ISSN 2616-5805 Vol. 4, Issue 1: 52-55, DOI: 10.25236/AJMS.2023.040108

The application of statistics in the teaching of advanced mathematics

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Abstract: *Advanced mathematics is one of the compulsory courses in the process of college learning, but its knowledge is obscure and difficult to understand, and the access threshold for learning is high, which also has a certain impact on students' learning. The introduction of statistics in the classroom of higher mathematics will help students understand the knowledge of higher mathematics. Based on this, this paper discusses the development of higher mathematics and statistics, and analyzes the similarities between higher mathematics and statistics, laying a solid foundation for the application of statistical knowledge in higher mathematics teaching, and puts forward some countermeasures for the use of statistical knowledge in higher mathematics teaching, with a view to providing help for teachers' teaching work.*

Keywords: *Statistics; Advanced Mathematics; Teaching Process*

Advanced mathematics has certain difficulties for most students with relatively weak mathematical foundation, especially the extremely important theorem proving and some difficult measuring problems. If students do not do a good teaching and analysis at the initial stage of learning, they will be difficult to apply flexibly. Therefore, the introduction of certain statistical expertise in the teaching process of advanced mathematics can improve students' understanding of basic knowledge, fully arouse students' interest in learning, and complete the teaching of higher mathematics under this premise.

1. Overview and development of statistics

Statistics is a science that provides quantitative research and cognitive methods for statistical activities. These methods involve the basic principles and principles of statistical work, the accounting and analysis used in the statistical process, the organization and management methods of statistical work, etc. They constitute the statistical science system and different statistical branches. Statistics is a science of cognitive methodology that explores how people collect data, integrate data, and analyze data in order to make inferences with certain credibility[1].

People are used to associating the quantitative characteristics of scientific research objective phenomena with quantity. The statistical analysis embodied in specific time, space and other conditions is called authenticity statistics, while the statistical process of scientific research statistical data collection, summary, synthesis and analysis methods is called methodology statistics. On statistics not only reflects the differences in the understanding of human thought, but also reflects the inevitable results of the historical development process. At first, the research of statistical methods was always combined with the quantitative analysis of practical problems, so early statistics were substantive statistics with objective phenomena as the main body.

In the course of higher mathematics education, teachers must be able to constantly innovate their teaching methods to mobilize students' enthusiasm for learning. The current teaching curriculum reform has strongly advocated the new type of classroom teaching. In the new type of classroom teaching, students can participate in the classroom more widely.[2] In the process of learning, if students encounter problems or knowledge points that they do not understand, they can directly consult teachers, and students' dominant position in the classroom has been highlighted. In this way, students can not only improve their own learning quality, but also teachers can find out the weak understanding of students in the learning process or their own lack of teaching, and then make improvements. Statistics is also a major branch of mathematics curriculum, which mainly focuses on the law analysis of random event quantities. Many fields involved in this course, ranging from various theories to probability theory, can be regarded as basic courses in the field of statistics. Statistics is widely used in human production and life, which provides a lot of convenience for the development of people's career.

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2. Problems in Higher Mathematics Teaching

2.1 Students have weak foundation and low interest in learning

The subject of higher mathematics has the characteristics of high abstraction and rigorous logic. For students with weak mathematical foundation, it is difficult to learn higher mathematics, which also leads to students often encounter some obstacles in the process of learning higher mathematics, thus reducing students' interest in learning, and even some students will have resistance. In the process of higher mathematics, although students with high learning awareness and good academic performance can often understand the classroom teaching content and solve relevant problems skillfully, they are still difficult to practice their basic mathematical knowledge and problem-solving skills, so they cannot flexibly apply the knowledge they have learned[3].

2.2 The teacher's classroom teaching mode is relatively simple

Most of the higher mathematics teachers graduated from the mathematics major, with a solid mathematical foundation, but also have a strong teaching and research ability. However, teachers who have been teaching theoretical courses in schools in the past are more accustomed to subject based teaching because of the influence of teaching characteristics and their own knowledge structure. Therefore, teaching is generally the main task in the classroom, while students' learning is relatively passive.

In addition, teachers' teaching methods are also slightly monotonous, and there is no good explanation of relevant teaching examples, which also makes the classroom interaction and interest of higher mathematics teachers relatively lacking, and further highlights the characteristics of higher mathematics teachers who are too theoretical, unable to learn or master. This is also the most critical problem in the current teaching process of higher mathematics, so teachers need to fundamentally solve this problem and effectively enhance students' enthusiasm for learning.

3. Difference analysis between statistics and advanced mathematics

3.1 Similarities between Statistics and Advanced Mathematics

Statistics and advanced mathematics, as two subjects in mathematics curriculum, have their commonalities in many aspects. On the one hand, statistics and higher mathematics have the same theoretical basis. As higher mathematics research is a required course, it has infinite theories that can deal with a large number of mathematical phenomena, and statistics is also an indispensable part of all mathematical courses.[4] It plays an irreplaceable role and has extremely special value in problem research and processing. Because both of them take data as the main research object, they can be considered to have the same theoretical background. Through observation or use of existing statistical data, and detailed analysis, we can grasp the law of changes in the interrelationship of some objective problems, and find the correct method for problem processing. In addition, statistics and higher mathematics research also have similarities in problem processing. Whether it is statistics or the basic course of higher mathematics, learners are required to master all necessary knowledge and explore the possible correlation between various data, such as functions, inequalities, etc., to solve a series of problems in the field of economic management. Although their teaching stages are separate, they are equally important for students' mathematical research.

3.2 Differences between Statistics and Higher Mathematics

In theoretical analysis, there are roughly two differences between statistics and advanced mathematics. On the one hand, there are some differences between them in terms of calculation formula. The calculation formula contained in statistics is relatively simple. As long as it collects a large number of data, it basically solves the problem by using the established statistical formula on the premise of summary. The calculation formula of higher mathematics research is relatively difficult, and also has the corresponding multi facet. It not only includes the methods of limit calculation and combination of number and shape, but also has the corresponding auxiliary line method and formula rule. In addition, the learning contents of statistics and advanced mathematics also have certain differences. Although the two have important similarities in basic theory and problem solving direction, they still have a big difference in the key content they require to study. The field of statistics can

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mainly include mathematical statistics and economic statistics. Mathematical statistics belongs to the main branch of the field of mathematics, while the field of economic statistics tends to apply statistical theory knowledge to production practice. And it focuses on the statistical laws and probability analysis methods of economic things. The key content required by the Institute of Higher Mathematics is the abstract operation of differential, function, vector, linear and other problems. The content is theoretical and is the main basis for mastering other courses.

4. The role of statistics in mathematics teaching

4.1 Guide students to establish good statistical awareness

Data thinking refers to the mathematical thinking that studies and evaluates the general nature and development trend of information after synthesizing, sorting out and arranging a large number of information materials in an orderly manner. It helps students combine images and data and cultivate their logical thinking agility and problem solving efficiency. Therefore, increasing the higher mathematics education for students can enable students to form good statistical ability, so that students can consciously use statistical thinking to study and deal with corresponding mathematical problems, so as to improve students' mathematical ability and interest.

4.2 Provide students with ideas for solving problems by combining numbers with shapes

The combination of numbers and shapes refers to the method of solving problems by combining the application of graphics with the processing of graphics. It is a new mathematical concept that teachers must apply to in the practice of mathematics. Guiding students to establish a correct concept of combination of numbers and shapes will help students improve the application level of combination of numbers and shapes, and help students further understand the connection between various mathematical knowledge, thus mobilizing students' enthusiasm for learning mathematical knowledge. Statistics is a course that requires learners to sum up certain results in the research and operation of statistical results based on statistical knowledge. Therefore, in the process of statistics teaching for students, students can be provided with a method to solve problems by combining numbers and shapes, so that students can flexibly solve and cope with relevant mathematical education problems.

5. The Application of Statistical Methods in Mathematics Curriculum

5.1 Using Image Thinking in Statistics to Construct Mathematical Models

Since the birth of mathematics, the combination of number and shape has been fully used in the teaching of mathematics, and still shows its strong vitality today. In order to improve the classroom teaching quality of teachers in the basic courses of higher mathematics, teachers should apply the idea of combining numbers with shapes, which is very common in statistics, to the educational practice of higher mathematics. Teachers should help students understand and verify the basic theorems in some advanced mathematical theories by establishing these mathematical models.

Graphic thinking is an important thinking module that must be used in mathematics courses. Strengthening the training of mathematical graphic thinking can not only improve students' statistical cognitive ability, but also stimulate their spatial thinking ability about graphics, so that they can have a good sense of relaxation and pleasure after mastering the knowledge points about geometric graphics. The teaching of basic statistical knowledge is mainly the drawing of statistical methods. Only by accurately identifying the differences of various statistical methods and drawing clear statistical graphs, can the improvement of basic statistical knowledge level have a solid quality foundation. Therefore, in the specific classroom teaching process, mathematics teachers should adopt the method of guiding students to draw statistical data together to stimulate students' graphic ideas, so that students can find more interesting mathematical knowledge from the drawing of different statistical methods.

5.2 Simplify the Proof of Higher Mathematics by Using Statistical Knowledge

There are many theorems in the research of higher mathematics, and these theorems are the important foundation and skeleton of modern mathematics education. Without the support of these mathematical education theorems, the research of higher mathematics will be difficult, or even

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disappear. For school teachers, the proof of these theorems is always a difficult point in teaching, because if school teachers still use traditional teaching methods to guide the whole process of teaching, students are likely to feel boring because the steps are too boring or repetitive, or even have a weariness of learning, and take the initiative to give up this knowledge. Teachers integrate statistical knowledge into higher mathematics, so that students can further spread their ideas on the basis of mastering the meaning of the questions, effectively enrich their knowledge structure in the process of thinking and exploring problems, thus increasing the possibility of reaching reasonable conclusions. For the more common inequality proof with considerable problems in the field of higher mathematics, they can also reasonably introduce statistical knowledge points, Let students have a more simple and clear proof idea in the process of answering such questions.

For example, when dealing with practical statistical problems, in the face of data tables of each specific situation, teachers of higher mathematics can enable students to study some effective information that can be obtained in the actual statistical data. When dealing with data problems of specific situations, teachers can also guide students to further analyze and evaluate the actual value of data information involved in the problem, So as to improve students' understanding of the practical significance and necessity of data knowledge.

5.3 The Application of Statistical Methods in the Evaluation of Higher Mathematics Teaching Quality

In addition to the integration with statistics, the method of statistical analysis can also be used in the assessment of higher mathematics teaching quality. In general, in the evaluation of higher mathematics achievements, it is necessary to comprehensively consider the achievements of each subject, so as to draw a more accurate evaluation conclusion. In this way, the use of multiple data analysis can make a very clear judgment on its education effect, and the research conclusions can also have some reference significance for future classroom teaching optimization. Through the effective application of statistics, teachers can clearly grasp the students' learning situation and their own shortcomings in teaching. In this way, they can fundamentally find solutions, so as to enhance the enthusiasm and learning ability of students in learning higher mathematics.

6. Conclusion

Higher mathematics has its inherent characteristics, such as high abstraction, thorough thinking logic and extensive application, which has become one of the subjects that perplex many students. As one of the key components of modern mathematics, statistics has an important enlightening effect on the innovation of higher mathematics teaching. In order to ensure the high efficiency in the teaching process of higher mathematics, teachers can introduce a certain amount of statistical logic thinking in the teaching link, which can help students expand their thinking, get rid of fixed thinking, stimulate students' interest in learning, and obtain excellent results.

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