

# Discussion on the Role of Science and Technology Competition in Improving Students' innovative Ability

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**Abstract** - It is of great significance for Engineering colleges cultivating more professional talents with comprehensive ability to innovate in the social construction of the first line of work for our country to realize the strategic planning and goal and solve social sustainable development key technology and problem faced by all. At first, this paper summarized the current ways to extend and improve college students comprehensive ability, and pointed out the importance of combination of traditional classroom teaching and the cultivation of the second classroom practice way for improving students' comprehensive ability; Then, take "the 4th national college students' energy conservation and emissions reduction social practice and technological competition" in 2011 hosted by Energy Science and Technology School of HIT(Harbin Institute of Technology) as the practical case, studied the training mode based on science and technology competition activities to improve comprehensive innovation ability of college students who majored in energy and power engineering. Hope this article can provide a reference for cultivation and promotion students' comprehensive innovation ability energy power engineering and other engineering professional field.

**Index Terms** - Science and Technology Competition, Engineering Universities, Innovation Ability, Practice Research

## 1. Introduction

Nowadays, talent is the most important resource for the development of country and society, therefore, talent cultivation and the exploration of education has always been a hot topic. Professional education advocates to learning and innovation ability training, so as to adapt to the era of talent "open direction, thick foundation, wide compound" [1]. For energy and power engineering college, cultivating professional talents with comprehensive ability to innovate as much as possible into the work of energy saving and environment friendly society construction, in the first line of practice and implement the national "energy conservation and emissions reduction" and "large-scale development and utilization of new energy safe and efficient" is the only way out of the major energy and environmental problem our country and even the sustainable development of mankind facing, which is the root of and ultimate goal of our education in energy and power engineering. Therefore, in order to improve the students' comprehensive qualities such as innovation ability, not only the first line teachers should explore the education of traditional classroom teaching mode actively, improve the teaching effect in classes; And, also schools, colleges and various aspects should organize and guide students to participate in the second classroom activities, such as undergraduate students join the professional laboratory study

in advance, participate in academic activities and competition of science and technology, etc.[2]. Sponsored by the department of higher education section of the "national college students' social practice and technological competition" for energy conservation and emissions reduction has great influence, not only the concept of "energy conservation and environmental protection" spread, but also provides students with a platform where students' practical abilities and comprehensive innovation showed. Here we take "the 4th national college students' energy conservation and emissions reduction social practice and technological competition" in 2011 hosted by Energy Science and Technology School of HIT as the practical case, studied the training mode based on science and technology competition activities to improve comprehensive innovation ability of college students who majored in energy and power engineering.

## 2. Overview of the Cultivation Way to Expand and Improve College Students' Comprehensive Ability

As the active power to promote scientific and technological progress, young students is the hope of winning the future. Paying more attention to the students' quality training is of great importance. To cultivate excellent young college students, not only do we need to pay attention to the classroom teaching in school, explore the teaching mode actively, improve the classroom teaching effect, laying a solid theoretical foundation for the students in the future work; but also to attach importance to the comprehensive enhancement of students' innovation ability and professional use who in this major, actively organize and guide students to take part in the second classroom activities [2].

### A. Exploring the Way of Teaching in Class Actively to Improve Students' Education Quality

Cultivating students is the basic function of education, and classroom teaching plays a huge role in the process of education. As a result, many teachers(especially those who teach in the classroom) explore the different teaching modes according to different requirements and time background, hoping to break the disadvantages of traditional teaching mode ,and to improve the teaching quality. For example, literature 4 based on the new characteristics of the professional class ,adopted the way of interaction between teachers and students as much as possible, build an atmosphere of conversational teaching, stimulate students' learning

enthusiasm, improve the teaching quality. Literature 5 build a multiple evaluation system based on the teaching process not just on examination results: comprehensive consideration of roll grades, classroom interaction, project training plan, grades, test scores and other factors, evaluating the learning effect more accurately. In the same time, students spurn the habit of "study before the tests only", improve students' comprehensive ability.

#### *B. Optimizing the Second Classroom Teaching Resources*

##### *Based on the Professional Laboratory*

However, as a way of knowledge spreading and professional skill training, traditional classroom education may not get the real educational purpose to a great degree. Literature 6 designed a new mode of practical task driven teaching, according to the characteristics of the student's study in the applied undergraduate colleges and universities. Experimental results showed that the new teaching pattern not only improved the students' academic performance, and greatly stimulated the students' interest in learning and strengthened the training students' ability of professional technology application [3]; While literature 7 introducing numerical simulation step by step teaching method according to the characteristics of the energy power engineering, not only richen undergraduates' teaching content, also expanded students' knowledge, stimulated students' interest in learning, deepened the understanding of the concept of professional knowledge and related physical phenomenon and improved the students' ability of analysis and calculation; Moreover, motivated students' ability to innovate, to some extent to promote energy power class undergraduate professional. However, the second classroom activities faced some specific details, such as experiment platform operation resource allocation problems. In this case, it is quite necessary to rely on the current college laboratory resources, optimizing the resources distribution of the second classroom teaching, and to improve the students' cognitive needs. Take laboratory organization form of Energy Science and Technology School of HIT as an example, the PhDs and masters in laboratory can answer and guide undergraduate students, and give full play to the laboratory resources advantage. In fact, in many laboratories of colleges and universities, there has been a lot of undergraduate students begin to participate in the laboratory of daily learning and scientific research work, and even have the opportunity to participate in some practical projects or scientific research experiments, so as to have the opportunity to communicate with professional teachers, PhDs, masters, and benefited a lot [4].

#### *C. Conduct Academic Activities to Improve Students' scientific Research and Academic Ability*

Academic activities, in general, is an important part of the graduate students' innovation ability training, and caused widespread attention. In recent years, however, undergraduate students also gradually involved in the academic activities in colleges and universities becoming an important supplement to

undergraduate cultivating innovation ability training. HIT did a lot of exploratory practice in this research, take the thermal power of the 21st century student academic seminar activities for example, so far has successfully held more than a dozen. Schools encourage all students to contribute to the general assembly actively under the strong support of the various aspects. Many teachers combined the undergraduate course graduation design with writing papers, some undergraduates form master personally guide junior undergraduate writing scientific papers. College teachers describe students academic seminar as "the big classroom of writing science and technology thesis", and these papers are relying on the birth of lab resources, not copied books or fanciful: for undergraduate students who is about to go through masters' study, many students know how to participate in a higher level of both seminars after exercise of academic seminar, also cultivate their engaged in scientific research consciousness; For that would begin the work for undergraduates, it is a very good experience for the future work of thesis writing.

#### *D. Cultivating Students Ability to Innovate Based on the Science and Technology Competition Activities*

In order to meet the requirement of developing industrialization of talent, a lot of engineering colleges and universities began to encourage college students to participate in science and technology innovation activities to expand the professional field of vision, so as to achieve the purpose of building an innovative campus and cultivating innovative talents. Such as literature 10 ,taken the robot competition for practice teaching carrier, stimulating interest in learning through holding various robot contest, deepen the understanding of professional knowledge, fully excavating students' innovative consciousness; Literature 11 take the mathematical modeling competition for effective carrier, through optimizing the talent training plan, improve the discipline of competition mechanism, strengthen the construction of innovation education base and other effective means, cultivate the students' practical innovation ability; Literature 12 points out: Race of fuel-efficient cars is science and technology activities to cultivate high-quality talents college students development of intellectual resources, to cultivate and develop students' creation, strain capacity, and fighting spirit. On the support and guidance of Department of Education and HIT, Energy Science and Technology School undertaken "the 4th national college students' energy conservation and emissions reduction social practice and technological competition" on behalf of the school with the Institutions of Higher Learning by Energy Power Discipline Teaching Steering Committee. To response and to carry out the strategic development of call and policies of national "energy conservation and emissions reduction", we should make full coverage and comprehensive guidance, actively organize and guide students to participate. Moreover, the conference has played an important role in cultivating excellent young college students and cultivate and improve the students' comprehensive innovate ability.

### **3. Practice Research on Developing the Innovative Ability of Students' comprehensive Based on the Competition of Science and Technology**

#### *A. Summary of "Energy Conservation and Emissions Reduction" Competition of Science and Technology*

In HIT, there are 160 to participate in the guidance on contest of energy conservation and emissions reduction, which include 120 experts and professors to actively participate in the early network evaluation, 60 experts attend to participate in the evaluation work , some including academician, college leadership and well-known scholars, experts from all over the country. HIT vice-chancellor academician Zhou Yu, academician of Chinese Academy of Engineering CenKefa, academician of Chinese Academy of Sciences TaoWenQuan and academician of Chinese Academy of sciences Qin Yukun, deputy director of the competition community professor ZhangXinxin, vice President of Nanjing University of Aeronautics and Astronautics professor XuanYimin, vice-chancellor of Jiangsu University of Science and Technology professor Yao Shouguang, etc. Above those are famous experts in energy engineering field, the experts will came to the school to participate in assessment and guidance work in the review stage and final stage. At the scene of the final question-and-answer display session, students participated in the competition will have the opportunity to communicate with experts in close contact, gain professional guidance from many experts in the field. The competition of science and technology, therefore, not only in the direction of professional development broadened students' horizons, but also cultivate college students' own innovation ability ,and had a great effect on the construction of college students' innovative group; In addition, it also encouraged students' advanced leading role in this activity, cultivated a large number of high quality young talents with outstanding achievements , political integrity, and innovative consciousness.

#### *B. Cultivate Students Innovative Ability and Constructing Innovative Collective through Competition Activities*

Energy conservation and emissions reduction competition cultivates students' innovation ability, enables college students give full play to the individual ability and intelligence in the school, society and the broad stage of life. Also, this contest takes fostering creative collective as an important objective, makes each participating team need mutual cooperation between the students, implementation innovation in three aspects : knowledge, theory and practice, completes first-class technology or practice works. Cultivating innovative collective not only requires students to learn autonomously, acquire the ability of application and development in professional and technical field; At the same time, strengthens the cooperation between the students, gives full play to the collective in each student's initiative and creativity, ideas, and achieves common progress and development. every link set by the competition emphasis on teamwork, to enhancing mutual understanding between the students in the form of team competition, developing teamwork team consciousness. Team activities

fully mobilize students to use personal knowledge, positive personal ability, let the students realized that only in the team cooperation can they maximize personal knowledge and effect, achieve the goal, to enhance the future cooperation in collective life and learning consciousness, as well as the realization of individual right values and outlook on life. Team can help to realize the individual education, guide students to establish the correct values and outlook on life, the cultivation of team spirit as the key to the education of college students, cultivate the students meet the social demand for talents, and competition with team to cultivate students spirit of cooperation is the effective way.

#### *C. Cultivating Undergraduates' leading Spirit through Competition*

As the party's future and hope, should give some excellent youth students party members platform to show excellence in the process, inherit and carry forward the "excellent" tradition, attract outstanding students. This can ensure that while maintaining the advanced nature of party members, youth students party members can actively guide students around. In the competition of the winning team in the school of energy, for example, most of the students party members of the winning team who is the backbone of the team, the grand prize, first prize and second prize of the team, are all party members. This illustrates the student party member's ability to apply the professional knowledge, but also the important embodiment of party member sophistication and innovation spirit. By the influence of the outstanding student party member, there will be more outstanding students to join the party, there will be more excellent party member play their leading role.

### **4. Summary and Outlook**

As the new forces of our country who master science and technology, college students plays a particularly important role in energy conservation and emissions reduction work which is the long and difficult topic in global .The science and technology competition of "energy conservation and emissions reduction", not only promotes the importance of energy conservation and emissions reduction in college students, also means a lot in promoting the construction of national energy conservation and emissions reduction, sustainable development; Especially, expands professional field of vision, builds an innovative collective for college students, provides the exchanges and displaying of platform cultivating students' leadership. Hope this article serve as a reference for promotion and training students' comprehensive innovation ability in energy power engineering and other engineering professional field.

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