Cultivation of College Students' Innovative Practical Ability by Subject Competition

—Taking Subject Competition as a Carrier to Cultivate College Students' Innovative Practical Ability

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Abstract—**The subject competition has a certain correlation with the cultivation of contemporary college students' innovative practical ability. Based on professional course teaching, taking subject competition projects as a carrier and technical practice as a means, colleges and universities across the country vigorously organize students to participate in a variety of professional subject competitions. At the same time, the universities are actively carrying out research on how to construct the training mode and mechanism for cultivating students' innovative practical ability, enhancing students' professional qualities, promoting their employment competitive power.**

Keywords—subject competition; innovative ability; practical ability; Autonomous learning

I. INTRODUCTION

The report of the 18th National Congress of the CPC proposes that the quality education should be implemented across the board. The universities should cultivate students' social responsibility, the spirit of innovation and the practical ability. This is a new mobilization order to advance scientific development of the educational cause, which has given a powerful impetus to further improve educational work. [1]

The ultimate value appeal of education is to cultivate all - round persons. The responsibility of higher education is to cultivate talents with morality, high quality. And educating people through practice is a new mode of cultivating all-round talents in accordance with the needs of society, which has the features of practicality, initiative, integration and openness. To implement quality education, we should reasonably allocate educational resources and improve the quality of education, focusing on cultivating students' innovative spirit and practical ability. The party and the country attach great importance to the cultivation of students' innovative ability, which is the objective need to build an innovative country, the demand to improve scientific and technological innovation, also the intrinsic requirement to promote quality education [2].

II. THE POSITIVE ROLE OF SUBJECT COMPETITION IN CULTIVATING STUDENTS' INNOVATIVE ABILITY

The subject competition is an effective means and important carrier for cultivating contemporary college students' comprehensive professional quality and innovative spirit. It has the very important instructional function to create an atmosphere of innovative practical education, to cultivate students' innovative spirit, teamwork spirit, communication skills and practical ability, also to stimulate students' interests and potential[2].

The level of competition in various disciplines in universities can be divided into national level, provincial level, Ministerial level, municipal level, etc. While a competition item or topic is often a comprehensive, interdisciplinary, highly applied, highly practical project. There-into, to complete the project involves professional knowledge in multiple domains, multiple disciplines, multiple majors, and multiple courses, no longer one simple professional course. In addition to professional teachers' instructing relevant professional knowledge in class, more often, students are required to take the initiative to self-directed learning, inquiry-based learning, collaborative learning, and network learning, to think about problems, to analyze and solve problems actively, so as to enhance practical ability, improve their own information technology processing capacity and quality, and cultivate students' sense of teamwork and innovative spirit.

In 2011, our College established the Zhong Yuan Robot Student Team. Initially the team had only 2 members, and the vast majority of students are afraid of difficulty at the very start of the subject competition. They felt that the competition was difficult, while their own abilities were not enough, mainly lack of self-confidence. In virtue of their interests in the application and research and development of singlechip microcomputer, intelligent control of the ARM application, the initial two members contacted the instructors to communicate with each other face to face, on their own initiative. The interest in learning is the best teacher and motivation. Students often used spare time to complete some intelligent control

application projects, based on Singlechip and ARM, with difficulty from simple to complex. In the same year, they signed up to participate in the relay subject competition of the Guangdong Provincial Robot Contest. As the robot contest breaks through the limitations of disciplines and promotes the organic integration of multi-disciplinary knowledge, during preparation for the contest, the students obviously became aware of the insufficiency of their professional knowledge. As a mentor, teachers led them properly and encouraged them positively, to search for missing related professional knowledge, allowed students to take the initiative to study with the project. Students had a reasonable division of labor to bring into playing their respective technical expertise. Through teamwork and combined efforts, they successfully completed the design and debugging of the project, and ultimately won the first prize in the final relay race of the Guangdong Provincial Robot Contest.

III. How to Cultivate Students' Practical Ability with Modern Information Technology

A. Using modern information technology

Taking the subject competition as the carrier, teachers should actively carry out practical research on deep integration of modern information technology and professional curriculum teaching reform [4]. By integrating information technology into the teaching process of the curriculum effectively, a new type of teaching environment is created, in which it is capable to actualize a teaching and learning mode, which can play the leading role of teachers and also fully reflect the student's the main body position, with the characteristics of "Independence, Inquiry, Cooperation". In this way, the initiative, enthusiasm, and creativity of the students are brought into full play, changing the traditional teaching model with "teacher" as the center fundamentally. At the same time, teachers can make full use of various teaching resources, giving full play to the maximum potential of teaching equipment, implementing high quality and efficient teaching process, improving students' information literacy, helping students to learn, cultivating students' innovative spirit and ability, improving students' practical and autonomous learning ability. Then the cultivation [9] of students' creative spirit and practical ability is put into practice.

In universities, computer subject competitions are often very comprehensive projects, like China Education Robot Competition and Guangdong Robot Competition, which need much more professional basic knowledge, such as electronic circuit, single chip microcomputer or embedded development, sensor detection technology, intelligent decision and control technology. The members of Zhong Yuan Robot Student Team are mainly sophomores and juniors of Electronic information engineering major, Internet of things engineering major, Network engineering major, etc., each of them has a strong interest in smart mobile robots. In recent years, instructors have guided students from different specialities to participate in the preparation process of the competition projects, using the intelligent robots subject competitions of various levels. This gave full play to their professional expertise and team collaboration capabilities, and led students to do learning based on the autonomous, inquiry-based, collaborative learning mode

with projects, tasks, and key issues. In practice, it had exerted their proactiveness and dominance, through arranging tasks to allow students to learn autonomously, to communicate deeply with the team members and to help each other. The ultimate learning efficiency and quality are ideal, and students improved their self-study ability, practical ability, abilities to think, analysis, and solve problem, team communication and collaboration continuously. The students, who have already graduated from university, have a distinct advantage over others in the employment process, with much better jobs and development opportunities [5][6].

B. Innovation Ability Training Mechanism

In the subject competition, students are the main part, while the teacher is a guarantee. The cultivation of students' innovation ability depends on the guidance and help from teachers. Colleges and universities need to attach importance to and strengthen the cultivation of teachers' teaching and practical innovative ability. Young college teachers should be encouraged to establish the sense of innovation, to update educational concepts, and to master modern information technology, to improve their own research, teaching capacity and innovative spirit constantly [3].

With the continuous development of science and technology, the application of computers has become more and more universal. The professionalism and intelligence of the computer are increasingly prominent. The development and update of computer technology is so fast that a computer professional teacher should have the spirit to learn as long as live. Computer hardware resources will double the integration level and capability every 18 months, corresponding course materials updated. As teachers and students of computer major, they all need to update their knowledge to meet the needs of society and employers, to be invincible in the fierce competition talent.

Education is an important way to improve people's comprehensive quality and to promote all-round development. It is an important cornerstone of national rejuvenation and social progress. University teachers not only bear the responsibility of teaching, but also the responsibility of knowledge innovation, social science popularization and academic research. Teachers' own teaching and research ability will have a direct impact on the result of actual teaching. Improving the teaching ability of university teachers is the core and crux to improve the teaching level. In order to enhance the teachers' teaching ability, it requires both the teachers' own efforts and the corresponding support and external conditions provided by university. There are varied ways to improve teacher teaching ability. As professional computer teachers, they should update their professional knowledge frequently and quickly by self-study or continuing education. They should summarize teaching practical experience; actively participate in professional technical training of enterprises or academic exchanges. Moreover, universities should establish perfect assessment and incentive mechanism to encourage front-line teachers to continue their studies or study abroad. Teachers should study the cutting-edge knowledge and technology trends, introducing the latest professional knowledge to broaden the students' professional vision [4].

C. Autonomous learning mechanism for team member

Computer subject competition projects are often a comprehensive project, which includes multiple courses. First, it is necessary to follow the professional teachers to learn relevant major courses, due to the limitation of academic hours, much professional knowledge required that needs student to acquire by autonomous learning. At the undergraduate stage, some students have clear learning objectives, strong ability to plan career and independent learning ability. But for most of the students, the pressure is relatively little. After entering the campus collective life, without family supervision, many students' initiative in learning is relatively poor. Some students even indulge in network games, whose day and night are reversed, it is impossible to attend class at all. For these students, college leaders, teachers, head teachers, counselors and class committees need to cooperate and guide them properly to make them aware of the main task of the students at this stage, to improve their theory learning ability, practical ability, and teamwork and communication skills.

As a front-line teaching teacher, the discipline competition team has once encountered such students. They need to be ideologically conscious of the primary and secondary points and constantly improving in action and they can be distracted. At the same time, it can divert their attention by assigning them a new project. During the design process, they can design the project by consulting reference materials and independently learning. In the project research, they show their achievement to solve problems through the designing process, with conversion of professional theoretical knowledge directly into practice. On the one hand it improves their comprehension of professional knowledge, and on the other hand through the project practice to find their own inadequacies, in order to locate and make up the deficiencies and enhance their own practical ability.

For some big projects, we can adopt a problem-based learning model [7]. Team members work in groups, setting about solving a physical problem. In order to solve the problem better, students often need to acquire some necessary professional knowledge, through using the internet and accessing in relevant books. Then they take a face-to-face interaction with each other to discuss how to use related professional knowledge to solve practical problems efficiently. After the students have solved the problem, they need to rethink profoundly and summarize their own learning process and methods individually [6]. This type of learning mode emphasizes the active learning of students and associates learning with tasks or problems, which enable learners to actively invest themselves in problems, focusing on how to solve problem, integrating multiple learning methods, emphasizing mutual communication and exchange among team members. In the end, we, in deed, improve our students' ability to learn independently, enhance their team communication and Collaborative ability, and practical ability [3].

D. The supervision feedback mechanism

College students' innovation team is generally composed of teachers and students, who share common interests and hobbies, aiming at innovation, and having achieved certain achievements in innovation practice, forming a learning community with certain value and achievements. The innovation team takes students as the main body, projects or issues as the core, independent research and inquiry learning as the main forms, the cultivation of innovative talents' practical ability as the guidance, the subject competition as the carrier, in which members come from the different majors, with majors relatively complemented, team formed freely, teachers' guidance, clear goals, reasonable division of labor. According to their own interests, hobbies and technical expertise, they actively participate in related disciplines competition, and continue to improve their professional quality and innovative practical ability [7].

For some team-type competitions, according to the technical characteristics of the competition project and students' professional interests and hobbies, the teachers reasonably set up the competition team, designating team leader, with clear division of labor, task in place, scientific and reasonable scheduling of tasks, regular exchange discussion and function demonstration. Through reports, discussions and demonstrations, all team leaders and members can keep abreast of the real-time progress of the project. They can easily find and solve problems. At the same time, as a teacher, it is also easy to clearly know the progress and attitude of each student, asking students establish a good sense of competition and integrity. A team member screening mechanism is carried out within the team; regularly eliminate some students who are not enthusiastic about the project [7].

The Zhong Yuan Robot Student Team has also investigated and explored the team management for many years, at present mainly participating in China Education Robot Competition, Guangdong Robot Competition and "Challenge Cup" Guangdong University Student Extracurricular Academic Scientific and Technological Works Competition. Due to the robot subject competition's integration of professional knowledge in computer, machinery, electronics, communications, control, acoustics, optics, electricity, magnetics, and other disciplines, in addition to hardware knowledge, students must also possess the capability of computer software programming, able to assemble robot system, test and debug intelligent sensor, write and debug intelligent control program. This enables students to continuously improve their comprehensive professional knowledge level. At the same time, their logical thinking ability, practical ability, comprehensive application ability, problem-solving ability, and innovation ability can be fully trained and promoted. After the robot competition or robot teaching has entered college course, the students' learning interest and learning initiative are continuously increasing. Logical thinking is much more active, and opportunities to practice greatly increase, which is just the important content of quality education.

IV. ACHIEVEMENTS IN RECENT YEARS

After years of unremitting efforts by instructors and team members, the Zhong Yuan Robot Student Team has won more than 60 awards in various subject competitions since 2011. The number of student team members has increased from 2 to 47. Through participating in the competition of related

disciplines, students can strengthen the transformation of theory into practice, improve their practical ability, and enhance their own professional accomplishment and employment competitiveness. So far, the team has declared 20 software copyrights, applied for 2 invention patents and 5 utility model patents, now 3 items have been authorized. Students have delivered 2 academic research papers publicly as the first author by guiding. More than 30 projects have been declared for university students' innovation and entrepreneurship projects at the provincial-level, national-level or university-level, and one major project and one general project for the "Climbing Plan" Guangdong University Student Science and technology innovation cultivation project, also represents the school to participate in the "Challenge Cup" GuangDong University Student Extracurricular Academic Scientific and Technological Works Contest, and achieves satisfying results, with 3 prizes in the provincial competition of Scientific and technological inventions.

V. SUMMARY

One important mission of colleges and universities is to train high-quality, innovative, applied and practical talents. There are many ways to cultivate talents. Subject competition would play an important role in personnel training, which is based on the close combination with classroom teaching, in the form of a contest. The subject competition can stimulate students' ability to contact theory with practice. Students are able to discover, analyze and solve problems through competition project. Subject competitions can continuously improve their professional quality; cultivate students' self-learning ability, research ability and teamwork ability. At the same time, by means of the subject competition, teachers can continue to study new knowledge of relevant professional fields, and get acquaintance of the latest domestic or foreign developments, improve the ability of science teaching and research by themselves, imparting knowledge to their students better [8].

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