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Robot Teaching and Creative Ability Cultivation of College Students

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----------ABSTRACT----------
Intelligent robot is a comprehensive cross discipline, and robot teaching can effectively cultivate the creative ability and comprehensive practical ability of the college students. This work first analyze the importance of developing the robot teaching in college, then it discusses the current situation of the robot teaching in China and abroad. Finally, this work expounds the relation between the robot teaching and the innovation ability cultivation of the college students from six aspects.
***Keywords**: Robot teaching, creative ability, comprehensive practical ability, teaching practice.*

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I. INTRODUCTION

Creation is a huge impetus of the human society development. Practice is the source of the creation, and the engineering practice is the basis of the creation. There is no innovative ability without the engineering practice ability. Therefore, explore the new idea and new method for the teaching reform, meet the urgent requirements of the innovative theory and innovative education, enhance the creative idea and ability of the college students, has put forward higher demand for the current teaching system reform. During the college education and teaching reform, how to cultivate the creative idea, practical ability and the comprehensive quality, has become the core goal of the current teaching reform. Cultivating the creative spirit and creative ability have become an important requirement for the personnel. Zhan etc, studied the robot teaching in the national colleges and abroad colleges, and pointed out that robot teaching can effectively improve the practical ability of the college students, and a sea of colleges and engineering training center have executed the robot teaching [1].

II. SIGNIFICANCE OF THE ROBOT TEACHING

Robot teaching is a trend, and it is an expansion and development of the robot fields. Due to the knowledge range and requirements of the technology integration, robot has produced great influence on the college teaching.

1.1 Cultivating the open idea through the practice training

Traditional teaching methods confine the express of the students nature instincts, while the robot teaching can inspire the interest and initiative of the students, as well as their imagination and creation ability, and let the students learn the knowledge of mechanics, electrics and computer. During the robot teaching, its activity themes are very interesting, and the students can study, design, plan, assemble and test the project, just like engineers. The college students can design their own robots, and program the robot, and make it to carry out different tasks they want it to do.

1.2 Improve their comprehensive ability of the college students

During the robot teaching, individual student is not independent existing. While in the procedure of communication, the students can exercise their expressing ability, cultivate their positive thinking and innovative thinking. The students can combine into a group on their own willing, to study and develop a project, and cultivate their team cooperation spirit. Many students like this group because this group can not only touch an army of fresh things, but also know more companions. During the robot competitions, they make friends with other college students which bring them new ideas and broaden their view [2].

1.3 Cultivate scientific quality of the teachers and students

Different students will choose different roads in the future, if they choose a science and technology road, studying the robot is necessary. For the teachers, robot is very helpful for their research. For the students, robot is very

important to develop their wisdom. During the robot activities, the students can not only achieve the knowledge, but also help them to cultivate excellent living habits and skills which make them to prepare for the new challenges well in the future.

1.4 Advantageous to the course integration and innovation

Robot is a integral technology, so if it is introduced into the colleges, the robot should not be confined in the classes of the information technology. Actually, the robot structure is closely relative with the physics, and we can do the classical physics experiments with the robot, at the same time, we can also design excellent control experiments with the high accuracy robot sensors. These experiments has not only demonstration, but also finish the data collecting and analysis in time. Course integration can be done from this view and bring new energy for the traditional teaching.

1.5 Improve the comprehensive ability of the college students

Intelligent robot technology is a comprehensive technology involving many disciplines, including automatic control, computer, sensor, artificial intelligence, electronic technology, mechanical engineering, etc. Through designing and practical teaching of the simple intelligent robot, college students can grasp the definition and structure of the intelligent robot, intelligent robot sensor, intelligent robot driving technology, position control technology, visual technology basis, computer control system. At the same time, they can also learn how to design the software to control the robot moving, understand the hardware, software components and working principle of the intelligent robot system [3]. After the study, the students can design the control algorithm, program the microcomputer software, and employ the software to the moving control of the intelligent robot, and bring the students systematic understanding of the mechanical electrical control system and intelligent robot system. Introducing the intelligent robot teaching to the electrics information courses, the students can enhance the operation and control ability for the modern mechanical equipments, through understanding and practical operate the intelligent robot. The students can not only achieve the abilities to use the mechanics, electronic, computer proficiently, but also inspire their study interest and passion, learn how to communicate with other people, face the challenges bravely, distribute and use their time reasonably, cultivate the willpower, self-confidence, and respect other people.

III. CURRENT SITUATION OF THE ROBOT TEACHING

2.1 Current situation abroad

- USA

In 1958, America Unimation firm designed the first industrial robot- Unimate, in the world, which forecasted the coming of the robot era. In 1994, MIT established the course "design and manufacture the LEGO robot" whose aim is to improve the design and creation capacity of the students in engineering design domain, and try to integrate the robot teaching and engineering experiments [4].

In America, the related governments carry out the "perception and cognition mobile robot" plan in the high colleges to support and encourage the robot teaching. The college students can obtain a total series of robot parts, with these parts, they can assemble the remote control robot according to their own ideas and creative thought, then they can take part in the robot contests. During this procedure, they can communicate and learn from other students, learn relative knowledge positively through the practical training, and promote their study initiative.

- Japan

In robot field, Japan lagged USA 10 years, but because the Japan governments pay much attention to the robot teaching, so the Japan robot technology leads the world nowadays. Japan RoboCup takes the robot soccer as the central research issue, and its aim is to boost the development of the artificial intelligence, robot technology and other relative subjects, through holding the robot contests. Its final goal is to set up a totally continuous, simulated humanoid robot soccer team in 2050, and defeat the human beings in the competition.

Japan teaching robot Memoni [4] has the artificial intelligence capacity, and it can talk with the students, record the scenes automatically, store more than 20 thousands words, and it can construct 2 billions complete sentences. All these greatly increase the students ability to study the language.

- Singapore

Singapore National Education College and LOGO Education department held the first Asia-Pacific ROBOLAB international education workshop in Singapore in June, 2006. Through special report, papers and hand operation,

they communicate the robot teaching and its application in technology and teaching courses, to promote the technology level and application ability of the teachers to carry out the robot teaching.

2.2 Current situation in China

China began its robot research in last 80s, so there is a large gap in China robot level and developed countries. However, nowadays, the China robot technology develops very quickly, such as the University of Electric Technology, teaching level and teaching quality of the robot teaching are both very high, and its robot soccer team is the traditional strong team.

One of the important forms of the intelligent robot teaching education application is various robot contests. Essence of the robot contest is the competition of the comprehensive quality and ability of the college students. The robot contests need various abilities, such as programming ability, practical ability, team cooperation ability, practical employment of the sound, light an electrics. It can not only inspire the innovative spirit of the college students, cultivate their practical ability, but also build a solid foundation for the quality education and the science and technology education.

Robot contest has become an important competition for the technology innovation of the college students, and achieved the consistent agreement among the educators and technologists. As a creative intelligence develop activity, robot contest can meet the requirements of the college students, and received their warm welcome. So, robot contest and teaching have produced broad influence in China.

IV. ROBOT TEACHING AND CULTIVATION OF CREATIVE ABILITY

Robot teaching provides a new platform for cultivating the creative ability of the college students, and it has the following 6 advantages.

3.1 Discipline integration and cross is a good platform for cultivating innovative ability

Intelligent robot technology is a comprehensive technology which is the most comprehensive platform for the discipline. The comprehensive discipline of the robot teaching is advantageous to the subject cross, strengthen the relations among the related subjects or courses. Robot teaching can provide an excellent platform for innovative education and cultivating high quality creative personnel.

After being familiar with the robot hardware, the college students can design, assemble, software program to automatic control the robot. The whole procedure is independently finished by the students, therefore, the study process changes from passive to positive, hence it enhance the abilities of analyzing and solving the problems independently. The students can choose the knowledge autonomously, do the practice operation combing the theory knowledge. Through analyzing and studying, the students can employ many different approaches to design different shapes robots, program with different algorithms, develop the individual potential proficiently, cultivate the students' plan and design ability, practical ability and comprehensive innovative ability, which can build a good foundation for the innovative education.

Moreover, during the innovative practice activities of robot parts assembling, from selecting the project, designing the profile, choosing the necessary equipments, constructing the model to designing the driving program, and all these tasks are carried out and finished by the students independently. These experiences are helpful for cultivating their innovative ability to independently carry out the research activities.

3.2 Teaching practice is the source for cultivating the creative idea

The basis of innovation is practice, and practice is the source of the innovation, so there is no innovation without the practice. Intelligent robot teaching is very advantageous to design many real projects with practical background. Our college has explored an effective teaching mode through the teaching practice. After the students have grasped the basic knowledge and basic programming skills, the college can execute the open teaching, i.e., open the optional design courses, and the design project is determined by the students themselves according to their own interest. The program is completed by the students independently, hence this teaching mode can inspire their study interest and cultivate their innovative idea.

3.3 Teaching enjoyment is the basis of cultivating the innovative idea

Interest is the best teacher. Most of the intelligent robot projects are very interesting which can inspire the keen interest of the engineering students. For example, we use the intelligent robot to demonstrate the usage of the sensor. During the sensor teaching, our former courses only use the multi-media to show how to use the sensor, and it is very boring. Now, the effect is very obvious when we introduce the intelligent robot to discuss the usage of the sensors, such as the infrared sensor, when it meets the obstacles, it can send the signal, so the students can program to control it. Hence, the students can grasp the concrete use method during the entertainment, and this method can change the deep theory into intuitional understanding which can greatly increase the students' study interest.

3.4 Cultivating students' team cooperation ability

Robot project group needs the mutual cooperation and positive match to finish the creative work. The mutual communication and study among the students contribute to draw on the wisdom of the masses, arouse the inspiration, broaden the thought manner, exercise their team spirit and cooperation ability.

3.5 Cultivating students' design works and software program ability

With the suitable guidance of the teachers in the classes, the students can design any mechanical and electrical products or models that they want to. Through constructing the model and program the software by themselves, the students can improve their abilities of analyzing and solving the practical problems.

3.6 Cultivating the students' practical ability

Nowadays, the graduated students generally lack of the engineering practical ability. Due to the influences of many factors, such as teaching idea, education direction, cultivating mode, etc, a sea of students emphasize the theory study while ignore to cultivate the individual practical skills which cause the creative ability, practical ability and comprehensive quality of the graduates not to meet the requirements of the enterprises. Through the robot practical teaching and the exercises of the robot contests, the students can transit the pure theory study into the theory connecting the practice, hence to improve their practical ability.

V. CONCLUSION

Based on the above discussion, it can be concluded that the robot teaching has sufficiently inspire the enthusiasm of the teachers and the students, and enhance the students' creative practical ability. The students grasp the technologies of robot structure design, control system design and program, sensor application, etc. During these procedures, they improve their abilities to comprehensively employ the knowledge, analyze and solve problems, innovative practice, meet the training goal of the high education -- cultivating high level engineering technology personnel with innovative spirit and practical ability, satisfy the needs of cultivating high quality and inter-disciplinary talent. These experiences bring good basis for the following teaching reform and improving the education and teaching quality further.

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