Research on the Teaching of Discrete Mathematics Course in the Context of Talent Cultivation of Applied Big Data and Artificial Intelligence Professionals

Dai Wei

School of Tourism Data, Guilin Tourism University , Guilin, Guangxi, China

Abstract: Discrete Mathematics is an important basic theoretical course for big data and artificial intelligence majors. In order to cultivate application-oriented big data and artificial intelligence talents suitable for economic and social development, aiming at the positioning of Discrete Mathematics in the professional knowledge system of big data and artificial intelligence, we strive to cultivate students' abstract thinking and logical thinking ability in teaching, and pay attention to training students' ability to solve practical problems with the knowledge of Discrete Mathematics and the ability to solve problems in relevant professional courses. Based on the analysis of the present situation and defects of discrete Mathematics teaching, this paper probes into how to integrate practical teaching, the connection of relevant courses, the combination of teaching and research, ideological and political education into discrete mathematics teaching, and the reform of assessment methods.

Keywords: Discrete mathematics; Practical teaching; Curriculum cohesion; Integration of teaching and research

1. Present Situation and Defects of Discrete Mathematics Teaching

1.1 Contradiction Between Teaching Content and Teaching Period

At present, the teaching content of Discrete Mathematics mainly includes mathematical logic, set theory, graph theory, algebraic system and other knowledge systems, which are rich in content, and the relationship between knowledge systems is not close. The teaching content has the characteristics of many concepts, theorems, formulas, strong theory and logic, but the teaching period is very limited, leading to the giving up of some important teaching contents, further making the knowledge incoherent, and the practical course has no time arrangement. In the case of Guilin Tourism University, its two majors of data science, big data technology and artificial intelligence have set up the course of Discrete Mathematics, with a total of 51 class hours. The teaching content only includes propositional logic, first-order logic, relationship, graph, tree and other chapters, and some of these chapters are not taught.

1.2 Teaching Model Tending to Be Theoretical

The teaching content is too theoretical, which is the basic situation of discrete Mathematics teaching in most universities at present. [1] Some of the teachers are mathematics teachers, who do not know much about the relationship between big data and artificial intelligence courses, and are easy to turn discrete Mathematics into pure mathematics courses, so that students are passively infused with a large number of concepts, theorems, formulas and mathematical proof skills, making the "mathematical flavor" permeate the whole classroom. Because of the lack of organic combination with the specific problems of the major, the phenomenon of "learning without using" is caused, which makes students unable to apply the knowledge of "discrete mathematics" to the study of subsequent professional courses.

1.3 The Assessment Method Tending to Be Mathematical

The current situation of most colleges and universities is that "Discrete Mathematics" is biased towards the mathematical examination method. Limited by the teaching conditions, especially the laboratory conditions, the test of application ability and practical ability has a small proportion in the assessment of discrete Mathematics, or even no. Students only use

mathematical theoretical deduction to cope with the usual homework and exam papers, so that the assessment results can not truly reflect the students' mastery of discrete Mathematics, which also brings difficulties to the subsequent professional courses.

2. Reform of Discrete Mathematics Teaching

By combining discrete Mathematics with interesting examples in life, with some practical applications in big data and artificial intelligence majors, or with curriculum ideology and politics, students can deepen their memory, understanding and application of knowledge. Teachers use a variety of ways to explain teaching content in teaching, so that students can master those concepts, theorems and formulas with strong "mathematical flavor" in a relaxed and pleasant atmosphere, and can feel that "learning can be used", and help students further deepen their understanding of the corresponding knowledge points in the course. Let students deeply understand the role of discrete Mathematics in solving practical problems and the basic role in the relevant courses of big data and artificial intelligence majors. Through the combination of teaching and research and discipline competitions, students can further understand the role of discrete mathematics and take the initiative to learn in the application of knowledge, so as to achieve the goal of "teaching" and "research".

2.1 Taking Practical Problems as Cases for Teaching Activities

The traditional teaching mode is "concept → theorem → proof → example problem". This pure mathematics teaching method makes students face a series of mathematical concepts, theorems and formulas, which makes students feel boring and at the same time ignores its application background and practicability. By elaborately designing some problems that students may encounter in their daily life and can stimulate their interest in learning, knowledge can go out of the classroom.

For example, when explaining propositional reasoning, you can design the following quotation:

A detective investigating the theft of a diamond necklace from a jewelry store based on the following facts:

(1) Salesperson A or B steals a diamond necklace;(2) If A commits the crime, the crime

is committed outside business hours;(3) If the proof provided by B is correct, the container is unlocked;(4) if the proof provided by B is incorrect, the offence was committed during business hours;(5) The container is locked. Q: Who stole the diamond necklace?

Take this example as an introduction, let the students discuss and infer who stole the diamond necklace, let the students feel the ambiguity of natural language to express a thing, and then let the students think: is there a better and more concise way to help us infer? Curiosity prompts them to participate in the learning of theoretical knowledge more actively, and finally solve problems with theoretical knowledge, so that the whole knowledge learning forms a closed loop, and also makes the high mathematical problems enter the daily life. How to solve the problems encountered in practical work is also a problem that students are interested in, and the problems encountered in future work can be designed as follows:

There will be an important meeting in the company tomorrow. There will be seven people attending the meeting, but they come from different countries and can speak different languages. The leader asks you to arrange a round table meeting and try to ensure that everyone can talk with people from both sides. b: Speak English and French; c: Speak English, Italian and Russian; d: Speak Japanese and Chinese; e: Speak German and Italian; f: Speak French, Japanese and Russian; g: speak French and German.

This topic is a more common problem in the work, you can give students some time to try to arrange it, tell their own solution ideas: to point to represent the participants, to line to indicate that the participants can communicate with each other, then the problem is abstract as the following graph:
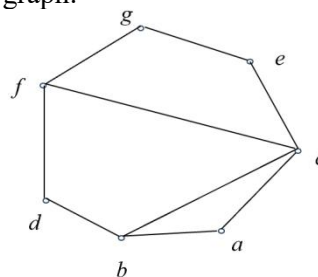
Figure 1. Discussion Communication Relationship Diagram

The graph shows that everyone can communicate with people on both sides through reasonable arrangements. Thus, the concept of

graph is introduced, and when the graph is explained to connectivity, the knowledge of graph theory is applied to solve the problem, so that students can compare their own processing methods and the difficulty of solving the problem with the knowledge of graph theory.

2.2 Strengthening the Linkage with Other Professional Courses

Big data and artificial intelligence major "Programming language", "Digital circuit", "Data structure", "Operating system", "Database technology", "Compilation principles", "Algorithm analysis and design", "Computer network" and other courses are based on "discrete mathematics". The construction of "new engineering" emphasizes on strengthening students' application ability and strengthening practical teaching links. At present, the teaching of discrete Mathematics in most universities is still in the stage of only explaining theoretical knowledge and lacking practical teaching links, which does not meet the requirements of the training of applied big data and artificial intelligence professionals in the context of "new engineering ". Under the teaching mode that only focuses on the explanation of theoretical knowledge, students' understanding of Discrete Mathematics only stays at the level of pure mathematical theory, but they cannot transform theoretical knowledge into application ability and practical ability. The disconnection between theoretical knowledge and applied practice is not conducive to the improvement of students' professional ability.

It is necessary to make students feel the relationship between discrete Mathematics and other courses in the learning process, so that students no longer think that this course seems to be independent within the curriculum system, and in terms of its internal chapters, it is also "discrete". Therefore, it is necessary to establish connections with other professional courses in teaching, especially courses with more practical content, so that students can truly feel the basic theoretical role of discrete Mathematics in big data and artificial intelligence professional courses.

Table 1. Linkage of Relevant Knowledge Points of Discrete Mathematics and Data Structure

Discrete mathematics teaching chapter	Data structure-related knowledge points
set operation	Storage logic of the elements and the collections
binary relation	Relational database, table structure design, Data query, relationship decomposition
picture	Deep first traversal, breadth first traversal, Adjacent matrix storage method, adjacent table storage method
tree	Abstract data type of the tree, iterate recursion method, Hierarchical traversal algorithm, the Huffmann algorithm

In the case of Discrete Mathematics and Data Structure, the teaching activities of Discrete Mathematics tend to be theoretical and focus on cultivating students' logical thinking ability and abstract thinking ability, while the teaching activities of Data Structure tend to be practical and focus on cultivating application ability and practical ability, and there are a lot of experiments in the teaching activities. Discrete Mathematics provides ideas and methods for mathematical model construction and practical problem solving for the course of Data Structure. Based on the theoretical derivation of Discrete Mathematics, Data Structure focuses on data types, algorithm design and time and space complexity analysis of algorithms [2]. In some colleges and universities, two courses are arranged in one semester, and teachers who teach the two courses can "learn from each other" in the course design. The theory of Discrete Mathematics course is used as the theoretical basis for the practice of Data Structure course, and the practice link of Data Structure course is used as the application scene of Discrete Mathematics theory, so that professional courses are woven into a net and twisted into a rope, so that students in the theoretical learning and practical teaching can really grasp and understand professional knowledge, and enhance professional ability.

2.3 Teaching Activities Being Combined with Curriculum Ideology and Politics

Curriculum ideology and politics is a comprehensive educational concept that integrates morality and intelligence. In the teaching of curriculum ideology and politics, it is necessary to study the educational objectives of different disciplines according to the

characteristics and advantages of different disciplines, deeply explore and refine the ideological value and spiritual connotation contained in the professional knowledge system, and scientifically and reasonably expand the breadth, depth and temperature of professional courses. From the perspectives of majors, industries, countries, nations, cultures, and histories involved in the course, the course should increase its knowledge and humanity, and enhance its leading, contemporary, and open character. Excavate the ideological and political elements contained in the curriculum, and integrate them into the classroom teaching in a silent way, so that students not only gain professional knowledge and ability, but also make the curriculum have the function of cultivating students' correct outlook on world, life and values, guiding students to strive actively, and turning them into the constructors and successors of socialism with Chinese characteristics in the new era with all-round development of morality, intelligence, physique, beauty and labor. To design interesting and natural ideological and political points in the curriculum, so that the "mathematical flavor" can be dispersed, which requires teachers to dig deeply. At the same time, the curriculum ideological and political design can also be used as students' after-class practice, so that teachers and students can participate in it.

In the case of the structural dilemma in logical reasoning, when explaining the formula $(A \to B) \wedge (C \to D) \wedge (A \vee C) \Rightarrow (B \vee D)$, we can design the course thinking and politics cleverly, taking Fan Zhongyan's sentence in "Yueyang Lou Ji" : "How can I try to seek the heart of ancient Ren, or do the two different things?Not happy with things, not with their own sorrow, the temple is high, then worry about its people;Where rivers and lakes are far away, worry about its king.Is into also worry, withdraw different worry;But when will you be happy?" To explain the formula, to help students memorize and understand the formula. First let the students read aloud, and then let the students think about what is the dilemma Fan Zhongyan encountered. Let the students know that Fan Zhongyan dilemma is high in the temple, then worry about its people and place rivers and lakes far, then worry about its king, resulting in Fan Zhongyan also worry, withdraw different worry. Using mathematical logic language to describe the dilemma Fan Zhongyan faced, symbolized as:

A: occupy the temple;B: Worry about the people;C: Far away from rivers and lakes;D: Worry about its king, so "the temple is high, worry about its people;Where rivers and lakes are far away, worry about its king.There are also worries about progress, but there are also worries about retreat. "The symbolic representation is $(A \to B) \wedge (C \to D) \wedge (A \vee C) \Rightarrow (B \vee D)$.

Fan Zhongyan is in a contradictory state of "high in the temple" and "far away from the river and lake" in his political life.Then came the question, "But when will you be happy?"The question.Explain here, and ask the students again: how does Fan Zhongyan solve the contradiction?Tell students Fan Zhongyan finally to "first the world worry and worry" the noble thought to solve this dilemma.

This combination of mathematical theory proof and curriculum thinking and politics should be used frequently in the course teaching of discrete Mathematics.Clever course design, so that the original "math flavor" of the classroom, become relaxed, and full of positive energy.

2.4 Teaching Mode Combining Teaching and Research

College students' participation in scientific research has a positive impact on improving their cognitive ability, course learning ability and fostering their sociality [3].In order to meet the requirements of the national "double first-class" universities, all colleges and universities strongly support students to participate in various competitions. "Interest is the best teacher", how to cultivate students' interest in discrete Mathematics, so as to improve students' enthusiasm and initiative in learning and improve the teaching effect, is a problem that teachers need to think about in teaching. The combination of teaching and research is a feasible way. Teachers can be interest-oriented, combine students' interests with relevant content in majors such as big data and artificial intelligence, organically integrate relevant hot issues with classroom teaching content, and guide students to analyze and solve problems with their professional knowledge. In addition, teachers can also combine their own research fields to introduce cutting-edge topics into the classroom, so as to achieve the effect of linking theories with cutting-edge subjects [4].In this way, students can not only understand the

important role of theoretical knowledge in the development of the discipline, but also enable them to contact the frontier of the development of the discipline as soon as possible, so as to cultivate their interest in scientific research and exercise their scientific research ability. Finally, on the basis of teaching and training, students are encouraged to participate in mathematical contest in modeling and other related competitions, and students are guided. In addition to enhancing students' professional ability, teachers' teaching and scientific research ability are also enhanced.

2.5 Adopting Diversified Assessment Methods Based on Application Ability Training

The traditional assessment method is "regular score + final exam score", which is composed of attendance and homework. Scientific and reasonable assessment methods can not only objectively test the degree of students' mastery of curriculum knowledge, but also stimulate students' learning initiative and enthusiasm, and improve the learning effect. As a basic professional course, the assessment of discrete Mathematics should break the traditional and relatively single assessment method, and adopt more diversified assessment methods on the basis of focusing on cultivating students' application ability. The content of the usual score assessment can include theoretical homework, experimental homework, course papers, ideological and political design, online test, and micro-course design applied in the course of discrete Mathematics. The content of the exam paper should also pay more attention to the assessment of the ability to deal with practical problems. Let students feel that learning "discrete mathematics" is useful, reflecting its basic role, and finally achieve the goal of training them to comprehensively apply knowledge to solve problems.

Table 2. Scientific Research Cases Based on Discrete Mathematics

discrete mathematics	Research cases
assemble	Design and implementation of K-means cluster analysis based on set theory
Mathematical logic	Research on optimization of digital circuit design based on mathematical logic
Binary relation	Research on data protection methods based on equivalence classes
figure	Research on image compression algorithm based on Huffman coding
The tree	Intelligent management system of tourist attraction information based on decision tree

3. Conclusion

Discrete Mathematics is an important basic professional course for majors such as big data and artificial intelligence. It is rich in content, rigorous in theory, logical and widely used. This paper introduces how to combine teaching activities with practical problems, other professional courses, scientific research, curriculum ideology and politics, and how to reflect students' application ability in the course assessment, which provides some references for teaching activities.

References

[1] HE Kun. The reform of discrete Mathematics teaching content under the new engineering education [J]. Computer Era, 2022 (5) : 82-84.

[2] Song Huina, Teng Xuyang. A Preliminary study on the teaching strategy of linking Discrete Mathematics and Data Structure courses [J]. Public Science and Technology, 2022 (24) : 156-159.

[3] Wang Qingxian, Gu Xiaofeng.The cultivation of scientific research Literacy of undergraduate students in discrete Mathematics courses promoted by research [J]. Computer Education, 2021 (4) : 140-142.

[4] Liu Mian, Zhang Jiping. Research on future classroom teaching model from the perspective of virtual reality [J]. China Audio-Visual Education, 2018 (5) : 30-37.