

Exploration and Practice of Undergraduate Talent Cultivation Mode in Mechanical Specialties

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Abstract

This paper grasps the purpose and strategic thinking of the construction of "new engineering", analyzes the existing problems in the process of cultivating talents in mechanical disciplines, summarizes other experiences with reference significance and in line with the requirements of the construction of "new engineering" in the new era, highlights the "student-centered" education concept, reflects the cross-cutting, innovative and practical development of talents in mechanical disciplines, and provides an opportunity to fully reflect the connotative development of "new engineering". It also summarizes other experiences with reference significance that meet the requirements for the construction of "New Engineering Science" in the new era, highlights the educational concept of "student-centered", reflects the intersectionality, innovation and practicability of talent cultivation of mechanical disciplines, and provides useful inspiration for the reform of talent cultivation mode that can fully embody the connotative development of "New Engineering Science".

Keywords

Talent cultivation; New engineering; Intersectionality; Practicality.

1. Introduction

In the future, industries will pay more attention to the performance of engineering talents in terms of learning ability and thinking[1], and the original engineering education, which emphasizes on knowledge acquisition and cognitive ability training, will be challenged. Therefore, the cultivation of new engineering talents should not only teach basic engineering knowledge[2-3], but also cultivate students' engineering thinking, so that they will be able to flexibly utilize and properly solve the unknown and complex problems they face in future engineering practice[4].

New engineering education is the transformation and upgrading of traditional engineering education, adapting to the development needs of the current national new economy and emerging industries[5-6], the traditional engineering talent cultivation mode is bound to change into an innovative new engineering talent mode. Currently[7], the new generation of artificial intelligence, new energy, new materials, big data technology, intelligent manufacturing[8], and other new engineering specialties have been widely used in the national strategic emerging industries, and the cultivation of innovative talents for new engineering is especially critical. Cultivation of innovative talents in new engineering disciplines is especially critical[9-10].

2. Talent Training Objectives

It implements the fundamental task of establishing moral education, cultivates outstanding talents with solid mechanical knowledge, profound engineering literacy, and practical

innovation ability, and lays a good foundation for students' professional course study, personal growth and development. Through comprehensive design to train the basic knowledge and skills of learning, with the ability of preliminary design and evaluation of mechanism movement program, with the analysis and solution of engineering practice problems of innovative consciousness and innovative design ability. The course will enable students to understand the engineering knowledge, important new technological achievements and the development trend of the new engineering disciplines, cultivate the sense of responsibility and mission to explore the unknown, pursue the truth and climb to the peak of science, and build up mathematical literacy and the spirit of science, so as to realize the realization of the moral education of the people.

3. Talent Training Model Innovation Program

3.1. Sound management system and strengthened institutional safeguards

In order to better organize the smooth implementation of this project, our college has set up a special project team to make professional decisions, unify the allocation of resources, strengthen communication and exchange, and formulate a special system and plan for the construction of the curriculum system, which encourages teachers to reform and innovate while improving their professional skills.

3.2. Build a professional teacher team to enhance teachers' awareness and level of innovative education

The key to the cultivation of students' innovative thinking lies in the ability to create a group of teachers with innovative educational concepts and build an effective teacher integration model. First of all, through the senior teachers "bring" young teachers, "training" young teachers, "study" the form of teaching experience, to build a professional team of teachers and improve the overall innovative education awareness and level of teachers. The school has been building a professional team of teachers and improving their overall awareness and level of innovation in education. At present, through a series of seminars on teaching methods and a series of team seminars on courses, the enthusiasm of teachers for innovative education has been effectively promoted. Secondly, we make use of the resource platform of school-enterprise cooperation to set up a "mentor team", take the members of the mentor team as a link, effectively integrate the technical resources outside the school, and through the coordination of the project team, incorporate them into all aspects and levels of talent cultivation in a flexible and diversified way, and introduce the resources outside the school through the forms of acquaintance internship, professional internship, and fixed-position internship. The synergistic effect of the professional teacher team and the enterprise mentor team has been highlighted.

3.3. Promote the comprehensive implementation of innovative teaching methods by realizing changes in course evaluation methods with training objectives to achieve the organic integration of the professional course system and employment.

In order to change the traditional teacher-centered teaching methods, the results of the integration of professional and employment, research and practice, simulation and combat, in-class and out-of-class teaching methods, case-based, problem-based, roadshow method, game method, catechism method and other teaching methods, so that students become the main body of teaching and learning activities, so that they can learn to question, ask questions, look for loopholes, test the evidence, organize debates, change the perspective of the whole teaching process and other ways of thinking. These innovative ways of thinking are the most necessary qualities and abilities for students to solve practical problems and engage in innovative work in the future.

In order to effectively implement innovative teaching methods, firstly, we have established the goal of cultivating "knowledge-capability-quality", focusing on the goal system of cultivating critical thinking, problem solving, analyzing cases, and communicating and collaborating, which fully embodies the concept of cultivating innovative thinking; secondly, we have realized the evaluation method of the courses through the cultivation goal. Secondly, the comprehensive implementation of innovative education and teaching is guaranteed by the double-drive matrix model, forming a closed-loop feedback mechanism of "embedding learning objectives, optimizing the curriculum system and content, changing the teaching methods, and giving feedback on course assessment and evaluation", which effectively realizes the organic integration of the professional curriculum system and employment.

3.4. Create an innovative education platform to provide students with a stage for hands-on practice

Utilizing the platform of "Thesis + Forum + Competition", we encourage students to actively participate in academic activities and disciplinary competitions by using educational forums and various important disciplinary competitions as carriers, and the enthusiasm of students is high, and the benefit surface is rapidly increasing. Accumulatively, dozens of teams have participated in various disciplinary competitions at all levels and won more than 50 awards in various categories such as Innovation and Entrepreneurship Training Program for College Students, Challenge Cup Entrepreneurship Program Competition, Mechanical Innovation and Design Competition for College Students, Advanced Drawing Technology and Product Modeling Innovation Competition for College Students, etc., and cultivated nearly one hundred award-winning students, which has improved the professional knowledge and skills of students and enhanced their practical skills at the same time. This has improved students' professional knowledge and skills as well as their hands-on ability.

4. Effectiveness of Implementation of Results

After five years of practice, our college has a strong atmosphere of innovative education and teaching, and the concept of innovative thinking education is comprehensively penetrated with remarkable results. With the integration of internal and external dual-creation teachers, the reconstruction of the curriculum system, the use of multimedia innovation education technology, and the integration of science and technology competitions, the concept of cultivating innovative thinking has been integrated into the whole process of curriculum and teaching in an all-round and three-dimensional way, and the students' sense of innovation has been enhanced, and the quality of cultivation has been improved. Specifically, the following results have been achieved:

4.1. Students' analytical and problem-solving skills are improved

Through a series of innovative initiatives in classroom teaching, students understand the theoretical knowledge of the course thoroughly, and are able to analyze specific problems and solve specific practical problems. In the past three years to participate in various types of scientific and technological works competitions, the production of nearly more than twenty physical works, are able to use the basic theory of the course to achieve the corresponding function of the corresponding works. Such as "a multi-functional intelligent closet can be lifted" using the "Principles of Mechanics" course in the four-link mechanism to achieve the cabinet door switch, the use of rack and pinion mechanism, multi-link scissor mechanism, wire rope roller mechanism to achieve the cabinet level and up and down to move, a better completion of the movement function. And then "wall-based three-dimensional parking garage" using the "Principles of Mechanics" course screw nut motion vice mechanism to achieve three-axis linkage, combined with robotic control to achieve three-dimensional access to the bicycle.

4.2. Increased systematization of student knowledge

Traditional classroom teaching is only for a single course and a single textbook, students learn and receive knowledge in a limited scope, relatively fragmented, and can not be effectively linked before and after. Through a series of innovative initiatives in classroom teaching in recent years, we are oriented to the actual demand, so that students learn to solve specific problems, professional and non-professional knowledge organic combination of knowledge learned more systematic, the learning effect is significantly enhanced. Such as in the practical aspects of the course, through the setting of different backgrounds, so that students as far as possible in the real workplace environment to be implemented in the case of teaching, to achieve the comprehensive use of knowledge in various subjects, the comprehensive ability to be significantly strengthened. For example, "Principles of Mechanics Course Design" through the setting of more than ten topics, allowing students to comprehensively use engineering mechanics, theoretical mechanics on the design of the topic program analysis and design, to complete the topic of the practical tasks.

4.3. Students' collaborative spirit and sense of teamwork have increased

Through a series of initiatives taken in the innovative teaching of the curriculum, laying the foundation for the realization of the "knowledge - ability - quality" training objectives, students in the learning and practice process of the spirit of collaboration, teamwork and awareness has been enhanced; in the participation of various academic activities, students are able to communicate and discuss collectively, cooperate with each other, and spared no effort to contribute to their respective strengths. In all academic activities, students can communicate and discuss collectively, cooperate with each other, and spare no effort to contribute their own strengths, gather the wisdom of all people, create excellent teams, gallop on the stage of academic competition, and win awards and honors in major competitions.

4.4. Stimulate students' interest in scientific research and a strong atmosphere of extracurricular academic activities

Based on the advantageous resources of the discipline, with the innovative teaching of basic theoretical courses and the cooperation between the college and enterprises, the college has built a trinity of "thesis + interest group + competition" innovation service and "dual-creation base + project base + incubation base" entrepreneurial service dual platform, which has now provided students with Intelligent car interest group, 3D printing interest group, electrical and electronic practice group, engineering drawing interest group, Challenge Cup guidance team, metallographic guidance team, machine creation guidance team, etc., and successfully absorbed hundreds of students to join, and get the practice of innovation and training, the students published more than ten relevant academic papers, won more than 50 awards at the national and provincial level competitions, and successfully stimulate the interest of students in scientific research, creating a strong atmosphere of extracurricular academic activities. Extracurricular academic activities to create a strong atmosphere, which is inseparable from the implementation of innovative initiatives in course teaching.

5. Summary

In this teaching innovation reform, the team teaching concept is advanced, the implementation system is complete, the foothold is high, and the innovativeness is strong; there are innovations in theory and expansion in practice, which benefit a wide range of people with remarkable results and social impact; in solving the problem of effective integration of traditional professional education and innovation and entrepreneurship education, the team explored a set of effective cultivation mode has important theoretical and practical significance, and it has an important popularization Value.

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