International Journal of Innovation and Research in Educational Sciences
Volume 11, Issue 2, ISSN (Online) : 2349–5219

Teaching Reform of Discrete Mathematics Course Based on the Concept of OBE under the Background of "Internet+"

Jing Lei[1*], Jia-Qing Song[2] and Bo-Ye Li[1]
[1]School of Mathematics and Statistics, Taishan University, Tai'an 271000, China.
[2]Experimental Teaching Management Center, Taishan University, Tai'an 271000, China.
*Corresponding author email id: elizabethia@126.com

Date of publication (dd/mm/yyyy): 14/03/2024

Abstract **– In the Internet era, the deep integration of "Internet+" with classroom teaching and the continuous exploration of new ways to effectively improve the quality of teaching have become the focus of curriculum teaching reform. Discrete Mathematics is the core basic course of computer-related majors, which is beneficial to the improvement of students' abstract thinking ability, logical thinking ability and inductive construction ability, but it also has the characteristics of strong theory, high abstraction and single assessment method. In order to solve the above problems, according to the teaching model of Outcomes-Based Education (OBE) that organizes, implements and evaluates education centered on expected learning outcomes, the teaching reform of Discrete Mathematics is proposed. In order to achieve the training goals and graduation requirements, the teaching reform and practice are carried out from the aspects of teaching content design, teaching method innovation and assessment method improvement, so that students can use the basic principles of Discrete Mathematics to solve engineering problems, so as to achieve the educational goals of "student-centered, output-oriented" and continuous improvement.**

Keywords **– Teaching Reform, Discrete Mathematics, OBE, Internet+.**

I. BACKGROUND AND SIGNIFICANCE

1. *Research Status at Home and Abroad:*

With the application of technologies such as the Internet, big data, cloud computing, and blockchain, as well as the popularization of various new media, people's work, study and life are undergoing tremendous changes in the "Internet +" era. Higher education needs to deeply integrate curriculum teaching with Internet technology, reform the teaching model, and achieve sustainable development. How to take "Internet+" as an opportunity to realize the teaching reform of discrete mathematics curriculum is the core issue of this project.

The concept of Outcomes-Based Education (OBE) is a structural model that organizes, implements, and evaluates education centered on expected learning outcomes. The OBE concept has been recognized by the American Accreditation Council for Engineering (ABET) and is integrated throughout the accreditation standards for engineering education. In June 2016, China became a signatory to the Washington Accord, and in order to implement the educational concept guided by the OBE of the Washington Accord, more and more colleges and universities in China have carried out the teaching reform of undergraduate certification in engineering education to improve students' ability to analyze problems and solve practical engineering problems.

Discrete mathematics is one of the important branches of modern mathematics, and since 1977, discrete mathematics has been recognized by IEEE as the core core course of computer science majors, and plays an important role in the basic theoretical support of the curriculum system of computer science majors. Discrete mathematics courses are the foundation of many subsequent computer science courses, and are closely related to

both computer hardware and software. This course is not only conducive to cultivating students' logical thinking, abstract thinking, formalization, inductive analysis, mathematical modeling and other abilities, but also conducive to cultivating students' ability to comprehensively use the knowledge they have learned to solve practical problems, and have the courage to explore and innovate.

Through years of teaching experience and literature analysis, it is found that discrete mathematics has the characteristics of many conceptual theorems, strong theory and abstraction, and it is difficult for students to learn, mainly due to the following reasons:

(1) *Traditional Teaching Content*

When teaching discrete mathematics courses, teachers usually focus on theoretical knowledge and logical expression, ignoring the relationship between the teaching of this course and the industry in the context of the Internet, and students' interest and enthusiasm in learning are relatively low.

(2) *Outdated Teaching Methods*

The traditional teaching method of discrete mathematics is the theoretical derivation method that runs through the teaching process based on board books, ignoring the introduction of relevant background knowledge, not giving full play to the guiding role of pre-requisite courses (such as C language programming) in this course, and lacking the cultivation of students' ability to connect theory with practical application in professional fields.

(3) *Single Assessment Method*

The traditional teaching assessment method focuses on abstract logical reasoning and theoretical derivation, which cannot stimulate students' enthusiasm for learning, does not provide students with more time and space for independent learning, and lacks the initiative of active exploration and learning.

It can be seen that the current situation of discrete mathematics course teaching has reached a situation where it must be reformed, and it is urgent to reform the traditional teaching form through the concept of outcome-oriented education (OBE) in the context of the "Internet+" era, so as to improve the teaching quality, enhance the teaching connotation, and cultivate students' theoretical, scientific research and engineering practice ability.

2. *Significance of Project Research*

Under the background of "Internet+", the reform of discrete mathematics teaching curriculum based on the concept of OBE has the following three significances:

(1) *Enrich the Teaching Content of the Course*

Teachers can use a variety of Internet tools and means to guide students to enrich their knowledge reserves, so as to stimulate students' interest in learning, improve learning autonomy, and absorb more teaching content.

(2) *Present New Teaching Models and Methods*

Give full play to the role and advantages of online teaching resource platforms, and flexibly use online and offline blended teaching, which is in line with the needs of the development of the education model in the new era and the direction of reform.

(3) *Promote New Learning Methods*

With the help of mobile devices such as smartphones, laptops, and tablets, teachers and students can flexibly and conveniently discuss, interact and learn freely and flexibly through WeChat, learning groups, learning websites and other public learning platforms, using MOOCs, micro-courses, video and audio, PPT and other forms, giving birth to a new type of learning in the new era.

II. Research Content, Objectives and Problems

1. *Research Content:*

(1) Keep pace with the times, optimize and update the teaching content.

The traditional teaching content is mainly based on basic principles, rarely teaches the application of discrete mathematics, does not have computer experiments, and does not establish the connection between the main content and the graduation requirements, which cannot effectively meet the graduation requirements. In the context of the Internet, the teaching of discrete mathematics courses needs to keep pace with the times, take OBE as the concept, take the teaching goal as the guide, incorporate new theories, new technologies and new achievements into the teaching process, and optimize and update the teaching content.

(2) Create a multi-modal teaching method with students as the main body.

The original teaching method was offline cramming, which affected students' learning initiative, and there were few opportunities to apply discrete mathematics to solve practical problems, and the teaching effect was not ideal. In order to achieve the goal of cultivating learning ability and strongly support the graduation requirements, the traditional teaching methods are reformed, and the teaching methods of diversification, multi-mode combination, and student-centered are added.

(3) Results-oriented, build a diversified assessment and evaluation system.

The traditional assessment method of theoretical courses is mainly based on the final closed-book examination, which basically calculates the total evaluation score according to the usual score (20%) + final score (70%), and the final total score is difficult to objectively evaluate the student's mastery of knowledge. Therefore, in the assessment and evaluation of discrete mathematics courses, the proportion of online learning in the final grades is increased, and the effect and completion of students' online learning are assessed with the help of the Wisdom Tree MOOC platform and the Chaoxing homework platform.

2. *Research Objectives:*

In the teaching reform of discrete mathematics courses, with "Internet +" as the background of the times, new information-based teaching methods and tools are fully explored, and the OBE education concept is introduced. The reform and exploration of assessment and evaluation have continuously stimulated students' interest in learning, motivated students to actively participate in the teaching process, and improved students' independent learning ability, so that students can have the expected learning results after completing the study of discrete mathematics courses, and have achieved certain results, providing ideas and methods for promoting the teaching reform of discrete mathematics courses.

3. *Key issues to be Solved:*

(1) How to optimize the teaching content with the times;

(2) How to create a multi-modal teaching approach;

(3) How to build a diversified assessment and evaluation system.

III. Reform Program Design and Problem-Solving Approaches

1. *Reform Plan Design:*

Under the background of "Internet+", the teaching reform of discrete mathematics course based on OBE will make full use of information-based teaching methods and tools, introduce the OBE education concept, and carry out reform and practice from three aspects: teaching content, teaching methods, and assessment and evaluation methods. These include:

(1) Optimize the teaching content based on the teaching goal. According to the teaching objectives, teaching content and teaching design of discrete mathematics course, the corresponding teaching implementation plan is proposed, and the teaching content is optimized, flexibly configured, reasonably reshaped, and new teaching content is added according to the training objectives.

(2) Student-centered and blended teaching mode. In order to better achieve the teaching objectives of the discrete mathematics course, the "Discrete Mathematics (Shandong Alliance)" platform of the Wisdom Tree MOOC platform made by the team of teachers is used to establish an online and offline blended teaching mode, which tracks and analyzes the data throughout the learning process, and adjusts the content and evaluates the learning according to the learning situation of the students. Based on the learning outcomes, the teaching model is designed, and the learning outcomes are ultimately achieved through the teaching process. Fully explore the intrinsic connection between each knowledge module of the discrete mathematics course and the follow-up professional courses, take the teaching content and requirements as the outline, take the students as the center, and design the teaching from the three dimensions of knowledge acquisition, ability cultivation and quality improvement, so that each learner can have the knowledge and ability required for the follow-up professional courses and independent work after graduation.

(3) Results-oriented, build a diversified assessment and evaluation system. The teaching evaluation of the OBE concept focuses on the learning outcomes, and pays more attention to the usual learning process, and its assessment and evaluation are composed of two parts: process evaluation and summative evaluation. The final evaluation consists of a final examination, in which the objective questions focus on the students' flexible application of knowledge points, and the subjective questions focus on the students' ability to analyze and solve problems, and the proportion of process evaluation and final evaluation is not less than 50% and no higher than 50% respectively.

2. *Ways to Solve the Problem:*

(1) Optimize the teaching content: reshape the teaching content, connect the chapter content, improve the systematization of the knowledge system, increase interesting and situational mathematical problems, stimulate students' interest in learning, increase the computer-based experimental class to improve students' practical ability to design programs, increase the analysis of practical application problem solutions, cultivate students' ability to open their minds, think independently, use network tools to collect, and cooperate and communicate, add the development history of discrete mathematics, discrete mathematics

culture, the introduction of scientific and technological achievements has imperceptibly instilled ideological and political education and enhanced professional self-confidence, scientific literacy and patriotic feelings.

(2) Create multi-mode teaching methods: use the Internet teaching platform to carry out online and offline blended teaching methods to increase the time and space for students' independent learning, realize interesting teaching with modern means, promote in-depth learning with problem-driven, promote personalized teaching with a variety of discussion and communication methods, increase experimental and practical teaching methods, and cultivate students' innovative practical ability and Internet thinking mode.

(3) Construct a diversified assessment and evaluation system: online learning accounts for no less than 20% of the final grades, and the effect and completion of students' online learning are assessed with the help of the Wisdom Tree MOOC platform and Chaoxing homework platform; the assessment ratio of ordinary grades and computer experiments is 30%, which assesses students' learning attitude and completion of usual classes and experiments; and the proportion of final exams is not higher than 50%, and the test questions include subjective and objective question types, which assess students' mastery of basic theoretical knowledge.

IV. Innovations and Expected Results

1. *Innovation:*

(1) Comprehensively reflect the teaching reform ideas of the new era.

On the one hand, the research of this project follows the guiding ideology of science and engineering courses with the "discipline system" as the clue, and takes concepts and theories as the main line throughout the knowledge structure of the research results. On the other hand, in order to highlight the cultivation of comprehensive application ability of technology, strengthen the practical application ability and practical operation and skill training, in order to focus on the training of students' practical ability, the training of students from a solid grasp of basic knowledge to learn the positioning, analysis and solution of practical problems is gradually cultivated.

(2) Comprehensively reflect the achievements of the new teaching reform.

The reformed teaching content, teaching methods, and assessment and evaluation system of this project not only integrate ideological and political education, but also integrate the characteristics of "Internet +", including teaching network platform, teaching resources, etc., combined with the characteristics of the new era, new forms, new tools, and new methods, which improves students' interest in attending classes and reading textbooks in the Internet era, helps teachers imperceptibly implement innovative teaching reform ideas, and fully embodies the characteristics of information teaching reform in the new era.

(3) The content and form of research results are suitable for the characteristics of undergraduate higher education.

The research results of this project comprehensively demonstrate the basic ideas, methods and practical problem-solving skills of the teaching reform of discrete mathematics courses, and the teaching content is organized from shallow to deep, step by step, which is not only convenient for students' active learning, but also conducive to improving students' practical problem-solving and programming operation ability. Solving

practical application problems and programming ability, cultivating students' comprehensive ability, reflects the characteristics of undergraduate higher education.

(4) It has a wide range of reference value.

All computer-related majors in colleges and universities at home and abroad offer discrete mathematics courses with different course natures, and discrete mathematics is also one of the major courses in many domestic postgraduate examinations. It can be seen that the research results of this project can not only provide valuable experience for the teaching reform of this course in our university, but also play a reference role in the teaching reform of this course in sister universities.

2. *Expected Effect:*

At the same time, the project team will also comprehensively sort out and summarize the experience of teaching reform, write and publish high-level papers, and compile high-level teaching materials, so that the results of the project can be more widely promoted and applied.

V. Scope of Implementation and Promotion of Application Value

1. *Scope of Implementation:*

The teaching reform carried out by this project will be piloted among the undergraduate students of the college, and after the successful experience, it can be gradually implemented in the relevant majors of the whole university.

2. *Promote the Value of the Application:*

The research results of this project can be promoted in other universities and related majors, and the benefits will be expanded, with strong promotion and application value, strong practical significance and operability.

VI. Summary

The "Internet+" classroom teaching model has brought new vitality to the teaching of "Discrete Mathematics". Through the teaching content that keeps pace with the times, the educational concept of "student-centered, outcome-oriented" and continuous improvement, and adapts to the requirements of professional certification of engineering education, the teaching of "Discrete Mathematics" is reformed to improve students' independent learning ability and solve complex problems in the field of computer engineering. In the future research, we will continue to make efficient use of the Internet, explore the teaching methods of "Internet + Curriculum Ideology and Politics" and "Internet + Engineering Education Certification", and provide more possibilities for personalized and intelligent teaching exploration.

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AUTHOR'S PROFILE

First Author
Jing Lei, Corresponding author, received the B.S., M.S., and Ph.D. degrees from Ocean University of China, in 2003, 2007, and 2010, respectively. She is a professor at Taishan University. Her research interests include educational administration, teaching management.

Second Author
Jia-Qing Song, Received the Bachelor from Shanghai University of International Business and Economics in 1991. He is an experimenter at Taishan University. His research interests include educational administration, teaching management. email id: jiaqing_song@126.com

Third Author
Bo-Ye Li, Received the Bachelor from Chungnam National University in 2017, and Master's and Doctoral degrees from Pei Chai University in 2019 and 2022, respectively. He is now a lecturer at Taishan University. His research interests include educational administration, teaching management. email id: liboye@tsu.edu.cn