as network security and information security that the country attaches great importance to, helping students realize that the security of critical information infrastructure is directly related to national security. Given that current artificial intelligence is becoming increasingly advanced, network security threats and risks are prominent, guiding students to establish a correct concept of network security.

## 3.2. Exploration of training approaches for balancing professional practice and scientific research

### 3.2.1. Optimizing the training system

Reconstruct literacy indicators to resolve structural contradictions in engineering education and achieve in-depth integration of industry and education. Through value-oriented literacy anchoring, precisely deconstructed capability maps, and data-driven dynamic adjustment, a new training ecosystem of "value shaping-capability development-continuous evolution" is built. Value orientation establishes a coordinate system for core literacy, focusing on three key aspects: "degree of anchoring to family and country feelings", "degree of internalization of scientific and technological ethics", and "degree of contribution to innovative breakthroughs". It translates the goal of fostering virtue through education into industry-urgently-needed qualities such as "sense of responsibility for carbon peak", "spirit of tackling challenges in new power systems", etc. Deconstructing the elements of technological innovation capability to generate a literacy map, a stepped capability chain of "basic ability-advanced ability-breakthrough ability" is constructed, forming a visual model of capability growth trajectory [13]. Through intelligent investigation and response to industry needs, tracking and analyzing the growth and development patterns of graduates, an adaptive iteration mechanism is established to realize a qualitative upgrade from knowledge-memorizing talents to literacy-generating talents.

### 3.2.2. Optimizing the curriculum system

Construct a three-level curriculum system of "basic theory-technical application-engineering practice". Compress the traditional 1-year theoretical courses to 0.5 years, and add 0.5 years of courses on disciplinary frontiers, academic seminars, and disciplinary practice. Under the guidance of supervisors (teams), graduate students are introduced to cutting-edge technologies in fields related to their research topics, guiding them to seek intersections through extensive exposure, stimulating their interest in scientific research. Through disciplinary practice, supervisors set up enterprise horizontal projects or self-selected topics for application project practice, laying the groundwork for entering research and engineering applications.

### 3.2.3. Reforming the evaluation mechanism for scientific research achievements and thesis

Allow high-level national innovation and entrepreneurship competition awards (such as "Internet+" or "Challenge Cup"), patent authorization (utility model or above), industry standard formulation, and solutions to major engineering problems to replace the requirements for traditional scientific research papers; improve the thesis evaluation system. Measure the completion of engineering master's theses through quantitative evaluation of process documents such as professional practice logs, technical iteration reports, and customer demand analysis, as well as enterprise practice satisfaction and project completion, to increase the blind review pass rate.

### 3.2.4. Optimizing the school-enterprise collaborative training mechanism

Build a school-enterprise collaborative education mechanism with in-depth integration of industry, academia, and research. By integrating enterprises' high-quality technical resources and educational elements, jointly construct a cluster of research topics with theoretical innovation value and engineering transformation potential, forming a positive interaction pattern between knowledge production and application transformation [14]. In this process, enterprises need to break through traditional cognitive frameworks and deeply understand the particularity of graduate training compared with undergraduate practical teaching. Its essence is to build an innovation ecosystem based on complex engineering scenarios, rather than skill-oriented job adaptability training. A development model for graduate students' engineering innovation capabilities should be established, focusing on cultivating their technical foresight, system optimization, and interdisciplinary solution design capabilities, avoiding simplifying high-end talent training into a "project intern" training model at the technical operation level.

For graduate students themselves, it is necessary to systematically strengthen scientific research methodology training, including but not limited to the ability of critical literature analysis, experimental design paradigm transformation, and independent planning of technical routes. By establishing university-enterprise joint laboratories and implementing a dual-tutor system, postgraduates are guided to proactively develop a bidirectional transformation mindset between "theory and practice", enabling the dynamic reconstruction of their knowledge graphs in the process of solving real engineering problems. Through the spiral improvement of "academic research-industrial application", improve the talent training paradigm of industry-education integration, and more substantially enhance graduates' competitiveness in career development.

## 3.3. Research on the collaborative mechanism for the reconstruction of tutor roles and capacity enhancement

As the core leaders in the academic growth process of postgraduates, the educational effectiveness of postgraduate tutors is mainly reflected in two dimensions: demonstration effect and guidance strategies. In the process of talent cultivation, tutors should strive to cultivate postgraduates' awareness of independent inquiry and

critical thinking ability through academic demonstration and value guidance, enabling them to deeply understand the survival principle in the era of knowledge economy that "only by being brave in exploring, thinking, and learning new knowledge throughout life can one achieve lifelong employment"[15].

In specific guidance practices, tutors should construct diversified guidance paradigms, including but not limited to academic lectures, subject seminars, and personalized guidance. They should adopt heuristic teaching strategies to guide students to complete the entire research chain of "problem discovery-scheme construction-practice verification". The frequency and depth of guidance should follow the "demand-oriented principle". For the phased confusion encountered by postgraduates in such dimensions as academic development, scientific research training, and career planning, tutors should intervene in a timely manner and provide systematic solutions.

To achieve the continuous optimization of the professional literacy of the tutor team, it is necessary to build a normalized and institutionalized academic exchange system. Relying on carriers such as international academic conferences, frontier discipline forums, and thematic research workshops, it can drive the iterative update of tutors' academic cognitive systems and the systematic improvement of their guidance effectiveness. On this basis, a systematic support framework for tutor development should be planned. Through a three-level linkage mechanism of pre-service standardized training, modular thematic studies, and periodic continuing education, emphasis should be placed on strengthening their professional development in key literacy dimensions such as awareness of scientific research ethics and norms, innovation in guidance paradigms, and interdisciplinary dialogue ability.

By establishing a multi-dimensional comprehensive evaluation mechanism, academic achievements, talent cultivation quality, and the construction of teachers' ethics and conduct are quantified into parameters. A tutor evaluation and feedback system is set up to form a closed-loop management model of "evaluation-feedback-improvement". This ensures the collaborative development of the tutor team in such dimensions as academic leadership, educational innovation ability, and moral appeal, and ultimately achieves the sustainable development goal of high-quality construction of the teaching staff.

## 4. Conclusion

The reform of postgraduate education and teaching is a multi-dimensional and collaborative systematic project. This paper explores three aspects: the transformation of the ideological and political education model in courses, the exploration of training approaches balancing professional practice and scientific research, and the collaborative mechanism for the reconstruction and capacity improvement of supervisors. It aims to promote an education model where professional cognition and ideological and political education resonate in harmony, strive to embed elements of value shaping in the process of knowledge construction, form a three-in-one training system integrating academic ability, engineering ethics, and patriotism, and realize the collaborative cultivation of postgraduates' academic interests, innovative capabilities, and practical literacy.

## Disclosure statement

The author declares no conflict of interest.

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