Current Situation and Strategies of Robot Education in China's Basic Education

Feng-tian QIAO¹,* and Jin YANG²

¹Department of Educational Technology, Capital Normal University, Beijing, China
²The Popularization Work Committee, Chinese Institute of Electronics, Beijing, China

*Corresponding author

Keywords: Robot Education, STEM education, Innovation ability.

Abstract. Experts at home and abroad in education proposed that robot education could serve as an effective platform for implementing Maker education, STEM education, and innovation education. The elementary and secondary schools of China are increasingly focusing on Robot Education. This presentation is about the robot education system currently implemented from elementary through high schools, the education results and strategies in China, and analyzing problems along with several strategies from the following four perspectives: robot curriculum, robot competitions, robot teaching, and robot education ecosystem.

Introduction

Robot is the key support equipment of advanced manufacturing, which will change our lifestyle. Countries around the world attach great importance to the national robot education, to meet manufacturing changes and reserve talents. As early as in 1994, the Massachusetts Institute of Technology set up a "design and build Lego robot" course, which aim is for students to improve industrial design ability, innovation ability and require the science experiment integration of the robot education into course. The Robotics Academy at Carnegie Mellon university, based on the ROBOTC platform, has launched nearly 20 education Robotics courses, creating a system of Robotics courses covering K12 to university. At the same time, the robot education is highly integrated in science, engineering, technology, mathematics and becomes an important representative of STEM education.[1]

China's robot industry has a huge talent gap, there are a shortage of 100,000 people in China, the demand for talent will reach about 200,000 by 2020, which severely restricts the development of "high-grade numerical control machine tools and robots" in key areas of "Made in China 2025". It is imperative to strengthen the robot education in China's basic education.

Based on such circumstances, this paper aims to present the robot education system currently implemented from elementary through high schools, the education results and the problem encountered in China and also suggest for solving problems.

Robot Education in China's Basic Education

The robot has always been important in China's primary and middle school science and technology education.(1) The total number of robot education research is increasing. The theme of "robot education" was searched in CNKI, and the time period from January 2001 to July 2017 was recorded by 1399 "robot education" related journal articles.[2] The keyword distribution involves robot education, robot, robot teaching, primary and middle school, intelligent robot, maker, information technology, artificial intelligence, robot competition, innovation ability, etc.(2) The developing trend diversification in China's robot curriculum. And one type, The robot curriculum in the existing discipline system. For example, high school information technology courses and high school general technical courses have robotics courses. For example, high school information technology courses and high school general technical courses have robotics curriculum. Another type, depending on the NAO, WeDo, EV3 or other Robot teaching equipment, is more common in
There are many robot races in China, such as ROBOT CUP, China Adolescent Robotics Competition (CARC) and National youth electronic information intelligent innovation contest which began to be held in 1999, 2001 and 2012 respectively. In particular, National youth electronic information intelligent innovation contest draws so much attention that it is attended by tens of thousands of people from all over the country. National youth electronic information intelligent innovation contest consists of elementary, middle and high school divisions, each of which has the Challenge Mission, Creative Design and Competitive Against.

In China, robots attract such much concern from elementary, middle and high school students for three reasons: First, The Chinese believe that robot education is a representative education to improve students' creativity and engineering abilities. Second, the prospect for robot industry is considered to be bright, as the China government designates robot industry as its next-generation growth engine industry. Accordingly, it appears favorable for finding jobs to have robot expertise and major in robotics in the difficult job-seeking conditions of the China's society. Third, China is world-famous for high competitive rates for college entrance exams. Therefore, it is not easy to enter prestigious universities. The university selects students with excellent technical quality through independent recruitment. Students who are rewarded with robot competitions have a competitive advantage.

The Problem of Robot Education in China

In June 2016, Education Informatization 13th Five-Year Plan issued by China's Ministry of Education has set new goals and targets for the STEM Education and Maker Education in China's elementary and secondary schools. According to the proposal on the 13th Five-Year Plan, teachers should explore the effective approaches to carrying out the STEM Education and Maker Education. As representatives of STEM and maker education education, more and more teachers are paying attention to robot curriculum, but also has encountered many problems. (1) Lack of qualified robot teachers. According to research carried out on a line the robot primary and secondary school teachers, the research object to participate in 2017 the Chinese institute of electronics first, the second session of national teenagers "robot and the guest teacher training" of the national primary and secondary school teachers, education institutions training lecturer, they mainly come from Hebei, Beijing, Tianjin, Hubei, Shandong, Jiangsu, Zhejiang and other places, the key research on 60 primary and secondary school teachers. Among the 60 primary and secondary school teachers, 81.52% of undergraduates, 16.76% of the master's degrees and 1.72% of PHD. Teacher's professional background shows that only 15.72% of elementary and high school teachers of robot with computer science, physics, engineering and technology science, mechanical engineering background, most of the teachers' professional learning experience no robot. (2) Lack of robot teaching equipment. In China, the eastern and coastal regions are economically developed, the central and western economies are backward, and the education funds are not balanced. The robot teaching needs equipment support, so the robot education has been affected by the lack of equipment. (3) Lack of systematic robotics courses. The primary and secondary school robot curriculum incoherence, is not conducive to the student system learning robot. Especially in high school, students are under pressure to get into the college entrance exam, which takes up a lot of time.

The Suggestion to Promote China's Robot Education Development

We need use society and government to publicize the Robot Education. (1) The display policy guidance function, promotes the Robot Education development. Local governments have increased funding for education to promote the Robot Education's teaching environment. (2) Establish the coherence of education in the primary and secondary schools Robot education is a systematic, long-term education project. Based on the characteristics of students, combining with the robot education rules, the structure of the robot curriculum from primary school to high school and even university is set up. (3) Improve the ability of robot teachers in primary and secondary schools. The
robot education of primary and secondary schools has higher requirements for teachers, especially in backward areas. Relying on education policy, we can use the advantages of education department to promote the construction of robot teachers. (4) Carry out robot related events for primary and secondary schools. Robot competitions and activities are an important way to promote the robot education and cultivate students' innovative ability. To summarize and improve the skills and experience of youth robotic races in various regions, so as to make a stage for science popularization, technical exchange and talent selection. (5) Integrate multiple resources to build robot education ecology. The depth and breadth of education teaching in primary and secondary schools are far beyond the scope of their own abilities. Only by establishing the robot education ecology and more social resources can we promote the development of education. Give full play to the institute, association and other various social organizations of bridge function, integration of university, research institutions, enterprises and other social resources at home and abroad, to build up the robot education ecological system of primary and secondary schools.

Conclusion
Robot Education as an important form of STEM education, which can cultivate students' creativity, problem solving ability, critical thinking ability and practical ability, has been taken seriously by the China's education. This paper, by review of the robot education development in the china, analyzes the current situation and seeing problems existing in the robot education, to find suitable path for the present situation of Chinese education.

Acknowledgement
This research was financially supported by the Popularization Work Committee of Chinese Institute of Electronics.

References