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Construction of cultivation system of quality education for mechanicalcollege students based on innovation competition

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ABSTRACT

According to the analyses of mechanical college students' quality requirements and study of the characteristics of innovation competition, the issues of teaching are presented about the cultivation of the senses of engineering and innovation. From the curriculum teaching, practical teaching and the relative guarantee policies and measures, the cultivation system of comprehensive quality education for mechanical college students are put forward based on innovation competition.

KEYWORDS

Innovation competition;
Mechanicalcollege students;
Quality education;
Cultivation system.

INTRODUCTION

〈Outline of the nationallong-term education reform and development plan (2010-2020)〉(short for OUTLINE) emphasize that colleges and universities should establish cultivation of talentsin central part of the work. "The high quality and top creative talents should be cultivated who should have persistentbelief, good moral character,abundant knowledge and strong ability."The major mission is aiming at all the students, promoting the all-round development of students, improving students' national service people's sense of social responsibility, the enterprising innovation spirit and strong practice ability to solve problems. In order to implement the 〈OUTLINE〉, we must establish and perfect the education system and innovation system to meet The Times. The students majored in mechanical is the main power to promote the translation from manufacturing country to manufacturing power. What qualities these students should have, and which system should be used to cultivate these students are one of the important topic of 〈OUTLINE〉 to improve quality education of university[1]. Cultivation of these students has its own quality requirement, including positioning the training goal what is used to mechanical students, reforming the cultivating mode, adjusting the structure of students' knowledge, ability and quality, forming characteristics, turning to cultivating innovative talents.

THE QUALITYCONNOTATION OF MECHANICAL ENGINEERING

The definition of quality based on pedagogy is that on the basis of the genetic and influenced by the environment, through its own long-term internalized, people develop a stable and long-term effective quality. Quality education includes ideological quality, moral quality, scientific quality, cultural quality,

physical and mental quality, innovative spirit and cultivation and train of practice ability[2]. Ideologicaland moral quality, cultural quality and physical and mental qualities are the common connotation of college students' quality education, while scientific quality, innovative spirit and practice ability mainly stand for the professional quality of college students. The professional quality connotation of mechanical talents mainly reflect in the ability of engineering technology application and innovation, and the essence is that theoretical knowledge is combined with practice, used to engineering practice and improved to a design capability with a certain innovation. According to a great survey data of training qualityof mechanical engineering graduate shows that graduates widely have some problems, such as low overall quality, narrowknowledge structure, lacking of basic engineering quality, weaken practical ability and innovation consciousness. So they don't have the multidisciplinary knowledge which is essential to a mechanical engineer[3]. The key of the above problem is that current education training system can't meet the requirement of The Times' development, the theory and practice disjointed phenomenon is more serious, the basic engineer quality of graduate couldn't keep up with the requirements of economy and society development. In order to solve the problem, our central government, local government and colleges and universities all pay great attention to the problem and put forward various measures and solutions, which have achieved certain results. Innovation contest is a feasible effective education and teaching behavior, whose special innovation function beyond the conventional teaching[4]. The education teaching system based on innovation competition is one of the effective ways to improve college students' comprehensive quality and ability.

MECHANICAL INNOVATION CONTEST

Innovation contest is a serial of activities, which contacts classroom teaching closely, and uses the contest to stimulate students' ability that integrate theory with practice and the ability to work independently to discover and solve problems through practice, enhance students study and work confidence by practice[4]. Innovation contest, especially the national and provincial innovation contests, are usually extracted from actual production project, some important problems of industry and professional, hot issues, frontier problem, or some necessary professional knowledge and interdisciplinary knowledge by industry experts, well-knownprofessional professors, corporation design engineers, and other senior figures[1]. Innovation contest not only emphasize the design and research of theoretical level, but also pay more attention to the system implementationand play. The actual process of a set of productions under the background of a special project ultimately require mold which is designed innovatively and independently. So it can take exercise students' innovative and practical ability heavily.

Mechanicalinnovation contest is an important measure that can cultivate college students' independent innovation ability, comprehensive design ability and the team cooperation spirit, also strengthen the university student's ability and engineering training. Mechanical Innovation contest includes college students' mechanical innovation design competition, engineering training comprehensive ability competition and so on. Such as the national college students' mechanical innovation design competition, the intention of contest is to guide the institution to pay more attention on cultivating students' consciousness of innovation design, integrated design ability and teamwork spirit; to strengthen the cultivation of the students' beginning ability and train of engineering practice; to improve their actual ability, including mechanical design and manufacturing process by innovative thinking according to actual demand; to attract and encourage to take part in extracurricular activities of science and technology to create conditions for the talents to stand out[5].

Through a string of innovation competitions, the practice ability of the students' mechanical design innovation has been improved overall. Entries mostly are electromechanical integration products, which require the students having various knowledge and skills, such as machinery, electronics, and material and processing. The degree of integration is higher

and higher. The representation need complete design specifications, aided design by computer, 3d model and animation, 3d simulation, video footage and physical prototype. Thus, it can be seen that the mechanical innovation design competition not only pays attention to the integration ofproject quality and humanistic quality education, but also,based on the practice, combines theoretical knowledge with practical engineering applications and learn, think and innovate in the practice to cultivate students' engineering application ability, innovation ability and the team cooperation spirit.

THE CONSTRUCTION OF CULTIVATE SYSTEM BASED ON INNOVATION CONTEST

Innovation contest is one of the important and useful measures to cultivate the students' comprehensive quality, such as engineering application ability, innovation ability and teamwork spirit. Innovation contest has a great function in cultivating students' comprehensive quality. So we need to not only break the current competition mechanismwhich is only belongs to a handful of elite students, and, based on the innovation contest, considerate the mechanical engineering teaching, practice and relevant supporting mechanisms overall, but also feedback the engineering application ability appeared in the competition and the theory knowledge and professional skills which are necessary to innovation ability to every part of teaching, and build a reasonable cultivation goal and the system to cultivate college students' comprehensive quality, to develop students' innovative potential from the source.

The teaching reform based on innovation contest

Base on the requirement to the cultivation of innovation contest talents, current curriculum system should be reformed to cultivate college students with a certain engineering quality and innovation ability. To the students still in the campus, cultivating engineering and innovation consciousness is a gradual process. Currently, college students'curriculum system is made up of three main parts - basic course, professional basic course, professional course and practice course. The system is constructed by theknowledge and knowledge level which the students should understand. Now the problem is that students don't have strong subjectivity to study, and the knowledge they get can't be used in engineering practice effectively and comprehensively, so it is too hard to form the innovation ability. With the help of reforming of current curriculum system based on innovation contest, the theory knowledge and professional skills which are necessary to innovation ability that is reflected in the competition will be fed back to every part of teaching, and the excellent case will be used in the classroom teaching to improve the students'engineering quality and potential of innovation. Finally, all the students will be benefited.

Professional cognitive education. At the beginning of the entrance, few studentshave clear professional direction, and they also don't understand major, far from professional interest. 1. Professional cognitive education firstly is Professional thought education, which main contain of professional orientation, professional development and related subjects. Freshman will take part in specialized cognitive education, enhance the students' professional emotion, and raise students' interest in professional and professional sense of honor. First of all, setting some required courses which are related to the professional knowledge in curriculum system,for an example,the book"An Introduction to Mechanical Engineering", introductorily introduces some basic knowledge and analytical problems and methods to solve problems which involved in the field of mechanical engineering. "Innovative Designed for Mechanical", help students master the basic principles and methods of creative thinking and innovative techniques with combining some cases of mechanical, developing students' engineering skills and innovation capacity, improving students' information retrieval capabilities by setting the course of "Information Retrieval "in the first grade; secondly, conducting a variety of professional ideological education in form of lectures or reports,just like asking the academic leaders or experts and scholars to describe the characteristics, dynamic and direction of development trends about the professional by means

of academic report or conference, inviting full-time teachers or outstanding seniors or excellent graduates to introduce the professional advantage, requirements and ways of being talent or enhancing the competitiveness of the various aspects by their experiences,etc. All the courses told above require students to write their feelings and experiences in order to obtain the corresponding credits,it not only can strengthen students' professional knowledge,but also improve their humanities, engineering, understanding and information retrieval capabilities, stimulate students' innovation desire at the same time.

Curriculum teaching reformation. Students will have the power of innovation when they have a full understanding of major, and are interested in learning professional theoretical knowledge, be able to understand the connotation of engineering quality. Teaching is the subject of students' learning lives, only contacting engineering practices in the classroom, combining study, implementing the reform of teaching methods,can the contest required theoretical knowledge, professional skills feedback to the various aspects of teaching. As the main contestants of mechanical innovation competition generally are juniors, students in first and second grade must establish engineering innovation, and (school) should teach combines with innovation competition requirements and the results achieved. The first step is implementing the project teaching which based on innovative contest outcomes. The innovation competitions of machinery are very close to reality construction nowadays, particularly the mechanical design competition and comprehensive engineer training contests,having a very complete system, with a physical model finally which is essence is a complete project. Implementing the project teaching which using a carries of innovation contest, assigning the project knowledge the relevant courses that from basic courses to professional courses reasonable. Projects teaching based on innovative competition can not only solve the problem of teaching cases preparation, but also fill the blank of the general education courses' teaching content. Allow students to really appreciate the innovation are just around themselves and they are able to fully participate it, so that students have a deeper understanding of the engineering and innovation. The second step is teaching based on the theoretical knowledge of innovation competition integration. The integration degree of Innovation Competition's works are increasingly high, that needs to comprehensive the learned knowledge, but also be able to combine knowledge with practical. Knowledge requires merging to form a systematic knowledge and engineering consciousness should gradually establish, so that we will digested in the innovation competition or practical work. Such as studying the "Computer Aided Design" course, we should not regard it as a pure software operating lesson but combine with "Engineering Drawing" in order to further consolidate students' cartographic knowledge; furthermore, contacting with innovation cases when concatenating the knowledge. For an example,combining with some creative works of students' which done involve work parts drawing and the assembly diagram forming at the beginning to ending of the "Engineering Drawing" course, the courses"Engineering Materials", "Engineering Mechanics" and "mechanical design" can take the same cases as well, explaining for different knowledge, concatenating knowledge by learning cases, forming a system of theoretical knowledge engineering, and engaging innovation competition cases so that students can feel the genuineness of the school's expertise in the practical application, especially know how to combine the knowledge and practice, how to apply the knowledge to innovate. Through the reformation based on project teaching and competition knowledge integration, making the engineering and innovation streaming into the hearts of students by a silent way.

Reforming the teaching system based on practicing innovation contest

Practicing teaching models and systems are related to the quality of professional training in machinery. The disconnection of disciplinary education and engineering practice is a major problem that we are facing current in higher education,so it is very important to build a practice teaching system based on the requirements and characteristics of innovation competition, which is at the core of capac-

ity-building and reflecting the principles of capacity, personality andsense of innovation cultivating in the practice teaching in order to achieve the organic combination of practical teaching and theoretical teaching.

The integrated and hierarchical of practice content. Changing the experimental content from "single" to "comprehensive" and turning the experimental methods from the "demonstration and validation" to "participation and research". Connecting innovation competition with the practice project,the mechanical innovative design competition particularly, to form a comprehensive and an organic integration of theoretical and practical content, which covers main content of professional engineering practice in machinery. Hierarchical practice requires not only embodies the requirements of a single curriculum practice, but also reflect the requirements of the integrated application of knowledge.

Open experiments-centered practicing autonomy and time liberalization. Open experiments are the main mode in the practice teaching, including time and space and equipment, students can arrange and organize practical activities independently and be enable students to have more self-learning initiative so that give full play to the dynamic innovation.

Diversification methods of practice teaching. The practice teaching is based on guiding and heuristic that fully reflect the concept of teacher guiding and student's self-study. The main practical teaching methods adopted as follows: Interactive teaching, which aimed at the certain requirements of practice, connecting the requirements analysis of the practice by students and the explanations of teachers' to form a plan combining with specific projects. The task-driven teaching depends on the different stages and different knowledge requirements. The practice projects are decomposed into sub-projects or sub-tasks, so students can gather information as the tasks' requirements and develop programs and finish the tasks completely. Combining collective teaching with individual guidance, the differentiated instruction is implemented.

Taking second classroom practice as a supplement. With the features of richness and integration, the second class overcomes the limitations and one-sidedness of the curricular teaching content,which is good for the physical and mental balanced developing to students ;in addition, the strong practical features second class has,it defeats the malpractices of emphasizing on teaching theory in curricular and less hands-on opportunities the students have,which is benefit to students to train beginning ability and develop practical skills. To aim at the overall quality requirements of students in machinery, booting the variety of activities in the second class by means of technological activities and innovative activities in engineering and found a certain activities brand, enriching the students' amateur lives as well as cultivating the engineering quality and enhancing students' interests in participating the innovation.

Building a support mechanisms based on innovation contest

To cultivate talents with truly engineering quality and creation, only apply the teaching reform based on innovative competition is not enoughÿit also needs a fully supporting mechanism to protectthe reformation. At present, the universitieshave a complete setting to protect the innovative competition, which are limited in only considering the purpose of innovation competition and strongly in utilitarian. To develop the overall quality of all students at the platform of innovation competition, every safeguard measures and mechanisms should be built above the objectives simply protecting to achieve good results in innovation competitions,and training all students' engineering and innovation awareness, encouraging all the students' innovation enthusiasm, making innovative ideas become common practice.

Innovation Management Policy. To make the students to participate in innovative practices actively, developing relevant policies is needed. Such as "innovative identification and credit management", "open laboratory teaching management approach", "student science and technology innovation management approach" etc. As the policies above,it needs students to achieve a certain innovation credits in four years studying in the school. To access the credits we can not only participate in a variety levels of innovation competitions, but also participate in an open test or teachers' research or involve in extra-

curricular science and technology activities or businesses practice related to professional or any other types of practical activities. Making innovation credits become compulsory credits so that guiding students to devote more spare time to engineering exercise and innovative practice to achieve it in the four years studying.

Guidance team, instructor of a small tutorial system. A relatively stable innovation instructor team of teacher is developed by building the tutorial system. Giving the necessary incentives for the excellent instructors, where reflects on teaching performance evaluation and an annual comprehensive assessment and other appraised awards to inspire the teachers' enthusiasm of guidance; While the small tutorial system applied,the senior students with innovative ability chosen by tutors to help them guide the innovation.

Branch support project. Setting up student's branch groups to support the activities organized by the branch groups. Setting up innovation projects and innovation Fund reporting system and a special Fund as well, building a special team of teachers to make the innovation projects reporting routinely. Actively support to hold innovation competitions and innovation activities at various levels, making efforts to expend the participation degree of the students so that most of the students could get the opportunity to have a deep-seated training.

CONCLUSION

In addition to cultivate the quality of public, the main professional quality is engineering capability and innovative design capabilities for the students in machinery. The innovation competition is the most effective means to cultivate students' comprehensive quality as it cultivates students 'innovative spirit and improve the students' innovation ability which is a test and exercise of the ability of integrated using. Reforming the personnel training model on the basis of innovation competitions,achieving the reformation of teaching system and practice teaching system,equipping a scientific managementsystem and operational mechanism,in order to improve the students' abilities of professional knowledge cognition and the knowledge learning interest,so that students developing balancedwith qualitiesof engineering and innovation will be obtained,and our country will be soon becomeinnovative and running ahead of the world.

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