Research on the Cultivating Mode of Interdisciplinary Innovative Talents in Bionic Robots

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Abstract: Current scientific problems are becoming increasingly complex and need to be solved through the cross-penetration of disciplines. Cross-disciplinary collaboration has become an important way to solve the major problems facing mankind. Cultivating high-level innovative talents with interdisciplinary knowledge background has become an urgent need for talent training.. At present, the construction of interdisciplinary subjects in our country is still in its infancy and requires continuous exploration. This article discusses the current status of domestic and international interdisciplinary construction, analyzes the current problems in interdisciplinary construction, and proposes corresponding measures.

Keywords: Interdisciplinary; Discipline Integration; Curriculum Reform; Higher Education

1. Introduction

A new round of global scientific and technological revolution and industrial revolution has begun and accelerated, putting forward new requirements for the innovation capabilities of talents. In 2016, the Central Committee of the Communist Party of China and the State Council issued the "National Innovation-Driven Development Strategy Outline", which requires promoting educational innovation, reforming the talent training model, and integrating the cultivation of scientific spirit, innovative thinking, creative ability and social responsibility throughout the entire education process. the "China Education Modernization 2035" issued in 2019 once again clearly pointed out that it is necessary to innovate the way of talent training

and cultivate students' innovative spirit and practical ability. With the rapid development of information, a single professional curriculum system can no longer meet the society's knowledge needs for students. According to different subject types and innovative talent ability levels, the current innovative talent training for middle school students in the education field can be divided into four categories, as shown in **Figure 1**.
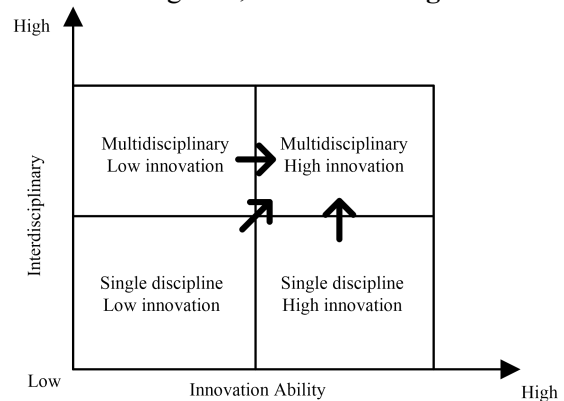

Figure 1. Current Status of Innovation Capability Training

Which are single subject-low innovation, single subject-high innovation, and multi-disciplinary-low Innovative, multidisciplinary -highly innovative. Among them, single subject-low innovation is the common current situation of cultivating innovative talents in traditional subjects. In traditional subject teaching, not only is the knowledge crossover weak, but there is also a lack of opportunities to cultivate students' innovative abilities. Although single-subject talent training represented by competitions in mathematics, physics, chemistry, mechanics and other disciplines can improve students' innovative abilities (high innovation in single subjects), the competition's selection threshold is high and it is difficult to popularize it among all

students. A study in Nature magazine showed that among the 88, 000 high-quality innovative scientific and technological papers published around the world, it was found that the cross-relationship between disciplines is getting closer and closer, which also shows that interdisciplinary innovation has gradually become the key to global scientific and technological development. trend. Therefore, the cultivation of interdisciplinary innovative talents is extremely important. [1-4]

2. Analysis of Domestic and Foreign Research Status

Looking at universities at home and abroad, the responsible units for talent training are generally established based on the administrative system. Related disciplines and similar research directions belong to different administrative units due to tutors, funds, platforms, and disciplines, resulting in interdisciplinary innovative talents. Barriers to cultivation. Take bionic underwater robotics as an example, which involves bionics, machinery, electronics, control, sensors, computers, networks, materials and other disciplines. They are all offered by different colleges based on their professional characteristics. There is a lot of overlap in basic course teaching, and professional courses are different. special. Chongqing University of Posts and Telecommunications, a domestic university, builds a base based on the concept of a large disciplinary platform to build solid platform conditions for interdisciplinary talent training. Based on the base, it cultivates talents in disciplines such as mechanical engineering and electronic science and technology, optical engineering, and information and communication engineering. As an example, we conduct a preliminary exploration of the practical process of talent training.

Taking Harbin Engineering University as an example, the department of Naval Engineering, Intelligence, Mechanical and Electrical Engineering, and Materials and Chemistry have all started courses related to bionic underwater robots, but they focus on different directions. the department of Marine Engineering mainly focuses on the directions of "Ocean Vehicle Design and Manufacturing" and "Fluid Mechanics", and offers courses such as "Ocean Robot Design", Ship and Ocean Engineering Fluid Mechanics", "Ocean Robot Environmental Perception", etc. the Intelligent college offers courses related to robot control, while the Mechanical and Electrical college mainly offers courses related to mechanical design and processing and manufacturing. This training model leads to certain limitations in students' acquisition of knowledge, making it difficult to comprehensively and systematically learn relevant theoretical and engineering knowledge about bionic underwater robots, which is not conducive to the cultivation of compound innovative talents.

The "Interdisciplinary Learning Project on Robots and Intelligent Systems", a project established by Princeton University, a foreign university, aims to introduce basic concepts to students through a set of organically combined required courses and elective courses, conduct in-depth discussions in the areas of interest to students, and prepare for future careers. Provide a platform for success. the project has two main aspects: Analysis, design and development of systems that automate manufacturing, transportation, health care, environmental work, scientific research, etc.; Utilizing concepts derived from cognitive and biological sciences, Creation of systems applied to learning, adaptation, decision-making, recognition, estimation and control.

At present, the training of interdisciplinary innovative talents is still in the exploratory stage, and there is no complete and comprehensive training system on how to cultivate innovative talents who can be compounded after starting school. This application project takes the direction of bionic underwater robots as an example, starting from the guidance of students' interests, establishing well-known professors in this field to give special lectures, so that students can understand the cutting-edge scientific development trends of bionic robots; building an interdisciplinary training team for bionic underwater robots based on the characteristics of the school, Form a complete interdisciplinary theoretical knowledge system of bionic underwater robots, establish a practical training model based on the school's scientific research platform, and build a training and testing model for bionic underwater robot core penetration talents.

Existing Problems:

The need for an interdisciplinary training team:

At present, in the work of interdisciplinary construction, there is a lack of professional interdisciplinary talent training teams to expand students' horizons and stimulate students' enthusiasm for learning, impart comprehensive and systematic interdisciplinary basic theoretical knowledge, and conduct high-level, It has unique teaching content and introduces the latest research results into teaching, emphasizing the coherence before and after the course to achieve integration.

It is necessary to form an interdisciplinary construction with school or regional characteristics: Analyzing the interdisciplinary research direction involves basic theoretical knowledge. How to combine the school's running characteristics and setting up an interdisciplinary theoretical knowledge system is a solution adapted to local conditions, which is helpful for giving full play to the advantages of the school or region. It is a great help, and it is also very important for students' enthusiasm and the school's long-term development of talent reserves.

Talent training evaluation standards need to be formed: the interdisciplinary innovative talent training model needs to be analyzed through long-term talent training results in order to optimize the innovative talent training model. Therefore, based on the evaluation of tutors and defense experts, interdisciplinary course results, and awards in scientific and technological innovation competitions, establishing evaluation standards for interdisciplinary innovative talent training that combines qualitative and quantitative aspects is a top priority for interdisciplinary training.

3. Reform Measures

Create a cross-learning talent training team: Led by the undergraduate school, actively communicate with the bionic robot research teams of various departments, form a multi-disciplinary cross-innovative talent training team for bionic underwater robots, and explore basic courses for bionic underwater robots Design ideas and formulate an interdisciplinary theoretical knowledge system for bionic underwater robots. In addition, we keep up with the cutting-edge scientific research on bionic underwater robots, actively contact domestic and foreign bionic underwater robot research teams, and invite well-known experts and professors to give lectures to students to broaden their horizons and mobilize their enthusiasm for learning.

Form an interdisciplinary talent training program: For the interdisciplinary direction of bionic underwater robots, practice is an important means to train innovative talents' hands-on ability. Actively discuss student practice with the bionic underwater bionic robot research teams of various departments. the course plan, with the support of the experimental platforms of each department, is based on instructors, and carries out practical courses on bionic underwater robots.

Establish evaluation standards for innovative talent training: Based on the evaluation of tutors and defense experts, scientific and technological innovation competitions, papers and multi-disciplinary course results, establish evaluation standards for interdisciplinary innovative talent training in the direction of bionic underwater robots. Adjust and optimize the innovative talent training model through qualitative and quantitative evaluation feedback.

Strengthen student enthusiasm: Encourage students to participate in various scientific and technological innovation competitions, summarize the practicality of students in solving practical problems in each course during the competition, and reset the experimental content of relevant courses. In practical teaching, tutors actively guide students to summarize research innovation and encourage students to publish high-level academic papers and apply for high-quality invention patents.

4. Conclusion

Interdisciplinary integration training is a major trend in future education and even science and technology development. It is also a trend in future talent training. It can cultivate a large number of high-quality, world-class talents. Although the current interdisciplinary training system is not perfect, we need to continue to explore and strive to establish a complete, high-level interdisciplinary training environment.

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