

# Exploration of Integrated Courses of Materials Subjects in Promoting Medicine-engineering Integration

Linghuan Gao<sup>1</sup>, Ning Qiao<sup>2,\*</sup>

<sup>1</sup>College of Basic Medical Sciences, North China University of Science and Technology, Hebei Tangshan 063210, China

<sup>2</sup>College of Materials Science and Engineering, North China University of Science and Technology, Hebei Tangshan 063210, China

\* Corresponding author

---

**Abstract:** Biomedical Materials Course is a medicine-engineering integration general education course of North China University of Science and Technology. The course is discussed to explore the effects of the materials course on the promotion of medicine-engineering integration. And a basic train of thoughts on how to improve the teaching methods is provided. Teachers of this course designed different version of teaching content and teaching logic according to students with different majors. Vary teaching methods, like online and offline mixed teaching, case teaching method, flipped classroom, were used in this course to inspire students' interest in learning interdisciplinary knowledge and improve the teaching effect.

**Keywords:** Biomedical Materials; Medicine-engineering integration; Interdisciplinary talents.

---

## 1. Introduction

In recent years, there have been more than 100 colleges and universities nationwide to carry out the "medicine-engineering integration" education. North China University of Science and Technology has actively carried out the construction of the "medicine-engineering integration" project in combination with the actual situation of the school, and established the construction principle of "all-round, multi-level, cultivating talents, strengthening scientific research, increasing services, and promoting integration". The College of Materials Science and Engineering of North China University of Science and Technology has opened a general course "Biomedical Materials" for the students of the whole university. In recent years, the teachers of the curriculum group have explored and practiced the curriculum teaching. Taking "Biomedical Materials" as an example, this paper discusses the role of material course teaching in promoting the construction of "medicine-engineering integration" and the reform of teaching methods [1-2].

## 2. Teaching Content Design

The main teaching content of "Biomedical Materials" course includes three chapters: Chapter1, Introduction to Medical biomaterials, teaching the concept of medical biomaterials, development history, sources and applications and other related basic knowledge; Chapter2, Biocompatibility and safety of medical biomaterials, teaching the interaction between medical biomaterials and organisms, the concept of biocompatibility and the safety evaluation method of biomedical materials, etc; Chapter3, Application of medical biomaterials, teaching the characteristics, preparation and application of medical biomaterials for various purposes[3].

In terms of the organization and arrangement of teaching content, it follows the cognitive rules of students from different disciplinary backgrounds. Considering the different knowledge systems and customary thinking modes of medical and non-medical students, teaching contents are integrated and optimized. For medical students who have relatively

weak knowledge base of engineering and science and lack basic knowledge background of materials science, the teaching of "Biomedical Materials" course needs to increase Chapter 1 and explain the relevant basic knowledge of materials in detail. For non-medical students with the basis of science and technology courses, such as students majoring in materials and chemical engineering, it is necessary to increase the class time of Chapter 2 in the teaching process, so that students can better grasp the basic knowledge of biology and medicine, so as to improve the learning effect of medical biological materials. For Chapter 3, medical biomaterials for various uses are taught. In the teaching process, according to the different professional backgrounds of students, it focuses on teaching the medical biological materials that are most suitable for students' majors, so as to stimulate students' learning interest. For example, for students majored in oral medicine, the emphasis is on polymer dental filling materials, oral binders, artificial dental materials, etc. For students majored in medical laboratory technology, anesthesiology and other clinical medicine majors, the emphasis is on teaching medical diagnostic materials. For students majored in pharmacy, it focuses on teaching pharmaceutical auxiliary polymer materials, such as drug sustained release and controlled release polymer materials.

## 3. Exploration of Teaching Method

### 3.1. Online and offline blended teaching

"Biomedical Materials" Courses are taught online and offline. In the course of teaching, teachers give priority to teaching and adopt different teaching ideas for students with different professional backgrounds. For students majoring in materials and chemical engineering, we start from the chemical composition and reaction principle of materials. For medical students, we start from the clinical application needs that students are familiar with. Before and after class, make full use of online multimedia resources. Many learning videos and other online course resources are produced and uploaded to help students make full use of fragmented time to improve learning efficiency and stimulate students' interest in independent learning. Build a platform for teachers to answer

questions and cross-disciplinary student exchanges, guide students to communicate and discuss among majors, and meet students' learning needs of interdisciplinary integration.

### **3.2. Case teaching**

The teachers of the research group take the teaching content of "Biomedical Materials" Courses as the subject matter library, design teaching cases, construct and form three types of teaching case libraries, namely, "scientific research feeds teaching", "curriculum thinking and politics" and "innovation and entrepreneurship", implement case-based teaching, promote the construction and development of teaching quality connotation. The teachers of the curriculum design a case of "scientific research feeds teaching" based on their own scientific research achievements. Scientific research feeds teaching, promotes interdisciplinary integration, and trains students to become innovative talents with "medical and material combination". The teachers insist on innovation and entrepreneurship education reform to cultivate students' innovative spirit and practical ability. Establish the teaching goal of innovation and entrepreneurship, and cultivate the students' innovation and entrepreneurship awareness and ability of "medical and industrial integration".

### **3.3. Student active participation**

The course of "Medical and Industrial integration" focuses on the cross-disciplinary integration and cultivates students' interdisciplinary learning interest. In the teaching of Medical Biomaterials, flipped classroom is adopted to enhance

students' participation in classroom teaching, activate the classroom atmosphere and stimulate students' interest in learning. At the same time, students are encouraged to set up interest groups, and cultivate interdisciplinary learning ability with interest as the driving force.

## **4. Conclusion**

Interdisciplinary integration plays an important role in cultivating innovative talents. Based on the "Biomedical Materials" Courses teaching, it explores the teaching and practice methods of "medicine-engineering integration", and contributes to the training of interdisciplinary talents with strong adaptability and high comprehensive quality.

## **5. Funding**

The authors acknowledge the financial support received from the Hebei Higher Education Teaching Reform Research and Practice Project (2022GJJG613); 2020 North China University of Science and Technology Education Reform Research and Practice Project (L2048).

## **References**

- [1] Willam D.Callister, David G. Rethwisch. Materials science and engineering an introduction. John Wiley & Sons Inc.
- [2] Harry R. Allcock. Introduction to materials chmestry. John Wiley & Sons, Inc., Hoboken, New Jersey.
- [3] Bradley D. Fahlman. Materials Chemistry. Springer Dordrecht Heidelberg London New York.