

Practical Exploration of Probability and Statistics Curriculum Incorporating Mathematical Modeling Ideas

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Abstract: With the improvement and development of mathematics subjects, more and more mathematics ideas are integrated into it. Traditional learning methods can no longer meet the current requirements of mathematics learning for students, especially in probability and statistics courses, the role of mathematical modeling thinking is becoming more and more prominent. This article mainly studies mathematical modeling ideas, and puts forward some suggestions for integrating mathematical modeling ideas into probability and statistics courses.

Keywords: Mathematical Modeling; Probability and Statistics; Thinking; Curriculum

1. The importance of integrating modeling ideas into probability statistics

Probability and statistics courses have a certain degree of practicality, and students must master a solid foundation of probability and statistics. However, the past teaching methods can no longer meet the needs of current education and training. They can only help train students to learn probability and statistics. In order to cultivate students' ability to use probability and statistics knowledge and master diversified mathematical thinking, professionals are beginning to improve teaching methods. The idea of mathematical modeling is the product of this foundation. The idea of mathematical modeling is a learning method for students in the process of learning mathematical knowledge. It enables students to use mathematical thinking flexibly, combining mathematical probability and statistics with common problems in life. In addition, teachers can also use other tools to help conduct probability and statistics experiments, such as widely used multimedia support facilities, improve teaching methods, and promote open learning.

1.1 Change traditional teaching methods and explore new educational models

Practice has proved that traditional teaching methods can no longer meet the needs of society and the requirements of modern teaching. The combination of mathematical modeling and probability and statistics can bring new elements to the traditional teaching mode. Combining relevant cases to choose heuristic teaching mode to realize the basic concepts and related methods of probability and statistics, and enable students to learn mathematics. Changing passive learning into active learning can deepen the understanding of probability statistics and modeling ideas.

1.2 Actively use different methods and skills in learning

Different methods and skills should be actively used in the process of mathematical modeling. This is why teachers should actively allow students to impart relevant knowledge in the process of learning and using modeling skills, explore the background and process of problems, and improve students' autonomy creativity. In addition, students should not be confined

to sufficient problems when they practice, and should always study problems that lack research conditions. It should also include the analysis and modeling of materials, information and data itself, and reflect more abstract problems to improve their learning interest and learning ability. In addition, teachers should continue to carry out discussion courses, actively express their suggestions, strengthen communication and learning with students, and enable students to continue to grow in an open learning environment. To enable students to understand what they have learned, textbooks should be designed as exercises for training students. Generally speaking, the content of probability statistics is too theoretical, and the arrangement of sequential and targeted exercises does not conform to the basic characteristics of students, and even some Textbooks are too difficult to design exercises, and students have great difficulties in learning, and they may lose interest in probability statistics and mathematical modeling. From a practical point of view, probability and statistics as a mathematics textbook, exercises are very important, and a large number of exercises can learn logical thinking. Therefore, when compiling textbooks, the exercises should be classified from the simpler to the deeper to meet the basic needs of different levels and objects. In the existing probability and statistics exercises, it is necessary to add a system that reflects the idea of mathematical modeling. At the same time, data statistics, data adaptation and other applicable probability cases and statistical cases have been added to the textbooks, so that students can learn mathematical modeling, enrich extracurricular knowledge, and improve applicability to a certain extent.

2. How to integrate mathematical modeling ideas into probability and statistics courses

2.1 Teachers' teaching models and teaching concepts must break the tradition

In traditional probability and statistics teaching, the teacher's task is only to explain the theoretical knowledge clearly, and students can use this knowledge to do homework and exams. Cultivating students' ability to use mathematical knowledge to solve practical problems is an important goal of college mathematics. The idea of using theoretical knowledge to solve practical problems is the core of mathematical modeling. From the National Student Mathematical Modeling Competition in the past ten years, it can be seen that the content of the competition includes a large amount of probability and statistics knowledge, such as lottery mathematics, automatic lathe management, higher education fees, etc., and the content of probability statistical models is also a lot of theoretical knowledge, such as Geometric probability model, variance range, parameter estimation, hypothesis testing, regression analysis, etc., in order to better teach students the basic theories of probability and statistics, applying the mathematical modeling ideas and methods in probability models to the general background of probability statistics is very necessary. What needs to be reminded is that the integration of mathematical modeling concepts should be carried out step by step, as far as possible in combination with existing courses, to complete the embodiment of the leading role of mathematical modeling concepts. To avoid excessive class hours and increase the burden on students, mathematical modeling must be combined with existing teaching content, which requires teachers to combine theoretical knowledge with practical applications in teaching.

2.2 Teaching content should be appropriately broadened

In the teaching of probability and statistics, we should not be limited to the textbooks. We should expand the scope of knowledge under the guidance of the basic theories of the textbooks. Considering the close connection between knowledge and real life, cultivating students' ability to analyze and solve problems is very necessary for students who do not have knowledge. This can not only guide students to deepen their understanding of mathematical knowledge, but also expand their thinking, thereby changing the existing way of thinking, improving and updating knowledge, and will have a profound impact on future learning and scientific research. Teachers should collect, sort out, and transform some mathematical modeling problems closely related to the students' own vision and professional characteristics, and pay attention to the openness and scalability of the problems; for example: in the mathematical expectation teaching of random variables, we will encounter an interesting For example, "The Tips of Newsboys" raises an interesting question: Newsboys buy newspapers from newspaper offices every morning, assuming that $a > b > c$ sells newspapers at night to earn ab , and then use the newsboy to compensate bc . Newsboy buys too many newspapers every day, and if he fails to sell them, he will lose money. If he buys too few newspapers every day, he will get less money. This requires a newspaper buying plan to plan the number of newspapers he buys every day to maximize his income. Encouraging students to think about learning, to a large extent can improve students' thinking ability.

2.3 Update teaching methods and methods to reflect modeling ideas

In the past, the application of theories such as definition theory, case theory and practice theory made it difficult for students to understand the process of discovering theories in the objective background of definitions. Practical experience tells us that teaching without problem is meaningless. Therefore, a more flexible and open way of learning mathematical modeling in probability and statistics courses is particularly important. You need to use different analytical techniques to help students learn. Therefore, when teachers conduct knowledge exchange, they should not use textbooks as the standard, but actively guide students to independently understand the background of the problem, consult relevant materials, and improve students' self-study ability, so as to achieve "teaching as the guide and learning as the mainstay" the goal. For example, in the chapter "Random Events and Probability", when we are studying the probability calculation formula of the geometric probability model, we need to expand students' horizons and thinking, fully supplement the mathematical boundary, and add new concepts, new ideas and new methods. And encourage students to have topic discussions and group discussions, encourage students to ask questions, and cultivate the ability to communicate and learn. You can ask students to consider the question: Arrange for two people to meet in the park on Saturday night from 9: 00 to 10: 00, and agree that the first person to arrive will have to wait 20 minutes. If it exceeds this time, the first person will leave. What is the probability that the two will meet? Since students often have appointments, this question will arouse their great interest, which will lead to controversy. First of all, starting from the general principles of the geometric model, the model is established through discussion, then the students are allowed to discuss, and finally the teacher will explain, so that the problem is solved, and the students will have a deeper understanding of the geometric model. The teaching content should be used in computer breakthroughs. Multimedia teaching methods and teaching concepts can be used for experimental teaching. Complete experiments such as statistical conclusions, data processing and simulation, image description, and curve adjustment in mathematical software such as MATLAB and SPSS. Statistical experiments can not only reflect the whole process of mathematical modeling of probability theory and statistical knowledge, but also achieve the purpose of simplification and abstraction, and improve students' ability to analyze and solve problems.

3. Conclusion

Probability and statistics is a practical subject. In order to achieve good results, many students passively choose to memorize knowledge points in the process of learning probability and statistics. This will lead to a decline in students' interest in learning, and cannot fundamentally guarantee students' the improvement of innovation ability. Integrating the idea of mathematical modeling into probability and statistics makes learning practical and theoretical, to a certain extent, promotes the innovation and reform of probability and statistics courses, and fundamentally promotes the development of probability and statistics.

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