

Teaching Reform and Practice of Statistics Course Based on the Cultivation of Students' Innovation and Practice Ability

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ABSTRACT

Mathematical statistics and application is a degree course for postgraduates majoring in science and engineering. It mainly introduces statistical methods and their application in practice. With the advent of the era of big data, the course is widely used in practice and plays an important role in scientific research. At present, there are some problems in traditional course teaching, which is not conducive to the cultivation of students' innovation and practice ability. Based on this, we carry out the teaching reform from the teaching content, teaching mode and assessment method, and achieve good teaching effect.

Keywords: Innovation and practice ability, Statistics course, Reform in education.

1. INTRODUCTION

According to the viewpoint of dialectical materialism epistemology, the process of students mastering knowledge is a kind of cognitive process in essentially. On the basis of practice, it follows the route from vivid intuition to abstract thinking, and from abstract thinking to practice. The cognition of students in teaching is a special cognitive process, which students grasp the book knowledge accumulated in human history under the guidance of teachers. This determines that integrating theory with practice should become one of the basic principles of teaching.

2. PROBLEMS IN STATISTICS TEACHING

The course of mathematical statistics and application is a degree course for postgraduates majoring in materials science and engineering, mechanical engineering and civil engineering in University of Jinan. The main purpose of this course is to enable graduate students to use statistical methods for experimental design, mathematical modeling and data processing. In scientific research and scientific experiments, when the amount of data is large, it is unrealistic to process the data manually. How to use the classical statistical methods (such as orthogonal experimental design, multiple regression

analysis and multiple statistical analysis) and effective statistical software to process the experimental data scientifically is very important. In the teaching process of traditional statistics courses, the main problems are as follows:

(1) The statistical basis of graduate students is poor. Most science and engineering graduate students have only studied a little statistical theory in the undergraduate stage, and have no contact with statistical software, so their ability to process experimental data is poor.

(2) It is difficult for postgraduates to study statistics courses. The course of mathematical statistics and application is planned for 48 class hours. The content of the course is many, and the proof of statistical theorem is complex, and the idea of statistical method is difficult to understand.

(3) There are few teaching cases combined with practical problems, and the graduate students have poor ability of applying statistical methods to mathematical modeling and solving practical problems, and lack of innovation ability.

Based on the above problems, it is necessary to reform the course of mathematical statistics and application. Integrate the application of statistical methods, statistical theory and statistical software, and integrate theory with practice. Students can not only understand the relevant statistical theory, but also use the

statistical methods and statistical software to solve scientific research problems, so as to continuously improve the innovation and practice ability of graduate students.

3. TEACHING REFORM OF STATISTICS COURSE

In order to combine theory with practice, improve students' ability to solve practical problems and achieve good teaching effect, we need to reform the teaching content, teaching mode and assessment method.

Table 1. Adjustment of teaching content

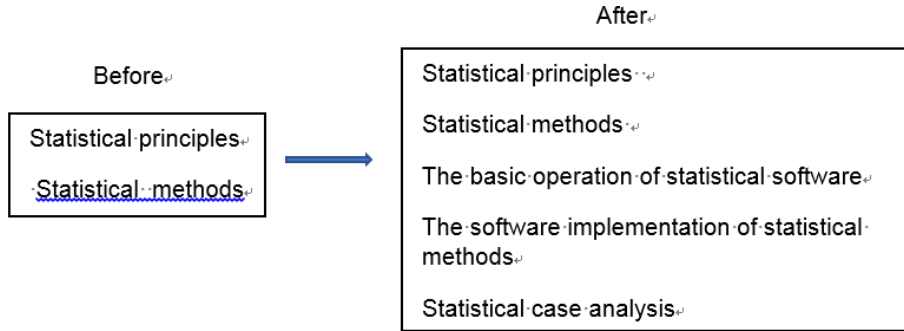


Table 2. Adjustment of teaching mode

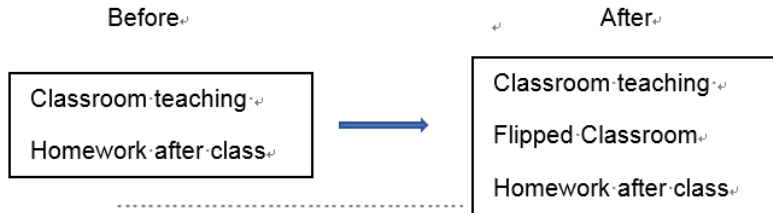
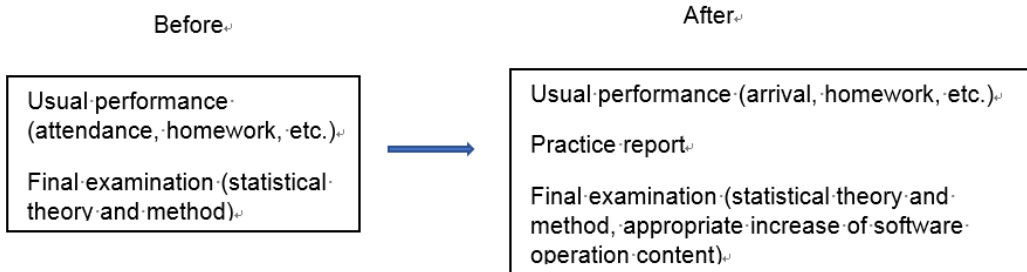


Table 3. Adjustment table of students' comprehensive evaluation



The first is the reform of teaching content. The original teaching content of mathematical statistics and application is mainly to teach the principles and methods of mathematical statistics, including the basis of probability theory, mathematical statistics and multivariate statistics. After the reform, the basic principles and methods of statistics remain unchanged, and the basic operation of statistical software, the software implementation of statistical methods and statistical case analysis are added^[1], as shown in Table 1.

The adjusted teaching content increases the learning of statistical software operation method and statistical case analysis, which can adopt the method of case teaching^[2]. It ensures the combination of statistical theory and statistical software from the content, and can apply statistical methods to practical problems. The teaching content is increased, and the planned class hours

are unchanged, so the teaching mode needs to be adjusted. The teaching mode is mainly based on classroom teaching and transformed into a teaching mode combining classroom teaching and flipped classroom, as shown in Table 2.

The teaching mode of flipped classroom is added to the reformed teaching mode. Flipped classroom is mainly to let students self-study the use of statistical software and the operation method of statistical software. In order to facilitate students' self-study and make it easier for students to master the operation methods of statistical software, we specially select SPSS (Statistical Package for Social Science) software with convenient operation, complete statistical methods and powerful functions, which has users all over the world. According to their own years of experience in using SPSS, the teachers of the teaching team have compiled a simple and easy to

learn *Introduction to SPSS statistical software handout*. In order to enable students to better grasp the implementation of statistical methods in SPSS, the team teacher has compiled *the practical handout of mathematical statistics and application*. Based on the actual cases, the handout shows the implementation process of SPSS of various statistical methods in the form of pictures and text, and explains the operation results in detail, which is very suitable for students to study by themselves.

In order to test the teaching effect of classroom teaching and flipped classroom self-study, the assessment method of combining process assessment and final examination is adopted, as shown in Table 3.

In the assessment, we add the practice report, which mainly adopts the process assessment method. We regularly distribute the teaching team's case handouts to the students according to the progress of the course. The students use statistical methods to analyze with the help of statistical software and submit analysis reports. The student report results will be part of the student's overall evaluation results, and the same report will be scored as 0. In the final examination, the content of practice will be added appropriately. Process assessment can improve students' learning initiative and learning effect, make students integrate theory with practice and improve their ability to solve practical problems.

4. CONCLUSION

With the adjustment of teaching content and appropriate teaching methods and assessment methods, the course system of mathematical statistics and application is reconstructed, so as to combine statistical methods, statistical software and practical problems, so that students can use statistical methods to carry out experimental design, mathematical modeling and data processing, so as to achieve our teaching objectives.

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