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Reflection on the Teaching of Probability and Statistic*

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Abstract—With the continuous development of society and economy, probability and statistic has penetrated into all aspects of people's life and science and technology. Western countries are paying more and more attention to the study of probability and statistics. Therefore, the use of methods and techniques of probability and statistics are becoming more and more important. This paper puts forward some reflections and summaries on the teaching of probability and statistic from three aspects: teaching, management and communication between teachers and students.

Keywords—classroom teaching; OBE teaching philosophy; classroom management; teacher-student exchange

I. INTRODUCTION

With the continuous development of society and economy, probability and statistic has penetrated into every aspect of people's life, science and technology fields. Western countries are attaching more and more importance to the study of probability and statistic. Its methods and applications are more and more important. Combined with years of teaching experience, this paper mainly puts forward some reflections and summaries on the teaching of probability and statistic from three aspects: classroom teaching, classroom management and teacher-student communication, so as to cultivate more innovative talents with learning ability.

II. REFLECTION AND SUMMARY OF TEACHING FROM THE PERSPECTIVE OF CLASSROOM TEACHING

Classroom teaching is the most crucial link in the whole teaching process. In order to better teaching design, it is mainly considered from the following nine aspects:

A. The Teaching Example in Classroom Must Arouse the Resonance of Students

It is better to cite examples that happen close to students' life, which can be related to students' professional courses, or examples of current popular knowledge points, so that students can get into the state of learning more quickly.

For example, when talking about the formula of total probability, what is the probability of catching a cold when

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investigating the population in a certain area? First of all, find out the reasons for cold with classmates. The answers are roughly as follows: first: viral colds; second: infected; third: changing seasons, large temperature difference; fourth: wearing less for beauty. It's supposed that after investigation: first: the probability of causing a cold is 30%, second: the probability of causing a cold is 33%, third: the probability of causing a cold is 20%, then what is the probability of people in this region catching a cold? Such kind of example is not unfamiliar to students, thus students can easily engage into the classroom.

B. The Combination of Courseware and Blackboardwriting

The teaching process is the combination of courseware and blackboard-writing, which not only guarantees the quantity, but also quality. In the process of making courseware, it is better to use 2-3 colors to give students multi-level visual perception, which is conducive to stimulating students' enthusiasm for learning.

C. Creating a Harmonious and Slightly Nervous Classroom Atmosphere

Students' study should not be too relaxed or too nervous, which is not conducive to the smooth progress of the teaching process, so the class question session is essential. It's best to remember the names of several students you're going to ask, which will help you get closer to them and prevent them from getting distracted.

The classroom atmosphere determines the teaching effect to a large extent, which requires teachers to speak in measured tones in class. In order to arouse students' enthusiasm and interest, simple suburban English or dialects will be interleaved occasionally, for example; look blackboard; speak loudly. In addition to oral English, professional words will also be interspersed, such as uniform distribution, so that students have a sense of freshness, not easily distracted, and learned the professional vocabulary.

D. Remembering the Formula by Combination of Roting and Life Example

Some formulas in probability and statistic are hard to remember. It's possible to use short spells, such as the dual law of the first section. Students are confused in the early

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stage, and the law can be summarized as three-character texts: long to short, cumulative to sum, and sum to variable. When promoting the formula of probability and statistic, the story method is adopted: there are n children in a family, and these n children come from the following way: the first is born first, the second is born after the first is born, and so on, after the n-1 is born, the n is born again, which makes it easier for students to understand and memorize the formula.

E. Treating Students Equally

During the course of the class, there are always some students who are very active in class, and their basic knowledge is very solid. They can't be left alone in the classroom. Teachers can find some relevant questions or examples of daily life for them to solve. The method that students often do postgraduate examination can on the one hand enable students see the depth of the examination, on the other side realize that this part is one of the most important aspects of the examination, stimulating students' learning enthusiasm. Examples in life mainly want students to apply what they have learned to reality and to practice, which is also required by the current teaching of new engineering: paying attention to students' ability to solve practical problems.

For example: if you are an engineer of a bus company and want to design the bus door height after learning normal distribution, if the door height is designed according to the chance that the man meets the door at 0.01, if the man is $X \sim$ N(170,36) in height, how to determine the door height? [1]

F. Rejecting the Phrase "I Don't Know"

Once you are asked in class, you can't say "I don't know", or "I don't understand". No matter how much you think about it, you can put forward your answer and reject lazy thinking.

G. Every-lesson-training

At present, the assessment of students is procedural and staged assessments. In order to make the assessment process more continuous and refined to each class, the exercises done in the last class should be handed in before each class. In this way, students can practice synchronously in class and review while doing exercises after class according to the courseware, so as to enhance their continuous learning style.

H. The Concretization and Targeting of Achievements

In 1981, American educators put forward the teaching concept of OBE, which refers to the formulation of reasonable teaching concepts and modes to improve students' thinking ability and independent learning ability, with students as the center and learning achievements as the orientation. Using this concept, when the course enters the middle stage, the mid-term examination will be conducted. Students will be asked to predict the score of the final examination and set the learning objectives of this semester by combining the score of the mid-term examination and their own learning situation in this semester. From the target sent in, all the students expect to pass. When the goal is clear, it is helpful for students to make reasonable class plan and effective study arrangement, which to some extent gives students some sense of urgency. At least some confused students are more motivated to study. At the end of this semester, there are 191 people take part in the exam, with 7 failing to pass the exam, which is a great leap forward compared with the 15 failing to pass in previous similar exams, and the number of students who failed is less than that of students in other majors of the same department in the same exam. What's better, there were 35 students in class 171, 12 of whom reached over 90, and the effect was very good.

I. Comprehensive Connection of Knowledge Points with Higher Mathematics and Applied Linear Algebra

Some knowledge points in probability and statistic can be associated with learned higher mathematics and applied linear algebra, enhancing the relationship between courses and practicability of probability and statistic.

Students usually study probability and statistic in their sophomore year. The foundation of higher mathematics has been firmly established. When it comes to the knowledge of probability and statistic, it can be appropriately extended and done with the previous knowledge.

For example:

 When explaining the axiomatic definition of probability and statistic, axiom 3: If listed event ^A₁.

 A_2 , and the two are incompatible with each other, then

$$P(A_1 + A_2 + \cdots) = P(A_1) + P(A_2) + \cdots$$

The question is: Does the series $\sum_{i=1}^{\infty} P(A_i)_{\text{converge}}$? [2] Why? If it converges, what does it converge to?

• When describing the covariance, it can be extended to the construction of covariance matrix, which is the content of applied linear algebra.

The cross-knowledge points between various courses in class are conducive to the integration of knowledge points and the comprehensive application of mathematics knowledge points during the postgraduate entrance examination.

III. TEACHING REFLECTION AND SUMMARY FROM THE PERSPECTIVE OF CLASSROOM MANAGEMENT

In order to ensure the smooth implementation and good results of teaching design, there must be a certain classroom management system:

A. Making Sure You Have Rules in the First Class

No rules, no standards. It's a must to clearly and seriously explain the requirements of class, homework requirements and the composition of ordinary grades in the first class, so that students can feel the formality of class requirements.



B. If There Are Rules, Stick to Them

After clarifying the requirements of the class to the students, once the students violate the regulations, the punishment will be strictly carried out in accordance with the regulations, and such doing is fair and restricts the students.

C. Being Late for Class and Leaving Early

Sometimes, some students will be late for class, and the score of participation can seldom incur students' attention. As soon as the bell rings, teachers close the back door, latecomers enter through the front door, and performances are required between classes. As long as you are late, you have to prepare the program, which has greatly reduced the phenomenon of being late and leaving early.

D. Loudly Answering Questions

In class, teachers should guide students to think and answer questions. Students must actively participate in and answer loudly, or deduct a point. Answering the questions loudly on the one hand will make lag-behind students find the answer in time, on the other hand can also mobilize the classroom atmosphere, let the distracted students back in time, learning state will be better and better.

E. Phone Ring

The author would like to say something about the mobile phone alone. The requirement for class is that the mobile phone is set to mute. If the mobile phone ringtone appears, students can sing the ringtone three times or choose a song they like. If students want to show their singing voice, have the courage to show, it's possible to provide a platform.

IV. TEACHING REFLECTION FROM THE PERSPECTIVE OF TEACHER-STUDENT COMMUNICATION

It is the responsibility and obligation of the teacher to answer questions and answer doubts. In the process of learning, students usually encounter some problems. The teacher should communicate with them in time to ensure that the problems they encounter will not get worse and they won't lose their confidence and interest in learning.

A. Greeting "Do You Review the Probability and Statistic Today?"

Most students taking in math classes are very nervous. The first is to let them accept probability and statistic psychologically. The simplest way is to make probability and statistic common, often chat with the students, suggesting that the first sentence they say when meet is "do you review the probability and statistic today?" Although it is a joke, it makes them feel that it is normal to study probability and statistic every day, and they are also advised to discuss some issues of probability and statistic before going to bed. This is very fashionable. When you solve a problem, the sense of happiness and achievement is beyond expression.

B. Questions and Answers

After class, students usually ask questions. Teachers should answer questions promptly. Small problems students encounter in class are usually solved quickly, and many students ask questions through QQ after review. No matter how it is done, the questions raised by students must be answered in time, and the stumbling blocks on the way should be kicked away together with them, which will greatly improve their confidence in learning.

C. Setting an Example with One's Own Conduct and Efforts

At the end of the day, the author would basically write notes or summaries of the course in front of the computer, and sometimes the author would send out some interesting questions or the understanding of a certain question. The purpose of such doing is to make students realize: I just finished the probability and statistic class today, should I review it? The teacher is working so hard, should we have a try? In fact, after class, there are more students asking questions on QQ. Although there are no clear statistics, the author can feel that the efforts of teachers and students are positively correlated.

D. Preparing Short Stories or Inspirational Stories About Mathematicians

During the class, sometimes the students are not totally participate in learning, thus it's needed to prepare some short stories of mathematicians to improve their mathematical literacy, or prepare some positive and inspirational things to encourage them to study better.

E. You Are Great, Well Done

It's needed to highlight the power of role models, and praise students in time. In class, if students do well in answering questions, they should be praised in time, and find out the students who are good at homework and encourage them in time, which not only makes the excellent students work harder, but also gives other students a goal to move forward [3] [4].

F. Questionnaire

Probability and statistic is a public course with large classes and a large number of students, so it is difficult to grasp the learning situation of students. Before the class is completed, a questionnaire will be conducted to allow students to self-examine the learning situation of each chapter of the semester according to their actual level. Students need to fill in the questionnaire truthfully (anonymous, only write professional class), excluding invalid questionnaire, which is similar to the estimated result. Such method can on the one hand lay a good foundation for the study plan of the review week, on the other hand, prepare for the next semester.

G. A Thorough Review Plan

The author works in a secondary school, where students' self-control and learning ability are relatively poor. Therefore, the author often guide students to make plans



before the exam, review probability and statistic together, basically keep the rhythm of 2 days and chapters, explain the knowledge points of each chapter, and draw mind maps, make review questions and answer questions at any time to ensure that they smoothly enter the state of probability learning.

H. Summary

The summary of each chapter submitted before the final exam is mainly to let students carefully comb and summarize knowledge points, and be more confident to meet the exam.

I. Applying What You Have Learned — Looking for Applications of Probability and Statistic in Life

Probability and statistic is ubiquitous in life. Students are encouraged to find the probability in life, explain or solve problems with the knowledge of probability learned in this semester, and finally submit papers, which not only exercise their writing ability, but also improve their ability to apply knowledge to practice.

After seeing the very popular Go fighting!, here is the question: During one period of the second season, Huang Lei, Wang Xun, Yue Yunpeng eat peaches in different rooms, they have nectarines, longevity peaches and wild peaches in front of them to test their tacit understanding. When they choose the same peach, they complete the challenge. What is the probability that they complete the challenge? What is the probability that at least one person chooses the longevity peach?

After the topic was sent to the study group, it aroused the broad interest of the students, and they spoke enthusiastically to express their views and understanding. It's needed to guide students to gradually understand probability and statistic from learning, and then using to enhance their application ability.

V. CONCLUSION

The above are some reflections and summaries on probability and statistic. After several semester of practice, it has been proved that compared with students of similar majors or the same majors in previous years, students taught in such method have achieved very excellent results.

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