Research on Innovation Ability Cultivation of Engineering Graduate Students Based on the Innovation Platform

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Abstract. Cultivating innovative ability for engineering postgraduates is a big challenge of college education. This paper proposes an optimized postgraduate training pattern based on four aspects: course system, teaching mode, practice and thesis level. The innovative ability of graduate students should be cultivated from all directions according to the market demand for talents. This paper also proposes the system model based on university innovation platform and industry-university-research cooperation pattern, which strengthen the function of projects and market, implement graduate training procedure based on the innovation platform.

Introduction

Innovation promotes the real combination of economic and knowledge. It can also help the sustainable development of society and economy. Research on innovation ability of engineering graduate students is a project that has both theoretical and practical significance. Education on engineering graduate students, as an important component of the graduate education in our country, shoulders the task that cultivating a large number of high-level technical talents.

Literature [1] analyzes the situation of innovation ability of engineering graduate students, puts forward that there are some reasons that cause the lack of innovation ability of engineering graduate students and proposes countermeasures. Literature [2] conducts a series of profound reforms in the aspects of teaching aims, curriculum system and educational method, to form an education atmosphere with the characteristics of innovation. Literature [3] proposes that we must strengthen the basic theories of mathematics of engineering graduate students, and give some suggestions on how to improve graduate student’s mathematical ability. Literature[4] apply TRIZ (теории решения изобретательских задач, TIPS in English (Theory of Inventive Problem Solving)) to practice, which improves the students' abilities of innovation and self-learning.

In recent years, graduate education pays attention to development, while ignores the innovation ability cultivation of the graduate students. In recent years, colleges and universities expand enrollment in large scale, which causes teaching resources in a seriously overload condition in some schools. How to cultivate high-level and creative talents is not only the core of postgraduate education, but also the inevitable trend of teaching reform.

Optimize the Mode of Cultivating Graduate Students

The development of practice ability and innovation ability of the engineering graduate students is a goal in the process of graduate education. Colleges and universities should pay attention to graduate students’ self-learning ability, thinking ability, expression ability and organization ability, in order to improve their innovation ability. At the same time, colleges and universities should lay emphasis on mutual coordination of intelligence factors and non-intelligence factors of graduate students.

Courses System Optimization

Courses should adapt to requirements of engineering graduate students, avoiding repetition and discontinuity of classes. Basic courses teaching quality should be guaranteed. Different majors should set specific courses according to their professional requirements and character of the subject.
When colleges and universities make graduate students to master professional knowledge systematically, they also should strengthen the cross and fusion between different disciplines. Innovation courses should be opened, so as to cultivate students' innovation ability. For graduate students with expertise and special abilities, personalized cultivation and management should be used.

Postgraduate courses should be diversified to cultivate integrated talents. In the construction of curriculum system, we should adhere to the principles of emphasizing basis, reflecting the frontier and comprehensive. We should attach great importance to the guiding, enlightenment of graduate courses, import hot issues, and infiltrate innovation consciousness into teaching.

The content of specialized courses should be selected completely according to the need of subject study. Therefore, increasing the proportion of postgraduate elective courses appropriately can help keeping the dynamics of the curriculum, conveying the latest information of the development of the discipline and promoting the course construction.

**Teaching Mode Reform**

Teaching methods of graduate students should be diversified, fully arouse the enthusiasm of teaching and learning, the teaching process should focus on cultivating the graduate students' research ability, innovation ability and the ability to solve the problem.

The process of teaching requires students to master scientific research methods, the correct way of thinking, and use modern scientific tools to raise, analyze and solve problems.

In the aspect of teaching methods, we should cultivate the students' thinking ability and language competence by adopting the way of finding problems by oneself, group discussion and academic report. We encourage graduate students comprehend problem in their own way, encourage them to think, learn and participate in knowledge construction actively. We should carry out the heuristic teaching, activate the graduate students' self-study consciousness and spirit, and provide them with various thinking ways to treat the knowledge and solve the actual problems, making the teaching a development process that teachers and students discuss and obtain new knowledge together.

The teacher should impart the cutting-edge knowledge and the latest achievements to students promptly. When graduate students master the existing knowledge, they should also make efforts to find new knowledge, to create new theory independently. Teachers are supposed to guide the students to summary and compare the problems they were study, so as to learn how to find new problems and find the breakthrough point to solve the problem, to interpret a new knowledge and conclusions.

Through the fundamental and integrated curriculum, we change the teaching pattern from teachers teaching unilaterally to mutual participation and cooperation between teachers and students, to promote the cultivation of graduate students' innovation ability. Construction of graduate students training plan and courses needs further reform along with the development of postgraduate education, to adapt to the requirement of society.

**Strengthen the Practice of Teaching**

We can strengthen the scientific research practical training. Research practice is the prominent feature that makes graduate students’ education different from other level of education, which cultivate innovative personality, innovative ability of graduate students and is the most effective way to stimulate innovation consciousness. Graduate students should strengthen the research depth and be independent in designing and implementing part of project.

The type and property of scientific research, the way and degree of graduate students to participate in the scientific research, management mode of scientific research, the training of the scientific research method are the main factors influence the graduate students innovation ability training. Scientific research is a comprehensive training of different levels of ability of graduate students.

The final foothold of graduate students’ innovation education is application in the practical work. Graduate students’ innovation ability should be cultivated from more ways, through various channels. Teaching activities, academic activities and practice activities should be saturated with the
requirement of innovation ability training. Social practice is a fundamental way to develop the innovation ability of graduate students.

At present, graduate students are lack of practical experience and ability to solve practical problems, so it is necessary to strengthen the practice training. We should pay more attention to student's ability to integrate theory with practice, adhere to the combination of course learning and scientific practice.

In practice, the graduate students can feel the value of knowledge and innovation, the social benefit, economic benefit of scientific research achievements, so as to arouse the enthusiasm for their innovation and creativity.

At the same time, practicing graduate students work as teaching assistants is an effective way to achieve the goal of training scientific research ability and developing critical thinking.

Practice is beneficial to the formation of innovative ability of team. Therefore, study the relationship between practice and innovation ability cultivation is of great significance for emergence of innovative products.

**Raise the Level of Academic Dissertation**

The dissertation is a comprehensive embodiment of graduate students’ innovation ability and is also systematic scientific research training. It can cultivate independent research ability and innovation ability systematically through the research process of the dissertation.

Dissertation level is an important symbol for the quality of graduate education. It is necessary to strengthen the supervision of the intermediate writing, establish the anonymous review system, evaluate the innovation point synthetically, which ensure the development of graduate students’ innovation ability and cultivation quality.

It is necessary to establish evaluation standard of dissertation innovation. At present, the evaluation of graduate students’ academic dissertation is almost through the subjective evaluation of judging panel. Therefore, the establishment of dissertation innovation evaluation standards is important to perfect the evaluation system of dissertations.

**Improving Ways of Instruction**

The guidance of supervisor is the dominant factor of innovation ability training of engineering graduate students, which throughout the whole process of graduate education. In addition to imparting knowledge, guiding in scientific research direction, professional business guidance, and review of papers influence the students, the teacher's own values, academic accomplishment, personality characteristics, education idea, the innovation quality also have a significant impact on students. We should take advantage of professional field, research methods of each member in the team to open the graduate students' mind, making them familiar with relationship between the subjects and the state of the forefront of academic research, which can avoid imperfect guidance by personal causes and make the training work smoothly.

Teachers should attach importance to consolidate foundation, cultivate practice ability and deepen the theoretical research for engineering graduate students. At the same time, to cultivate graduate students interpersonal skills and organizational capabilities.

Supervisors’ scientific research quality and research level have important influence on graduate students. Building a team of supervisors of creative quality is the best choice to develop the innovative ability of graduate students, under the background of continuous expansion of the postgraduate enrollment scale. This requires colleges and universities pay attention to perfecting examination system of supervisor selection, providing sufficient objective conditions for supervisors and giving full play of enthusiasm of supervisors.
Building a Platform of Science and Technology Creation

The Impact of Platform of Science and Technology Creation on Graduate Students Innovation Ability Training

The innovation platform provides the hardware and software environment for graduate students. Relying on the innovation platform, graduate students can choose a few topics that have certain difficulty for research. The platform encourages unique thought and advocates academic freedom to cultivate the graduate students' innovation ability.

The university innovation platform directly motivates innovation desire of graduate students. Graduate students can obtain practical training, in the process of participating in innovation platform project.

In the subject, the team of experts consisting of supervisors will guide the students to bear corresponding studies and impart students with necessary professional knowledge and skills, which make students grow imperceptibly.

Innovative ability cultivation of graduate students relies on the team, projects, academic environment, professional equipment, and the achievement is the academic paper.

The Process of Platform of Science and Technology Creation in Training Innovation Ability of Graduate Students

The main purpose of the platform is cultivating graduate students the ability to solve the theoretical problem through project training, relying on the subject and professional equipment of innovation platform, led by the team of innovation platform.

Innovation platform can provide graduate students with academic frontier knowledge, board the graduate students’ cognitive view and accelerate the formation of innovation ability.

Projects in the innovation platform provide a basis for the framework of postgraduate dissertation and sufficient resources for the writing. The team of supervisors in innovation platform can put forward the ideas to solve the problem from multiple perspectives for each student, improve the level of the whole team, and improve the innovation ability.

The System Model Based on University Innovation Platform and Industry-University-Research Cooperation Pattern

Graduate students innovation ability cultivation is a complicated system, covering many aspects in the higher education system, such as the development, team of supervisors, scientific research platform, the allocation of resources, and cultural system, etc. This paper proposes the system model based on university innovation platform and industry-university-research cooperation pattern, which includes the innovation platform, industry-university-research cooperation pattern, postgraduate education, market supply and demand and innovation ability cultivation of postgraduates, as is shown in the following Figure 1.

Figure 1. The system model.
**Characteristic of the model.** The system model based on university innovation platform and industry-university-research cooperation pattern is completely a new mode to develop the innovative ability of graduate students, which combines the elements like the team of supervisors, subjects, equipment, environment and occupational guidance. Elements in the model promote each other and maximize the function of the system. Most importantly, the model is students-oriented.

**Training methods of the model.** Graduate students merge together the theoretical study and practice ability through the learning of the project in the platform. The elements in platform like the team of supervisors, subjects, equipment, environment and occupational guidance support for innovation ability cultivation of graduate students. These factors contribute to the formation of graduate students’ innovative thinking and play different roles at different stages in the growth of graduate students. The platform integrates multiple factors to build the graduate students’ innovation ability training mode, according to the market demand.

**Conclusion**

This paper proposes the system model based on university innovation platform and industry-university-research cooperation pattern. This paper discusses the rule of graduate students innovation ability cultivation according to market demand, analyzes the effect of the system model based on university innovation platform and industry-university-research cooperation pattern, illustrates the methods to deepen the awareness of innovation ability training and broaden the view of graduate students.

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**References**


