



# Exploration and Research on Enhancing the Practical Ability of Graduate Students Majoring in Electronic Information under the Background of New Engineering

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## Abstract

At present, the educational concept, education system, and training mode of graduate education in China are in a critical period of reform and innovation. Under the pressure of expanding graduate enrollment and the background of new engineering disciplines, how to strengthen the practical ability of graduate students majoring in electronic information has become an urgent problem to be solved in the development of graduate education. This article mainly discusses the current situation of cultivating practical skills for electronic information graduate students in China and analyzes it, clarifying that practical skills are the core literacy for cultivating electronic information graduate students. A series of innovative measures such as school enterprise cooperation, improvement of evaluation system, and integration of laboratory resources have been proposed to effectively enhance the practical ability of engineering graduate students. Specific implementation steps and routes have been provided in detail, providing effective ways and inspiration for enhancing the practical ability of engineering graduate students.

## Subject Areas

Higher Education Teaching

## Keywords

Graduate Education, Electronic Information Major, Practical Ability

## 1. The Current Situation of Cultivating Practical Abilities of Graduate Students in Electronic Information in China

The teaching and training of graduate students in electronic information is very

different from other disciplines, requiring them to have a solid foundation in theoretical knowledge and systematic expertise in their field, as well as the ability to independently engage in scientific research work [1]. Through the learning and training during the graduate stage, the theoretical level and practical ability of graduate students should be elevated to a higher level on the basis of undergraduate studies, and the combination of theory and practice should be taken to a higher level. Graduates should be able to quickly adapt to the environment, enter roles, possess high practical, innovative, and research and development abilities, and take on important responsibilities in their work after entering society [2]. Therefore, practical teaching and practice are a very important component of the graduate training process.

However, the current situation of practical education for graduate students in electronic information in China is not optimistic, mainly due to the following reasons:

### **1.1. After the Expansion of Graduate Enrollment, There Is a Lack of Hardware Resources**

Since 1999, China's higher education has experienced rapid development and has entered a stage of popularization, as the highest level of graduate education in the higher education structure, it also averages 30% per year Expansion of enrollment at a speed of around [3]. With the expansion of graduate education, the problem of insufficient teaching staff and funding in various training units is becoming more and more prominent, reflected in the development of graduate education. This is reflected in the fact that the content and form of practical teaching cannot keep up with the development of disciplines and the expansion of graduate enrollment, with insufficient equipment and space, which greatly affects the cultivation of practical abilities of graduate students. Due to China's weak economic foundation and limited financial strength, the original high schools have been affected the laboratory and equipment of the school are lacking, and after the expansion of enrollment, the hardware facilities are even more difficult to meet the requirements of cultivating practical abilities of graduate students.

### **1.2. The Outdated Cultivation Concept Has Become an Obstacle to Improving the Practical Ability of Electronic Information Graduate Students**

Cultivating the practical ability of graduate students is essentially to cultivate their innovative, design, and research abilities towards society [4]. At present, the cultivation of practical abilities for graduate students in China is mostly limited to the operational abilities in traditional experimental teaching, satisfied with hands-on operation and theoretical verification models, especially in training units with lower levels of education. This situation is even more serious. The backwardness in training concepts is directly reflected in the training objectives and system of electronic information graduate students, which hinders the sub-

stantial improvement of their practical abilities, and some even remain at the undergraduate level.

### **1.3. A Training System That Emphasizes Theory over Practice**

Graduate students, especially those in electronic information, are mainly trained through theoretical teaching, practical training, and thesis research, among which thesis research also requires practical demonstration. However, currently most graduate training institutions attach great importance to theoretical teaching and thesis research, and have also made clear requirements for these two aspects in the design of the training system, but there are no clear provisions for the practical ability cultivation process.

### **1.4. The Content and Form of the Practical Stage Lag behind the Development of the Discipline**

The practical stage of graduate students should reflect the development of the discipline, be adapted to theoretical teaching, and clearly define the position and role of the practical stage and the goals to be achieved in the training objectives and plans [5]. However, the current situation is worrying. The rapid expansion of the scale of graduate students has made many training units tired of dealing with it, and they have not paid enough attention to the practical aspects of the graduate training process, even ignoring its existence. Therefore, the content and form of the practical stage cannot reflect the development of the discipline, and some even simply repeat and continue the undergraduate experimental teaching content, which fundamentally fails to meet the goals and requirements of the graduate practical stage.

## **2. Practical Ability Is the Core of Cultivating Electronic Information Graduate Students**

The cultivation of graduate students includes the study of basic theories, the cultivation of practical abilities, and the cultivation of comprehensive qualities. The basic theory of graduate students should be a higher theoretical platform built on the foundation of undergraduate studies, which should meet the basic knowledge, professional foundation, and professional knowledge required for graduate education goals. The practical stage is an important component of graduate education, which should run through the entire training process of graduate students, exercising and mastering necessary practical skills, tools, and abilities to engage in scientific research and engineering practice. Due to the engineering practice-oriented nature of electronic information graduate students, it is not only necessary to impart basic theoretical knowledge, but also to cultivate their practical ability, independent work ability, and engineering implementation ability. This does not mean that theoretical knowledge can be ignored. Knowledge is the foundation on which ability depends for survival, and scientific research practice must be supported by a considerable number of foundational

theories. We emphasize the cultivation of practical abilities for graduate students in electronic information, aiming to combine theoretical teaching with practical application, fully tap into the comprehensive potential of students, enhance their practical work and innovation abilities, and ultimately transform science and technology into productivity.

Firstly, the cultivation of practical abilities for graduate students in electronic information reflects the needs of social development. In today's world, technology is developing rapidly, and science is highly differentiated, integrated, and interdisciplinary. A large number of interdisciplinary, horizontal, and edge disciplines have emerged, which require us to cultivate a large number of engineering scholars and researchers with practical abilities. Modern scientific research and technological innovation require graduate students to master modern practical methods and transform scientific research achievements into practical productivity. This ability is a concentrated reflection of a country's competitiveness, and this transformation is based on the engineering implementation ability of high-level scientific research talents. The Ministry of Education's "Several Opinions on Strengthening and Improving Graduate Education" clearly requires that "scientific research practice is the main means of cultivating graduate students' innovation ability, and graduate students in engineering and technology disciplines and disciplines with strong applicability should strengthen the training of practical work ability and social practical ability." Secondly, with the expansion of graduate education scale, the source of graduate students is becoming diversified, many students come from local universities with insufficient practical conditions, and their practical abilities are particularly weak. Taking our school as an example, a considerable proportion of graduates from local normal universities are unable to meet the requirements of electronic information graduate training due to objective conditions, and their practical skills are also difficult to integrate into the overall training process. To ensure the quality of training for this group of students, it is also necessary to strengthen the cultivation of practical abilities for graduate students. Furthermore, strengthening the practical aspects of electronic information graduate training is an important opportunity for the reform of the electronic information graduate training model [6]. The cultivation of practical abilities for electronic information graduate students runs through the entire process of graduate training work. From subject layout, curriculum and experimental teaching, project research to thesis research, this should be the main axis to promote the reform of the training mode: establishing training goals that are oriented towards society and the forefront of scientific development; reform fragmented and inefficient experimental teaching; attracting social resources to participate in the cultivation of graduate practical abilities and expanding new models of graduate ability cultivation; Establish a complete system for cultivating practical abilities. From this, it can be seen that implementing the cultivation of practical abilities for graduate students is an important way to promote the reform of the electronic information graduate training mode and

even the innovation of electronic information graduate education ideas.

### **3. Main Educational and Teaching Problems and Analysis of Their Causes**

In order to better understand the current issues in graduate education and teaching in China, we conducted a questionnaire survey on several universities with qualifications for granting master's degrees. The survey found the following three issues:

#### **3.1. The Scale of Graduate Students Is Expanding, and There Is a Relative Lack of Teaching Staff and Funding**

With the expansion of graduate education scale, the problem of relatively insufficient teaching staff and funding in various training units is becoming more and more prominent, leading to the content and form of practical teaching not keeping up with the development of disciplines and the expansion of graduate enrollment, insufficient equipment, space, and research funding, which greatly restricts the cultivation of practical abilities of graduate students. Due to limited national financial investment, laboratories and equipment in various universities were originally lacking. After the expansion of enrollment, these hardware facilities became even more difficult to fully meet the needs of cultivating practical abilities of graduate students.

#### **3.2. Unreasonable Curriculum System, Emphasizing Theory over Practice**

The cultivation of graduate students in electronic information mainly involves theoretical teaching, practical teaching, and thesis research, among which thesis research also requires practical demonstration. At present, many graduate training units attach great importance to theoretical teaching and thesis research, so in the curriculum design, theoretical courses are set up, but there are fewer practical courses offered, and the regulations for practical ability cultivation are not clear enough; On the other hand, the lack of humanistic courses in the field of electronic information is not conducive to the comprehensive improvement of the quality of master's students.

#### **3.3. The Practical Content and Form Lag behind the Development of the Discipline**

The rapid expansion of the scale of graduate students has made many training units tired of handling their work, and they have not paid enough attention to the practical aspects of the graduate training process, even ignoring its existence. Therefore, the content and form of the practical stage cannot reflect the development of the discipline, and some even simply repeat and continue the undergraduate experimental teaching content, which fundamentally fails to meet the goals and requirements of the graduate practical stage.

## **4. Research on the Training Program for Graduate Practical Ability**

### **4.1. Enterprise Projects Run Through the Training Process of Electronic Information Graduate Students**

According to the ongoing research and development projects or provincial and ministerial scientific research projects undertaken by the enterprise, the post-graduate project design shall be carried out, and progressiveness and applicability shall be considered in the project design [7]. In the process of selecting courses for graduate students, it is necessary to consider the needs of the project, combine the learning and practice of the course, so that graduate students can better and faster integrate into enterprise projects, and shorten the time for adaptation. And during the project execution process, innovative achievements can not only be transformed into the productivity of the enterprise, but also be reflected in the academic field, organically integrating graduate education with the needs of enterprise production.

### **4.2. School Enterprise Cooperation to Jointly Build a Theoretical Course Teaching System for Electronic Information Graduate Students**

Enterprises should participate in the construction of the theoretical teaching system for electronic information graduate students, so that universities can provide targeted training for graduate students in the first year after enrollment, and prepare for enterprise practice [8]. Especially, taking into account the different characteristics and professional backgrounds of each graduate student, it is necessary to design a better theoretical research direction that is tailored to each individual, so as to ensure that electronic information graduate students have a solid grasp of relevant theoretical knowledge and have a certain ability to discover, analyze, and solve problems, laying a solid foundation for practical application in enterprises.

### **4.3. To Establish an Open Laboratory to Support Student Research Practice and Strengthen Scientific Research Training**

In order to solve the problem of insufficient supply of hardware resources caused by enrollment expansion, electronic information colleges can focus on the needs of electronic information teaching, scientific research, and practice, establish open innovation laboratories through cooperation between the government, schools, and large domestic enterprises, break through the previous model of laboratory construction relying on departments, disciplines, and mentors, and strive to achieve open concepts, time, and space A laboratory with the aim of resource openness [9]. Through the construction of open laboratories, the research practice model of using mentors as the unit laboratory has been broken. By leveraging the independent and collaborative research and development tasks of graduate teams in open laboratories, and integrating multiple mentors to par-

ticipate in team guidance, the cross disciplinary faculty of the school has been effectively integrated, breaking the boundaries between majors and disciplines to encourage graduate students [10]. Through self-directed learning, collaborative learning, task driven learning, research-based learning, as well as interdisciplinary cross disciplinary learning and independent innovation practice, supplemented by expert guidance from cross mentors and support from interdisciplinary graduate technical groups, we aim to cultivate graduate students' innovation and social practical ability in comprehensive and interdisciplinary scientific research and social practice.

#### **4.4. To Provide Technical Training, Improve the Curriculum System, and Strengthen the Curriculum of Engineering Technology**

Due to the limitations of the electronic information graduate education system, there is relatively insufficient teaching of new technology courses, especially the introduction and training of engineering technologies and tools that are widely used in current work in enterprises and institutions. Universities or relevant management departments can rely on the technology and equipment resources of innovation laboratories, and invite renowned domestic and foreign experts and technical personnel to conduct a series of short-term training, teaching advanced engineering technology and the theory and application methods of tools in engineering practice at home and abroad, so that electronic information graduate students can learn the technical theory and advanced tools applied by enterprises and institutions in school, At the same time, practical exercises can be conducted in open laboratories, breaking free from the contradiction of practical content falling behind the development of disciplines, and further improving the existing curriculum system of electronic information graduate education.

#### **4.5. To Carry Out Characteristic Academic Activities, Create an Atmosphere of Scientific Research and Innovation, and Guide Students to Explore and Innovate**

By organizing a series of lectures by renowned domestic and foreign experts, academic salons, organizing regional graduate innovation competitions, implementing graduate visiting programs, and participating in domestic and international science and technology competitions, we can fully create an academic atmosphere that integrates humanities, technology, nature, and society, thereby comprehensively improving the comprehensive quality of graduate students and creating a good atmosphere for scientific research practice, Not only does it expand the knowledge base of electronic information graduate students, but it also benefits the cultivation of comprehensive electronic information graduate students and enhances their social adaptability.

#### **4.6. To Strengthen the Evaluation of Practical Ability Cultivation and Increase Guarantee Efforts**

To improve the quality of graduate practical ability cultivation, it is necessary to

monitor, analyze, and evaluate the existing graduate ability cultivation process [11]. Firstly, it is necessary to evaluate the objectives and requirements of the process and results of cultivating graduate practical abilities, identify areas for improvement and entry points, and then analyze the factors that affect the quality of training, explore the causes of problems and possible improvement measures and methods. The cultivation of practical abilities for graduate students in electronic information should run through the entire process of graduate education, and only continuous quality improvement can ensure the comprehensive realization of graduate students' innovative practical abilities.

## 5. Technology Roadmap

As shown in Figure 1, reform measures and content run through the entire process of graduate education, seeking an effective solution to cultivate graduate students' practical innovation ability, combining theoretical knowledge with practice, adapting school training to social needs, enhancing graduate students' ability to solve practical problems, and promoting the comprehensive improvement of graduate quality. In accordance with the overall requirements of the country for graduate education, and the innovation of the training mode for master's students in electronic information, we can carry out work through several aspects such as building open laboratories, offering training courses, conducting brand academic activities, coordinating scientific research and engineering practical ability, and building innovation practice bases.

## 6. Innovative Methods for Graduate Practical Ability Education

### 6.1. To Establish a Practical Course Model

The curriculum should focus on guidance and practicality, rather than just mastering knowledge as the goal. The reform of teaching methods is an important opportunity to promote the reform of the training mode for engineering master's degree. The practical aspect should run through the entire teaching process. Therefore, in course teaching, it is necessary to add operating venues such as

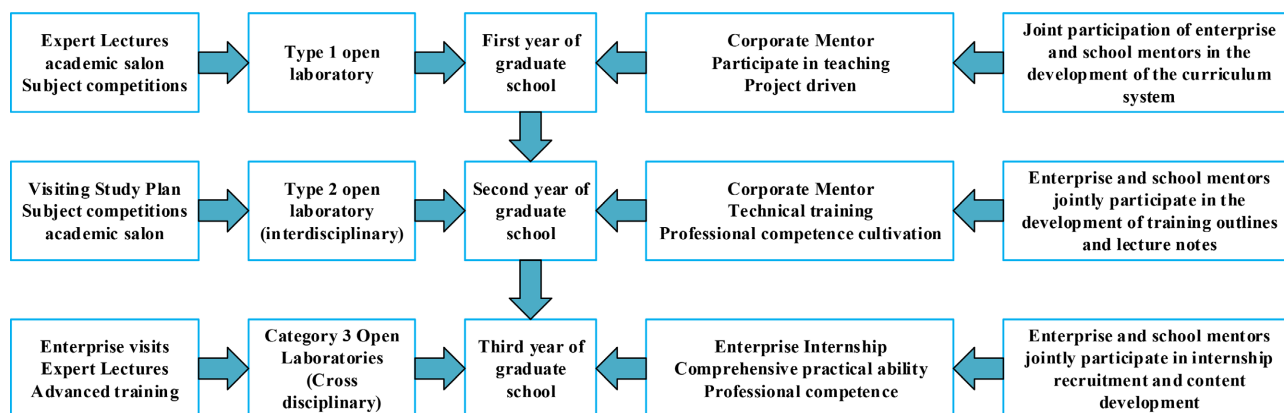


Figure 1. Technical roadmap for improving practical abilities of graduate students majoring in electronic information.



laboratories and experimental platforms, offer classroom experimental operation courses, and increase students' practical experience in school; And on this basis, encourage students to design their own experiments to solve problems based on the curriculum, which is not only beneficial for improving their self-learning ability, but also for cultivating their ability to construct and solve problems.

### **6.2. Building a Diversified Practical Platform**

Engineering practice is an important practical aspect of Master of Engineering, and building a diversified practical platform is an important guarantee for the quality of Master of Engineering training. The knowledge transformation ability of Master of Engineering refers to the ability of Master of Engineering to transform scientific research results into practical production, which is a social oriented ability cultivation. The cooperation between industry, academia, and research is coordinated and promoted by the government, guided by talent cultivation, forming a joint mechanism between higher education institutions, industries, and enterprises, cultivating talents who participate in enterprise economic and technological research and development, and driving comprehensive cooperation between industries, industries, and universities; By focusing on building graduate joint training bases, integrating industry and social resources, improving cooperative training mechanisms, providing students with opportunities for on-the-job practice, and effectively participating in scientific and technological research and innovation. By building a diversified practical platform, a training system of resource sharing and mutual benefit has been formed, which is conducive to improving students' knowledge transformation ability and cultivating suitable talents for regional economic needs.

### **6.3. Establishing a New Concept of Engineering Education**

The rapid development of the new economy requires universities to accelerate the reform of higher engineering education, establish new educational concepts, and meet the demand of society for high-level talents. Among the 12 quality requirements proposed by the Washington Accord for graduates, it not only requires engineering knowledge, but also emphasizes moral ethics and general abilities. Universities, guided by the concept of "big engineering", offer elective courses to promote interdisciplinary integration; Strengthen the organic combination of humanistic and scientific education, focus on shaping the personality of engineers, and clarify the role of industry leaders.

## **7. Conclusion**

In conclusion, measures such as project oriented approach, introduction of school enterprise cooperation, and construction of open laboratories play an important guiding role in the cultivation of practical abilities of master's students in electronic information. Proposing educational innovation methods such as teaching method reform, building diversified practical platforms, and estab-

lishing new engineering education concepts to enhance graduate practical abilities is an exploration and innovation of improving the training program for master's students in electronic information, And through practical testing, it has shown significant results in improving the curriculum system, cultivating scientific research abilities, and ensuring social practice, which is a series of effective ways to improve and innovate graduate training programs.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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