

Preliminary Exploration on the Practice of Science and Technology Innovation Project Model in Engineering Class Teaching and Curriculum Design

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ABSTRACT

Combined with the teaching practice of engineering core courses for engineering students, this paper explores the teaching concepts and methods of integrating science projects and creative projects into classroom teaching and curriculum design, and proposes a flexible and personalized teaching training mode. In the course of classroom teaching, students are inspired to propose new big innovation projects independently, based on the actual situation of engineering students in our school, to build innovative teaching modes.

Keywords: *teaching practice, creative project, teaching model*

1. INTRODUCTION

The cultivation of innovative talents has become an important determinant of a country's international competitiveness and improvement of its international status [1]. Innovation is the driving force for development and the ladder of human society progress. The purpose of higher education is to impart knowledge, spread ideas, and cultivate senior specialized talents. Colleges and universities play a very important role in the cultivation of college students' innovative awareness and spirit. Cultivating college students' innovative ability is the core content of higher education in the context of new engineering, and it is also a sacred mission given by the development of the times [2]. As an important base for the cultivation of innovative spirit and innovative talents, universities play a unique role in the development of national innovation [3-4]. Exploring the mode of cultivating college students' innovative ability under the background of new engineering, and constructing a college students' innovative ability training system are of great significance for improving college students' innovative ability, building an innovative country, and promoting economic and social development.

Innovation is an inexhaustible motive force for social development in the context of the new era, as well as the attributes, values and fundamental requirements of new engineering disciplines [5-7]. General Secretary Xi Jinping has repeatedly emphasized: "Innovation is the primary driving force for development, and it must be placed at the core of the overall national development situation to ignite the reform engine with innovation." Innovative ability is an important factor to promote the comprehensive development of college students. Innovative activities are an important way to improve the innovative ability of college students. The new engineering concept puts forward new and higher requirements for the cultivation of college students' innovative ability in the new situation.

2. SIGNIFICANCE OF INNOVATIVE TALENT TRAINING MODEL

The university stage is a crucial period for undergraduates to realize the transition from "self" creativity to "social" creativity. For senior undergraduates, they are at a turning point in this transition. In the teaching of undergraduate professional courses, scientific research thinking and methods are introduced into the classroom teaching process, inspiring students to apply the professional theoretical knowledge learned in the classroom. Apply to real life and solve practical problems. Let students independently propose innovative research projects and complete them through curriculum design.

In the syllabus of core courses for undergraduates, almost every course has a follow-up curriculum design teaching plan. Therefore, in order to make effective use of the curriculum design time, the curriculum design related to the professional background can be combined to reduce the students' curriculum design burden. The independent science and technology innovation project as the curriculum design of relevant courses, "real questions really do", guide students into the field of scientific research, through the combination of teachers' scientific research direction and Daiso projects, through practical reform of engineering college students innovative talent training model, The significance is as follows:

1. Pay attention to the combination of classroom teaching, curriculum design and big innovation projects, and teach scientific research thinking methods

The cultivation of students' scientific research and innovation ability should be implemented in all aspects of education and run through all aspects of teaching. One of the most effective methods is to combine the teaching of theoretical courses, attach importance to, strengthen and improve the undergraduate classroom teaching and curriculum design models. Incorporate scientific research results in classroom teaching, teach scientific research thinking methods, cultivate students' creative consciousness, and stimulate students' creative passion. At the same time, students are encouraged to independently propose practical topics of interest based

on what they have learned in the classroom.

2. Pay attention to the crossability of curriculum design, improve the technical difficulty and innovation of the project. During college, there are many professional courses for undergraduates, and professional courses have curriculum design tasks. Based on this, in the course of the two courses we undertake, try to selectively combine the course design of the two professional courses, pay attention to the comprehensive application of theoretical knowledge, focus on the innovation and technical difficulty of the project, and emphasize the members of the project team Cooperation. After completing the course design tasks, submit paper reports and overall system drawings.

3. Combining flexible and personalized teaching modes to cultivate students' autonomous learning and innovation ability

As the saying goes, "Teaching people to fish is worse than teaching people to fish". In the past, we have emphasized the commonality of students too much, and to a certain extent ignored the personality of students. Dealing well with the relationship between "individuality" and "commonality" in teaching will play an extremely important role in cultivating students' creative ability. In response to this problem, teachers should encourage students to take the initiative to learn and actively explore in the teaching process, advocate students to learn independently, encourage students to find and ask questions, boldly question and innovate, and cultivate students' ability to use knowledge and create new knowledge. In the course design of the topic selection, the guiding and flexible ratio has been increased. Students can choose course design topics, development tools, and development platforms according to their hobbies and learning abilities, creating a healthy development for students' personality. Environment and atmosphere.

4. Constructing a New Normal for Scientific Research Innovation and Improving the Level of Scientific Research Innovation for College Students

College students should have the ability to actively learn, think and innovate, so that college students can establish a good sense of cooperation, team spirit and social responsibility, and cultivate the correct outlook on life, values and world outlook. Colleges and universities should actively create a good atmosphere of practice, provide sufficient material guarantee, and promote the development of students' personality. Relying on the broad and strong interests of college students, making full use of their knowledge, better stimulating the interest of autonomous learning and scientific research enthusiasm, and attaching importance to the reform of practical teaching will help the formation of college students' innovative thinking consciousness and continuously improve the students' practical innovation Ability, professional skills, and improve students' core competitiveness.

3. PROBLEMS TO BE SOLVED IN EXTRACTING PROJECTS FROM SCIENTIFIC RESEARCH PROJECTS-STUDENTS HAVE A WEAK KNOWLEDGE BASE FOR CREATIVE THINKING

Under the new era, the thinking of college students is more active, and their channels for obtaining information are more extensive; At the same time, the influence of the external environment, the development of innovative thinking is

completely different. With the expansion of the scale of colleges and universities, how far is the student group, and their differences in intelligence, thinking, and emotions have led to differences in college students' awareness of innovation and learning abilities. Adopting traditional teaching plans and curriculum settings, there is a duplication of some content, not paying attention to the connection between courses and the transfer of knowledge, and ignoring the setting of interdisciplinary subjects, which leads to insufficient understanding of the frontiers of disciplines and lack of "new ideas" in knowledge reserves. "All these aspects have restricted the improvement of college students' innovative ability. Lack of initiative to explore and think actively.

4. INTEGRATING AND IMPLEMENTING SCIENCE AND TECHNOLOGY INNOVATION AND CURRICULUM DESIGN-COMBINING IOT TECHNOLOGY AND MACHINERY

The former Internet of Things technology is getting hotter and keeps the momentum of continuous development. Many countries are trying to apply the Internet of Things technology to the field of agricultural production. And China also attaches more importance to the study of this technology. China has clearly stated that we must focus on the development of agricultural modernization and continuously improve the development of agricultural mechanization. Therefore, as far as possible, the Internet of Things technology should be applied to the field of agricultural production in order to continuously enhance the comprehensive strength of China's agricultural development. With the rapid development of the rural economy in recent years, the demand for agricultural production for mechanization is becoming higher and higher, and the degree of automation of agricultural mechanization needs to be continuously improved.

In the design of agricultural machinery, strengthen the intelligence and precision of agricultural machinery, combine modern agricultural machinery with the Internet of Things technology, enhance the level of agricultural management and improve the efficiency of agricultural management. Taking the course design of Qiqihar University's School of Mechanical and Electrical Engineering in 2018 as an example, the integration and implementation process will be specifically introduced. The onion of Meiris District in Qiqihar City is listed as one of the top 50 green products in Heilongjiang Province. The Qiqihar Municipal Government and the Municipal Science and Technology Bureau have given great attention and support to the research on mechanized cultivation and picking of Meris onions.

Multifunctional onion screening machine is a highly practical agricultural machine, which can solve the problem of screening difficulties for the majority of farmers, greatly saving manpower, financial resources, energy, and improving work efficiency.

Before designing, students consulted a large number of relevant literature and combined many existing screening models. Because of many sorting machines on the market, due to the problems of large machine vibration and clogging of meshes by debris, the energy is not produced. This multifunctional onion screening machine designed

by students has advanced design, accurate classification and screening, safe and reliable work, and high production efficiency, which can meet the large demand for onion sorting in the agricultural market.

However, most of the existing onion screening machines are purely mechanical structures, which can only select the size, and cannot monitor and screen the factors that affect onion growth, such as temperature and humidity, based on the size. This design is to add the Internet of Things monitoring and screening module to the design of the original onion screening machine. The gratings are used to accurately sort to achieve onion classification and screening and rot screening.

In the early stage of the project, the students used the campus network to inquire about related papers and patents on the sorting machine device. High, can only be used in the workshop, not suitable for small household processing of agricultural production in China. Considering the Northeast field planting environment, the students obtained the principle model of the screening machine in the 2017 university student innovation and entrepreneurship project, and performed part modeling based on the UG 3D modeling software to obtain the 3D model of the screening machine.

In the middle of the project, the students improved on the original model and inserted the IoT screening module before the screening and packaging module to achieve the quality screening function of onions. The quality screening module is composed of an onion transfer tumbling mechanism, a visual image acquisition and analysis system, and a rejection mechanism. The onion transfer and tumbling mechanism includes mechanical devices such as twin screws, gear pairs, support frames, and electrical components such as stepper motors and motor drivers, which are used for onion transfer and surface deployment scanning; The vision image acquisition and analysis system includes CMOS image sensors, machine vision industrial power supplies, and embedded GPUs for the acquisition and analysis of onion surface images; The rejection mechanism needs to meet the requirements of smooth, fast, and continuous. In the industry, the short-distance rapid movement usually uses hydraulic / pneumatic transmission or electric cylinder design. A basic hydraulic transmission system consists of power components (oil pumps) and actuators (oil cylinders Or hydraulic motor), control elements (various valves), auxiliary components and working medium, etc., but the hydraulic transmission requires high maintenance, and the working oil must always be kept clean; The manufacturing requirements of hydraulic components are high, the technology is complicated, and the cost is high; The maintenance of hydraulic components is more complicated and requires a higher level of technology; Hydraulic transmission is more sensitive to changes in oil temperature, which will affect its working stability. For this hydraulic transmission system, there are many types of components required, and the maintenance is difficult, which is not suitable for the quality screening mechanism of a multifunctional onion screening machine. The commonly used electric cylinder is a modular product that integrates the servo motor and the screw. It converts the rotary motion of the servo motor into linear motion. Because it can convert the precise speed control, precise rotation number control, and precise torque control of the servo motor into The excellent characteristics of precise speed control, precise position control and precise thrust control can be used to achieve high-precision linear motion. Compared with hydraulic cylinders, electric cylinders do not require too much support from peripheral devices, have higher accuracy, and are more suitable for use in quality screening mechanisms of multifunctional onion screening machines.

Taking the Daiso project "Intelligent Design of Bus Stops" in 2018 as an example in figure 1, the intelligent research and design of bus stop signs based on the Internet of Things technology and wireless communication technology are proposed to meet the daily travel needs of passengers. This intelligent bus stop designed by students has a trash can at the bottom of the outer shell, a display screen on the front, and an ordinary stop or electronic stop below the display.

The content of the intelligent algorithm involved in the teacher's scientific research project is reflected in the use of the QR code on the outer shell to exchange coins. The student who designed the coin outlet started to have no ideas. Through repeated communication with the instructor, the eccentric cam and the connecting rod structure were organically combined. A coin outlet was set under the QR code, and the coin outlet was connected to the coin shell. Coins The bottom of the shell is provided with a coin pusher. The coin pusher is used in conjunction with the coin pusher. The lateral end of the coin pusher is connected to the eccentric cam. The eccentric cam finally designed is connected to the output shaft of the motor. The first half of the motor and coin pusher are housed in a load-bearing housing. A plurality of rebound springs are connected to the lateral end of the coin pusher plate in the load-bearing shell, and the function of exchanging a two-dimensional code for coins is finally realized.



Figure.1 Intelligent Design of Bus Stops
Feasibility suggestions for problem solving during the implementation of scientific research projects:

- 1.The study of professional knowledge and the grasp of basic theory are the basic guarantee for the cultivation of university students' innovative ability. The cultivation of college students' innovative consciousness and thinking must be guaranteed by the learning of basic knowledge. Only by further consolidating the theoretical foundation can we provide an innovative foundation for the sustainable development of college students.
- 2.Introduce the cutting-edge knowledge from the course into the classroom, so that students can fully understand the new developments in science, and indicate to students the problems that need to be researched and discussed, and let them explore by themselves, in order to broaden their horizons and stimulate students' interest in learning. By incorporating cutting-edge scientific research topics into the classroom, students' interest in scientific research is stimulated, and students' confidence in the research of practical problems is increased.

5. CONCLUSION

Integrate Daiso projects with the research direction of

teachers, explore engineering classroom teaching and curriculum design, and form an innovative talents training model for college students. In order to improve the scientific literacy of college students, as a model that can be promoted, related scientific research topics of other professional teachers can also be integrated into related big innovation projects. The content is rich and diverse. This model can be applied to various majors. The surveys and studies of the students who participated have shown that the students' innovative ability and innovative consciousness have improved, and they have become more interested in professional learning. The experience of participating in the project is regarded as the biggest gain in their learning career.

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