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# *Research on the Cultivation of Postgraduate Academic Practice Ability Driven by the Closed Loop of "Theory-Practice-Feedback"*

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***Abstract:*** This paper explores the optimization of the "Postgraduate Academic Practice" course, focusing on the integration of theoretical knowledge with practical application. The current teaching framework faces significant challenges, including a fragmented theoretical structure and an evaluation system that overly emphasizes final results at the expense of the learning process. To address these issues, we propose a "theory-practice-feedback" loop system that systematically reconstructs theoretical teaching, innovates practical instruction, establishes a comprehensive evaluation framework, and enhances feedback mechanisms. These proposed changes aim to cultivate students' research capabilities, innovative thinking, and comprehensive problem-solving skills. By implementing a multidimensional evaluation system that includes self-assessment, peer evaluation, and expert feedback, we ensure a holistic measurement of students' growth. The establishment of a continuous feedback mechanism facilitates real-time adjustments to course content, thereby enhancing student engagement and satisfaction. Ultimately, this course plays a pivotal role in postgraduate education, fostering high-level professionals who possess both a solid theoretical foundation and practical skills.

## 1. Introduction

Postgraduate education, as a vital component of the higher education system, plays a crucial role in cultivating high-level professionals for society [1,2]. Its core objectives extend beyond deepening students' understanding of specialized knowledge to fostering their independent research spirit, innovative thinking, and comprehensive problem-solving abilities. In today’s globalized and knowledge-driven economy, the quality and effectiveness of postgraduate education are directly linked to a nation's research innovation capacity and international competitiveness [3]. Therefore, effectively cultivating postgraduates with solid theoretical foundations, practical innovation skills, and global perspectives has become a key focus of educational research.

Within this context, the "Postgraduate Academic Practice" curriculum in the master's program

for Mechanical Engineering at the University of Shanghai for Science and Technology has garnered significant attention for its unique practice-oriented approach. This course emphasizes the close integration of theoretical learning with practical application, providing students with a platform to apply their knowledge in real-world situations while simultaneously focusing on both academic and practical competencies. It embodies a high degree of interdisciplinarity and experiential learning. Through this course, students are able to connect theoretical knowledge with research practice, honing their hands-on skills and innovative thinking, which are crucial for developing their research capabilities and comprehensive abilities.

However, despite the course's achievements in enhancing practical skills, several issues remain in the current teaching process. First, the organization of theoretical content lacks coherence and systematic structure, making it difficult for students to develop a comprehensive and integrated knowledge framework. This fragmentation hampers the effective application of theory in practical tasks. Furthermore, the current evaluation system for assessing the effectiveness of practical teaching is underdeveloped, focusing heavily on the final results rather than the learning process. This makes it difficult to fully and accurately assess students' progress, particularly in the development of innovative thinking and research abilities. Establishing a scientific and reasonable evaluation mechanism to holistically measure students' learning outcomes remains a significant challenge in postgraduate course design.

This paper aims to optimize the design and implementation of the "Postgraduate Academic Practice" course to address existing challenges and improve overall teaching quality. Firstly, by restructuring the theoretical framework to enhance the coherence and comprehensiveness of the knowledge system, it ensures the close integration of theory and practice. Additionally, it explores the establishment of a scientific and reasonable evaluation mechanism for assessing the effectiveness of practical teaching, providing a comprehensive and objective evaluation of students' learning outcomes. This will lay a solid foundation for cultivating high-level talent with a strong theoretical foundation and outstanding practical abilities.

## 2. Measures for the "Theory-Practice-Feedback" Loop

This paper develops a "theory-practice-feedback" loop system by focusing on four key aspects: reconstructing theoretical teaching, innovating practical teaching, establishing an evaluation system, and enhancing teaching feedback. The aim is to improve the academic and practical abilities of postgraduate students and cultivate talent with a strong theoretical foundation and innovative practical skills.

### 2.1. Systematic Reconstruction of Theoretical Teaching

#### 2.1.1. Problems in Current Theoretical Teaching

In the current "Postgraduate Academic Practice" curriculum, theoretical teaching often exhibits a tendency towards fragmentation, lacking systematic coherence. This teaching approach makes it difficult for students to connect the knowledge they acquire into a complete framework, leading to insufficient understanding of core theories. Particularly in the research process, students struggle to effectively utilize scattered theoretical knowledge to solve complex practical problems, which limits their ability to translate theoretical insights into practical skills.

Specifically, the teaching of key research skills such as literature retrieval, paper writing, manuscript submission, and academic reporting is relatively disjointed, lacking a systematic process. This results in students often feeling lost when faced with these aspects of actual research. Inadequate literature retrieval skills prevent students from timely accessing cutting-edge findings in

their research areas, while irregularities in paper writing and submission skills affect their ability to communicate effectively in the academic community. Furthermore, insufficient training in academic reporting restricts students' capacity to convey their research findings accurately in public settings. These issues not only weaken students' research capabilities but also diminish the overall effectiveness of the teaching process.

### 2.1.2. Reconstruction Goal and Method

To address these issues, this paper proposes a systematic restructuring of theoretical teaching in postgraduate education. The course design should prioritize the coherence and comprehensiveness of the knowledge system by integrating scattered teaching content to form a systematic theoretical framework. This approach not only helps students establish connections between different knowledge points but also enhances their ability to apply theory to practical research.

For core research skills such as literature retrieval, paper writing, manuscript submission, and academic reporting, it is essential to leverage existing library resources and optimize the teaching content. For instance, in literature retrieval, advanced search tools and techniques can guide students in efficiently obtaining high-quality academic resources. In paper writing, the focus should be on developing structured and standardized writing skills, helping students master the format, structure, and academic norms of scientific papers. The teaching of manuscript submission should cover practical aspects, including journal selection, submission processes, and review feedback, to improve students' success rates in publishing papers. Furthermore, academic reporting should be restructured to enhance students' academic communication skills. By organizing simulated presentations and academic seminars, students can repeatedly practice in real scenarios, improving their academic expression abilities. For instructors, course design should emphasize interaction and feedback to help students enhance their critical thinking and expression skills during academic exchanges.

### 2.1.3. Effects of Reconstruction

Through the restructuring of theoretical teaching, students' core skills in research have significantly improved. Systematic theoretical instruction helps students establish a clear knowledge framework, while a structured learning approach directly enhances their research efficiency.

Improvements in literature retrieval teaching assist students in quickly and efficiently locating relevant studies, reduce the time needed for topic selection, and ensure a solid research foundation. By strengthening skills in paper writing and submission, students' research outcomes are more likely to be accepted and recognized in the academic community, thereby increasing both the quantity and quality of their publications. Enhanced academic reporting abilities benefit students' performances at academic conferences and public presentations and bolster their competitiveness on the international academic stage.

These improvements will ultimately enhance postgraduate students' performance and innovative capabilities in the academic field while also strengthening the quality of theoretical instruction, providing robust support for subsequent practical teaching.

## 2.2. Innovative Development of Practical Teaching

### 2.2.1. The Importance of Practical Teaching

Practical teaching is an indispensable part of the postgraduate curriculum, serving not only as a verification and extension of theoretical knowledge but also as a crucial component for students to apply what they have learned to real research work [4]. During practical instruction, students face

complex problems and challenges in their fields, which helps cultivate their problem-solving abilities and significantly enhances their innovative thinking and independent reasoning skills. Moreover, it allows students to think through and resolve issues in a more open and authentic environment, which is vital for their future independent research projects and innovative studies [5]. Additionally, practical teaching provides opportunities for collaboration and communication; by completing projects in teams, students can learn from each other, complement one another's strengths, and not only develop their teamwork skills but also enhance their interpersonal communication and coordination abilities.

### 2.2.2. Development Path of Practical Teaching

To better harness the role of practical teaching, this paper proposes the development of innovative practical teaching models to enhance students' research capabilities. In line with the trends in the field of mechanical engineering, the design of practical teaching should closely align with current cutting-edge topics, integrating students' interests and abilities to stimulate their innovative potential. Specifically, the development path for practical teaching includes the following aspects:

First, emphasis on teamwork and topic selection. Practical teaching is conducted in groups, allowing students to collaborate on research as a team. Team members can choose topics based on their interests, backgrounds, and abilities, and advance their projects through collaborative discussions and role assignments. This team approach not only fosters a spirit of cooperation among students but also simulates the operation of real research teams, enhancing their organizational and management skills.

Second, strengthening the training in literature reviews. Research topics in practical teaching should be grounded in literature reviews, requiring students to identify their research direction based on an in-depth analysis of cutting-edge research in relevant fields. This not only helps students build an academic background but also enables them to discover problems and research gaps through literature analysis, guiding subsequent experimental design and research implementation.

Finally, focusing on academic reporting and communication. During practical teaching, students should present their literature review progress and innovative thinking. Through oral presentations and academic discussions, students can improve their expression and communication skills while refining their research summaries based on feedback from others. The formats for academic reporting can include group discussions and classroom presentations, with open discussion models stimulating students' critical thinking and creativity, encouraging them to continuously reflect on and optimize their research work.

## 2.3. Comprehensive Construction of Evaluation System

### 2.3.1. The Shortcomings of the Current Assessment System

In the current postgraduate education system, assessments often place excessive emphasis on students' final results while neglecting a comprehensive evaluation of the entire process. While this assessment method can measure students' research output at specific points in time, it fails to reflect their growth and development throughout the research process [6]. Results-oriented evaluations may lead students to prioritize high scores over the innovation and exploration inherent in research, which not only limits their academic potential but also adversely affects the cultivation of genuinely capable researchers with innovative thinking. Furthermore, the current assessment system often overlooks the development of students' soft skills, such as teamwork, academic communication, and

their autonomy and sense of responsibility in research. Especially in fields requiring interdisciplinary collaboration, evaluation standards frequently do not adequately consider the contributions students make within teams and their personal growth.

### 2.3.2. Construction of a Multi-Dimensional Evaluation System

To address the shortcomings of the current assessment system, it is crucial to establish a comprehensive, multidimensional evaluation framework. This involves introducing an assessment method that combines self-assessment, peer evaluation, teacher assessment, and expert feedback to more thoroughly measure students' overall qualities and research potential in academic practice. A multidimensional evaluation approach not only focuses on students' final results but also emphasizes the innovative thinking, practical skills, teamwork abilities, and problem-solving capabilities they demonstrate throughout the research process.

First, self-assessment serves as an important tool that encourages students to reflect on their strengths and weaknesses in research practice, helping them identify areas for future improvement. By prompting students to actively evaluate their learning processes and research abilities, self-assessment enhances their self-monitoring and autonomous learning awareness. Second, peer evaluation allows students to assess each other's research work, enabling them to learn from one another's strengths and research approaches, thereby improving their personal research skills and teamwork abilities through interaction. Teacher assessments provide targeted feedback from a professional perspective, helping students understand the connections between theory and practice, and identify blind spots and deficiencies in their research. Finally, expert feedback offers students a more specialized and cutting-edge perspective, aiding them in better positioning the innovation and academic value of their research.

By constructing such a multidimensional assessment system, not only can students' comprehensive performance in academic practice be reflected more comprehensively and objectively, but it can also promote continuous improvement and enhancement of their capabilities throughout the research process. Ultimately, this approach aims to cultivate high-quality talents who possess a solid theoretical foundation and innovative practical skills.

## 2.4. Continuous Improvement of Teaching Feedback

### 2.4.1. Establishment of Continuous Improvement Mechanism

The feedback mechanism plays a crucial role in the teaching process, serving not only as a tool for assessing the effectiveness of course implementation but also as a foundation for continuous improvement and optimization of the curriculum. To ensure the effectiveness and sustainability of the feedback mechanism, it is proposed to establish a multi-channel feedback system, primarily utilizing online surveys, classroom feedback, and discussion sessions to regularly collect students' authentic evaluations and suggestions about the course. Online surveys have the advantage of broad coverage and ease of use, allowing all students the opportunity to participate in providing feedback and expressing their views. Classroom feedback can quickly capture students' immediate reactions during the teaching process, helping instructors adjust the pace and focus of their teaching in real time, thereby enhancing interaction. Discussion sessions provide a deeper communication opportunity between students and instructors, allowing for face-to-face discussions to gain a clearer understanding of students' true needs and learning experiences.

Additionally, feedback from these different channels should be systematically organized and analysed, and integrated into the adjustments of teaching design and curriculum planning, creating a positive cycle of dynamic adjustment and optimization. Furthermore, the development and changes

in the discipline should also be reflected in the course design through this feedback mechanism, ensuring that course content remains aligned with the cutting edge of the field and provides students with timely academic and practical guidance.

### 2.4.2. The Effects of Continuous Improvement

Through this multi-channel, multi-level feedback mechanism, course content can be promptly adjusted and optimized in each teaching cycle, better adapting to students' learning needs and the trends in the discipline. The implementation of this mechanism not only increases student satisfaction with their learning but also promotes their engagement with the course. Students can see their suggestions for improvements being realized in the curriculum, which enhances their sense of involvement and responsibility. At the same time, teachers can gain clearer evaluations of teaching effectiveness through the feedback mechanism, helping them identify shortcomings in their instruction and make timely improvements, thus enhancing overall teaching quality.

The continuous improvement of the feedback mechanism also facilitates better integration of theory and practice, ensuring that the theoretical components of course design complement practical teaching. By adjusting based on feedback, practical tasks and theoretical instruction have been more effectively combined, allowing students not only to better understand theoretical knowledge but also to apply it in practice. As the feedback mechanism continues to improve, course design gradually forms a closed-loop system where theory, practice, feedback, and improvement mutually reinforce each other. This closed-loop system not only enhances the effectiveness of the course but also lays a solid foundation for students' long-term development in academic and research fields.

In summary, the introduction and deepening of the continuous feedback and improvement mechanism is not only key to enhancing the quality of postgraduate education but also an important guarantee for cultivating high-level talents with a solid theoretical foundation and innovative practical abilities. This mechanism closely integrates theoretical instruction, practical teaching, and evaluative feedback, forming a closed-loop driven teaching system that provides strong references and insights for future educational reforms.

## 3. Conclusions

The "Postgraduate Academic Practice" course plays a critical role in the development of students' research and practical skills, serving as a cornerstone in the postgraduate curriculum. Through the implementation of a "theory-practice-feedback" loop system, this course facilitates a comprehensive learning experience that effectively integrates theoretical knowledge with hands-on research application. The systemic restructuring of theoretical teaching addresses the fragmented and disjointed approach of traditional methods, creating a cohesive framework that allows students to connect core concepts with real-world research challenges. Practical teaching, enhanced by collaborative team projects and targeted research skills training, enables students to hone their problem-solving abilities and apply theory to practice in meaningful ways.

Moreover, the introduction of a multidimensional evaluation system ensures that students' progress is assessed not only based on their final results but also through a continuous reflection on their growth in critical thinking, creativity, and research competence. This shift towards a more holistic evaluation fosters a deeper engagement with academic practice and nurtures the development of essential soft skills, such as teamwork and communication, which are indispensable in both academic and professional research settings.

By establishing an effective feedback mechanism, the course continuously adapts to the evolving needs of students and the demands of the discipline. This feedback-driven approach ensures that the course remains dynamic and responsive, enabling iterative improvements that align with academic

advancements and the changing landscape of research. Ultimately, the "Postgraduate Academic Practice" course forms a robust closed-loop system of teaching, learning, and evaluation, providing a strong foundation for the cultivation of high-level talents with both theoretical rigor and practical innovation.

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