

# Strategies for the design and implementation of interdisciplinary courses in new engineering education

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**Abstract:** With the advent of the fourth Industrial Revolution, emerging technologies represented by artificial intelligence, big data and cloud computing are reshaping the global economic structure and social ecology. In the face of such changes, the traditional engineering education mode appears to be short, so the new engineering education arises at the right moment, and is committed to cultivating the compound talents who not only master the cutting-edge technology, but also have the interdisciplinary thinking ability. As the core link of the new engineering education, the importance of the interdisciplinary curriculum design is self-evident. This paper briefly analyzes the principles of interdisciplinary curriculum design in new engineering education, and deeply explores the strategies of interdisciplinary curriculum implementation in new engineering education for reference.

**Keywords:** new engineering education, interdisciplinary, curriculum design, implementation, strategy

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## Introduction

With the continuous progress of science and technology and the profound change of industrial structure, it is difficult for the traditional engineering education to meet the needs of the modern society for talent diversity, innovation and interdisciplinary ability. The emergence of new engineering education can cultivate high-quality engineering and technical talents with international vision, innovative spirit and practical ability. At the same time, the interdisciplinary curriculum design can break the disciplinary barriers, integrate the knowledge, methods and skills of different fields, form an organically integrated curriculum system, effectively broaden students' knowledge vision, improve the ability to solve complex problems, and realize the cultivation of students' innovative spirit and interdisciplinary thinking. Through the study of interdisciplinary courses, students can better adapt to the development needs of the future society, so as to become excellent talents with comprehensive quality and innovation ability.

## 1. Principles of interdisciplinary course design in the new engineering education

### 1.1 Requirements-oriented principles

As the core guiding principle of interdisciplinary curriculum design in new engineering education, the demand-oriented principle emphasizes that the starting point and destination of curriculum design should be oriented to meet the actual needs of economic and social development. Under the background of new engineering education, with the continuous progress of science and technology and the rapid change of the industry, the demand for talents is becoming

increasingly diversified and high-end. Therefore, the interdisciplinary course design must be based on the industry needs, enterprise needs and social needs, to ensure that the course content is closely connected with the practical application scenarios, and the trained students can quickly adapt to and contribute to the development of social economy. Course designers also need to conduct in-depth research and analysis of the current and future industry development trends, and clarify the industry's expectations for the skill requirements, knowledge structure and comprehensive quality of talents. Around these needs, the knowledge and methods of different disciplines are integrated to form a targeted teaching content and curriculum system. At the same time, we should also pay attention to the latest research results and technological progress of the academic community to ensure that the course content is forward-looking and innovative. Adhering to the principle of demand-oriented, the interdisciplinary curriculum design in the new engineering education can cultivate interdisciplinary talents with both solid theoretical foundation and practical operation ability. These talents can quickly meet the needs of economic and social development and make positive contributions to the promotion of scientific and technological progress and industrial upgrading.

### **1.2 Integration and optimization principles**

In the interdisciplinary course design in the process of engineering education, course designers to integrate optimization, abandon the traditional single subject thinking mode, the knowledge, methods and skills of different disciplines, to build a comprehensive, system, optimization of knowledge system, to broaden the students' knowledge vision, enhance their ability to solve complex problems, promote the intersection between disciplines, promote the development of scientific and technological innovation and industry. Under the guidance of the principle of integration and optimization, the curriculum designers should also conduct an in-depth analysis of the knowledge of each subject, find out the internal connection and common points between them, make reasonable curriculum arrangement and teaching methods, and organically combine the knowledge together. Learning in a broader knowledge background, students can better understand the mutual influence and role of different disciplines. At the same time, the course designers should also pay attention to the frontier and the latest development of the subject, and introduce the latest scientific research achievements and technological progress into the course, so as to keep pace with The Times, and cultivate students' innovative consciousness and ability. In a comprehensive, systematic and optimized learning platform, it can better adapt to the development needs of the future society, and become an excellent talent with interdisciplinary knowledge and innovation ability.

### **1.3 Practice and innovation principles**

In a comprehensive, systematic and optimized learning platform, it can better adapt to the development needs of the future society, and become an excellent talent with interdisciplinary knowledge and innovation ability. At the same time, course designers should also carefully design practical teaching links, such as experiments, practical training and projects, to ensure that students have enough opportunities to apply their theoretical knowledge to practical situations, and help students deepen their understanding of theoretical knowledge, cultivate practical ability and problem-solving ability. In addition, innovative elements should be integrated into the course, set up innovative problems, carry out innovative experiments, and organize innovation competitions, so as to stimulate students' enthusiasm for innovation, and cultivate innovative thinking and innovation ability. Through the implementation of the principle of practical innovation, the interdisciplinary curriculum design in the new engineering education can cultivate students' learning subjectivity and participation, improve their learning interest and enthusiasm, promote their all-round development, and then cultivate compound talents with innovative spirit to better meet the development needs of the future society.

## **2. Strategies for interdisciplinary curriculum implementation in the new engineering education**

### **2.1 Constructing an interdisciplinary curriculum system**

In order to realize the effective implementation of interdisciplinary courses in the new engineering education, it is necessary to build a high-quality interdisciplinary curriculum system, and on this basis, to break the barriers between traditional disciplines, and to integrate and optimize the knowledge, methods and skills of different disciplines. Curriculum designers should expand their own interdisciplinary knowledge background and vision, and gain insight into the internal connections and common ground between different disciplines. At the same time, a deep understanding of the actual needs of economic and social development, to ensure that the curriculum system can meet the needs of the industry, enterprises and society.<sup>[1]</sup> In the construction of interdisciplinary curriculum system, modular curriculum design should be adopted to integrate the content of different disciplines into each module to form an organic curriculum system. And focus on the connection and transition between courses, to ensure that students can smoothly transition from one course to another course in the learning process, forming a complete knowledge structure. In addition, in the construction process of interdisciplinary curriculum system, we should pay attention to the combination of theory and practice. Curriculum designers should design practical and innovative experiments, practical training and projects, so that students can learn in practice and practice in learning, and cultivate practical ability and innovative spirit.

## **2.2 Adopting diversified teaching methods**

In the implementation process of interdisciplinary curriculum in the new engineering education, diversified teaching methods should be adopted to adapt to the learning needs and styles of different students. First of all, through the introduction of talents, training existing teachers, build a have interdisciplinary background and rich teaching experience of teachers, let it through the design problem oriented teaching method, put forward the problem of interdisciplinary nature, guide students to further thinking and discussion, cultivate its critical thinking and problem solving ability, effectively stimulate the students' interest in learning and enthusiasm, improve their learning effect. At the same time, the method of case teaching can also be used to introduce real cases, so that students can learn interdisciplinary knowledge and methods in the process of case analysis, so as to help students better understand the practical application of theoretical knowledge and improve their practical ability and problem-solving ability. In the process, online teaching, group discussion, role play and other teaching methods also need to be adopted to meet the learning needs and styles of different students.<sup>[2]</sup> At the same time, curriculum designers should pay attention to the update and innovation of teaching methods, constantly explore more effective teaching methods, and improve the teaching effect of interdisciplinary courses.

## **2.3 Establishing an interdisciplinary teaching evaluation mechanism**

The implementation of the interdisciplinary curriculum in the new engineering education needs to establish a corresponding teaching evaluation mechanism. By formulating interdisciplinary evaluation standards and methods, we should pay attention to the evaluation of students' interdisciplinary knowledge and ability, so that they can comprehensively and objectively reflect students' learning results and comprehensive quality. Work presentation, oral report, group discussion and other evaluation methods are adopted to comprehensively evaluate students' interdisciplinary knowledge and ability, stimulate students' interest and enthusiasm in learning, and improve their learning motivation and participation. At the same time, teachers should establish a feedback mechanism for interdisciplinary teaching, collect feedback from students and teachers in time, and continuously improve and optimize the teaching content, teaching methods and teaching effect, so as to help course designers to find and solve the problems in teaching in time, and improve the teaching quality and effect of interdisciplinary courses.

In short, the interdisciplinary curriculum design and implementation strategy in the new engineering education is a complex and important topic. By constructing a scientific and reasonable curriculum system, adopting diversified teaching methods and establishing a teaching evaluation mechanism suitable for interdisciplinary courses, it can better promote the development of new engineering education and contribute to the cultivation of more excellent talents with innovative spirit and practical ability.<sup>[3]</sup> At the same time, teachers also need to deepen the interdisciplinary curriculum design and practical exploration, constantly reflect on and improve the interdisciplinary curriculum design and implementation methods, improve and optimize the curriculum system, so as to better adapt to the needs of economic and social development and

students' learning needs.

### **Conflicts of interest**

The author declares no conflicts of interest regarding the publication of this paper.

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