The Incorporation of Mathematical Modelling Theory in Teaching Probability Statistics

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Abstract: Probability statistics are critical in the entire teaching system. Many mathematical ideas are incorporated into the subject of probability statistics, which fundamentally promotes the innovation of probability statistics. In probability statistics, incorporating mathematical modeling ideas into teaching concepts and changing the past teaching method will help students develop their innovative abilities. In this paper, the teaching significance of incorporating mathematics modeling thought in mathematics probability statistics is expounded, and relevant innovation measures are put forward.

1. Introduction

With the continuous development of science and technology, the knowledge base is constantly being updated, and traditional teaching methods can no longer meet the needs of this society. In such a fierce social competition environment, the students' knowledge development is also more and more important, and teachers' teaching requirements are also getting more and more. While teaching basic knowledge, teachers should also pay attention to students' all-round development, strengthen students' ability to compete and innovate, and promote students' all-round development. According to the current teaching environment, traditional teaching methods can no longer meet the requirements of this era. Students cannot effectively master and understand new ideas in the process of learning knowledge. To solve this problem fundamentally, it is necessary to combine practical cases with teaching to promote students' all-round development. Probability statistics are very important in the student's learning life and they are widely used in their future work and life. In order to enable students to learn probability statistics better, mathematics modeling ideas are introduced into probability statistics teaching. Mathematical elements are introduced in teaching to increase students' interest in learning and to strengthen the understanding and mastery of students' knowledge of probability and statistics.

2. The Significance of Incorporating Mathematical Modeling Theory into Probability Statistics Teaching

Introducing mathematical modeling theory into probability statistics teaching can improve the teaching quality of probabilistic statistics teaching, improve the enthusiasm for students' learning, and cultivate students' application ability and innovation ability. Through the incorporation of mathematical modeling theory, we can cultivate students' ability to solve problems, enable students to understand mathematical modeling and solve practical problems in life by using mathematics. Teachers use examples of mathematical modeling in the teaching process and combine them with probability statistics to leave students with profound influence and improve their enthusiasm for learning. Creating conditions for the development of young teachers, and cultivating the personal teaching style of young teachers It is conducive to the improvement of students' learning and is of great help to the mathematical modeling contest.

Probability statistics have the characteristics of practicality and theory, and have become an important part of mathematics subjects. In recent years, cultivating students' mathematics applications has gradually become a key direction in mathematics teaching. Using modeling to solve practical problems. As one of the important courses in higher education, the probability

statistics course is widely used and has been gradually applied in the fields of economics and psychology. With the continuous deepening of mathematical modeling, major universities have conducted in-depth research on mathematical modeling ideas and methods. The idea of integrating mathematics modeling in the probabilistic statistics curriculum is an important breakthrough point of the solution in theory and practice.

3. The Principles of the Incorporation of Mathematical Modeling Theory and Probability Statistics Teaching

Mathematical modeling is the investigation of specific issues, the collection of data, the study of the regulations between data, the seizure of issues, the formulation of hypotheses, and the existence of relationships between the problems and results through experiments. In simple terms, it is to use mathematical theory knowledge to solve practical problems in life. Integrating mathematics modeling in teaching can not only improve students' ability to solve problems, but also has a very profound display significance. When combining mathematical modeling ideas with probability statistics teaching, the following points need to be noted:① The mathematical models of different majors are different, so the design of mathematical modeling ideas should be related to the same profession as far as possible.②Choosing the reality and perfecting the combination of mathematical modeling and teaching content.③Choosing computer-related mathematical models to improve students' computer skills.④When the right mathematical model is combined with the curriculum, the focus should be highlighted;⑤It must be as close to life as possible and linked to reality. In the teaching process, university teachers collect and sort out the characteristics of different majors in their spare time, choose mathematics modeling problems that are close to the student's life, combine them with the features of mathematical modeling, and try to design some novel and reasonable problem situations for students to solve, stimulate students' curiosity, so as to improve their learning efficiency.

4. The Application of Mathematical Modeling in Probability Statistics Teaching

Training students' mathematical modeling ability is to enable students to use mathematics knowledge to solve real-life problems. For students of science and engineering, fully cultivating their own mathematical modeling capabilities can quickly solve the practical problems encountered in their professional fields. In the process of cultivating mathematical modeling ability, students' innovation ability has been further improved. In the process of cultivating students' mathematical modeling capabilities, it is necessary not only to set up specialized courses related to mathematical modeling, but also to integrate mathematical modeling ideas in other basic teaching courses. In basic teaching, teachers should allow students to fully understand the importance of mathematical modeling methods and actively integrate mathematics modeling ideas into the teaching content. In the teaching process, adding appropriate mathematical modeling cases. Through the explanation of practical problems, students' interest in learning can be stimulated while learning new knowledge and students' ability to solve problems could be developed. Probability statistics and mathematical theory is a basic course in the process of science and engineering learning. The traditional teaching mode is to use the concepts and formulas in textbooks to teach courses, thus ignoring the practical problems in life. Introducing appropriate mathematical modeling cases in probability statistics teaching. Inspire students' interest in learning and change students' thinking through the new concept of teaching. The following are detailed understanding of specific mathematical modeling cases.

Case 1: For example, a traffic accident occurred in a city and the driver escaped after the accident. According to the witnesses, the vehicle was a blue taxi. Since the taxis in the city are only blue and green, probability statistics have been applied to the colors of the two taxis in the city after the possibility of committing other city taxis has been ruled out. Two colors account for 80% and 20%. Witnesses' accuracy of blue-green identification is above 95%.①Calculate the probability that witnesses determine the color of any taxi;②Calculate the probability that the police will check the

green taxi based on the eyewitness's description. Through the practical problems in life, the probability statistics are discussed. It is necessary to use the basic knowledge of probability statistics to establish a suitable mathematical model, and then to calculate it through the computer software. Such problems can not only enable students to experience the fun brought about by mathematical modeling, but also inspire students to learn the probabilistic statistical theory, so as to improve students' ability to solve problems.

Case 2: When explaining the basic knowledge of probability statistics, join the idea of mathematical modeling and use the colloquialism as a relevant teaching example. Taking "The three stooges" as an example, the idea of the three heads can be smart as one Zhuge Liang, indicating that the effect of cooperation among multiple people is relatively effective. Introducing this kind of practical problems into the teaching of probability statistics to prove whether this idea is correct through scientific method. First, establish a suitable mathematical model based on specific issues. The main discussion is whether there is a big difference in the ability of solving problems between multiple people and one person. Using probabilistic statistics to solve problems. Using a to show Zhuge Liang's ability to solve problems, b indicates the ability of three cobbler to solve problems. Calculating the probability of solving each problem independently by each headscarf, and C=(b1)=0.45, C=(b2)=0.6, C=(b3)=0.45. The probability of Zhuge Liang solving the problem is C=(a)=0.9. d indicates a smooth solution to the problem. Then Zhuge Liang's probability of solving the problem is C(d)=C(a)=0.9. The probability that the three heads can solve the problem is P(d)=P(b1)+P(b2)+P(b3). According to the basic formula in probability statistics: P（d）=P（b1+b2+b3）=P（b1）+P（b2）+P（b3）-P（b1b2）-P（b2b3）-P（b1b3）+P（b1+b2+b3）, And P（b）=0.901. Therefore, the probability that three heads are able to solve problems smoothly is more than 90%. The problem is confirmed. In this process, students can find the joy of learning in mathematical modeling, learn probabilistic knowledge in a relaxed and enjoyable classroom, and get closer to life, thereby increasing students' interest in learning probability statistics.

5. The Important Role of Mathematical Modeling in Probability Statistics Teaching

5.1. Integrating mathematical modeling into after-school exercises in probability statistics

In the study of any discipline, the practice and mastery after class is the key to improving the performance of the subject. It is an important part of consolidating the important part of knowledge, and it is also an important process that cannot be ignored in the teaching content. The content of probability statistics is very pertinent and its characteristics are obvious. In the actual teaching process, students should be organized to participate in various social practices so that the learned knowledge can be used in real life. Therefore, the arrangement of after-school exercises puts the idea of mathematical modeling into the classroom to improve students' practical ability and ability to solve problems. Allow students to classify the height and weight of classmates in the class, or conduct random surveys on the students of the college. Using statistical knowledge to analyze the difference in height, and propose corresponding solutions; Or doing statistics on sports in the school and do an analysis of the students' favorite sports. In the process of completing the exercises after class, the students will be grouped to experiment and use teamwork to complete the work. Completing the course content through practical activities. In the process of student solving problems, not only can they understand the thought of mathematical modeling, but also have a deep grasp of relevant knowledge of probability statistics. Through scientific statistics and analysis to solve practical problems in life, so as to cultivate students' comprehensive ability.

5.2. Incorporating mathematical modeling theory into the teaching concepts of probability statistics

Using specific practical cases to incorporate a large number of realistic learning materials. Importing mathematics modeling ideas, choosing appropriate teaching cases according to students' professional. For example: the probability of a lottery winning; the probability of insurance compensation; the probability of a car accident and the probability of critical diseases. Let students

master the origin of probability statistics through practical life cases, laying the foundation for the application of mathematical modeling in probability statistics; Making students to find problems and discuss them in groups. Assigning some interesting, real-life-related questions and ask students to collect data in practice, organize problems and solve problems. An overview of the problem using the methods of probability and mathematical theory could be obtained. Through real situations, students participate in the case in real time, so that students really feel that they are the protagonists of problem solving, and thus have a sense of accomplishment; The use of modern scientific and technological means allows students to use computers to perform experiments related to probability statistics. In the process of collecting data, collating data, and analyzing data, the ability to solve problems is gradually improved, and the use of computers is improved.

6. Conclusion

In the teaching of probability statistics, the idea of mathematical modeling is slowly introduced into teaching, and students' mathematical modeling ability is cultivated, which is an innovation in teaching. Mathematical modeling can not only stimulate the initiative and enthusiasm of students' for learning theory, but also bring interest to them, thus it could train students' comprehensive ability.

References

[1] Liqiong Ma. the Application of Mathematical Modeling in the Course of Probability Statistics [J].New Education era(for Teachers),2017,(43):259.

[2] Xionghua Wu. Application of probability statistics in mathematical modeling -- Taking the 2012 National Undergraduate Mathematical Contest in modeling (undergraduate group) A as an example [J].Journal of XiangNan University,2015,(5):77-79.

[3] Siyuan Ma. An Example of the Application of Mathematical Modeling in the Teaching of "Probability Statistics" [J].Modern Economic Information,2014,(20):412-412.

[4] Guilan Liu, Honglei Ji, Suzhen Huang et al. How to Infiltrate the Thought of Mathematical Modeling in the Curriculum of "Probability Statistics" [J]. Education Forum,2015,(5):274-275.

[5] Yujie Wu. Discussion on the significance of mathematical modeling ideas in mathematical probability statistics [J]. Ability and Wisdom,2014,(26):142-142.

[6] Ling Zhang, Wei Xu, Dongxia Zhao, et al. An Analysis of the Integration of Probability and Statistics into Mathematical Modeling [J]. Natural science journal of Harbin Normal University,2014,30(2):5-8.

[7] Lifeng Zhang. Exploration on the reform of probability statistics course integrated with mathematical modeling thought [J]. Education Forum,2014,(46):145-146,147.