

Research on the Blending Teaching Mode of Probability Theory and Mathematical Statistics Based on OBE Education Philosophy

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Abstract: Based on the OBE education concept, a hybrid teaching model is constructed by combining the characteristics and contents of probability theory and mathematical statistics courses. This paper discusses the teaching mode of probability theory and mathematical statistics from subject-oriented to goal-centered, from teacher-centered to student-centered, from the rational design of online and offline teaching hours, and from quality monitoring to continuous improvement. Student's ability as the output orientation, efficient construction of curriculum teaching reform.

Keywords: OBE educational philosophy, probability theory and mathematical statistics, blended teaching mode

1. Introduction

In the increasingly developed Internet information technology and the emergence of educational concepts, under the premise of both educational reform and innovation, relying on the hybrid teaching mode of online and offline to do a good job in the reconstruction, innovation and inheritance of probability theory and mathematical statistics courses is the key content of probability theory and mathematical statistics course teaching.

In this regard, many scholars have used different teaching concepts and built different models based on different teaching platforms to discuss and practice the teaching of probability theory and mathematical statistics.

Yang Miaomiao^[1]In the article Teaching Innovation Case of Probability Theory and Mathematical Statistics Course Based on OBE Concept in the Context of New Engineering, based on the OBE Education Concept and relying on the variance knowledge module in probability theory and mathematical statistics course, several ideas and methods of innovative teaching design are proposed. Zhang Shuli, Qu Cong^[2]In the exploration and practice of teaching reform of probability theory and mathematical statistics, the Boppps teaching mode is used to create online course resources, focusing on the application of statistical software, and carrying out teaching reform in order to increase design topics and projects. Ding Mengzhen^[3] integrates the open source software R software into the hybrid teaching mode of the course in the article Probability Theory and Mathematical Statistics Course Design Based on R Language, and uses software-assisted teaching to improve the teaching effect of the course. Gao Fazhen et al^[4] combined the MOOC teaching mode in the exploration of the mixed learning mode of probability theory and mathematical statistics introduced into MATLAB experiments, and reconstructed and innovated the teaching mode of probability theory and mathematical statistics. Huang Yujie^[5] combines MOOC teaching mode in the exploration of MOOC-based hybrid learning mode of probability theory and mathematical statistics, and reconstructs and innovates the teaching mode of probability theory and mathematical statistics. Ma Zhanyou, Lv Shengli^[6] In the exploration and practice of online and offline hybrid teaching of probability theory and mathematical statistics, online and offline hybrid teaching methods are adopted. By combining online and offline results, the teaching effect of the new blended teaching mode and the traditional teaching mode was compared, and the rationality of the new blended teaching mode was affirmed. Chen Min et al^[7] adopted the classroom teaching of peer discussion in the article Reform of Mixed Classroom Teaching of Probability Theory and Mathematical Statistics Based on Peer Discussion, and carried out teaching reform in the selection of teaching content and test questions, teaching process and evaluation method. Xi Li^[8]Research on the Hybrid Teaching Mode of

Online Courses + Offline Teaching-Taking probability theory and mathematical statistics courses as examples, the course teaching content is adjusted, and the hybrid teaching mode of online courses and offline teaching is adopted, and the respective advantages of online and offline are used to make up for the shortcomings of traditional teaching.

Based on the research of many scholars, this paper further considers the curriculum teaching reform of probability theory and mathematical statistics. With the help of the OBE teaching concept. By integrating the ideological and political elements of the curriculum, an online and offline hybrid teaching mode of probability theory and mathematical statistics based on the OBE education model was constructed. From course teaching to course assessment, the teaching reform of the course was comprehensively considered.

The book "Probability Theory and Mathematical Statistics Course" compiled by Mao Shisong et al ^[9] who has been used in this course of probability theory and mathematical statistics for ten years, and the course design and teaching ideas are also mainly based on this book.

2. Characteristics and content of the course on probability theory and mathematical statistics

In the era of rapid development of knowledge, data is often faced, and it is a routine operation to collate, analyze and summarize the corresponding data and further reveal the connection between events. Probability theory and mathematical statistics are introductory courses in data analysis and statistics.

All disciplines involving data-related theoretical analysis basically offer courses on probability theory and mathematical statistics. In many colleges and universities, there are professional courses in probability theory and mathematical statistics in science, engineering, agriculture and forestry, economic management and other disciplines. Some colleges and universities also use probability theory and mathematical statistics as science thinking development courses in liberal arts, art, physical education and other disciplines.

The course of probability theory and mathematical statistics mainly includes random events and probability, (multidimensional) random variables and their distributions, the law of large numbers, the central limit theorem, statistics and their distributions, parameter estimation, hypothesis testing, analysis of variance, regression analysis, etc.

The course of probability theory and mathematical statistics is a mathematical discipline used to study the statistical regularity of random phenomena, the course is rigorous in theory, has many content, formulas and views, but is widely used, and is the basic course of many courses.

3. OBE educational philosophy

OBE education concept is an emerging educational concept in recent years, also known as results-oriented education, ability-oriented education, goal-oriented education, or requirement-oriented education.

The OBE educational philosophy adopts a reverse thinking approach to the construction of the curriculum system, which is student-oriented and is an outcome-oriented educational philosophy.

The traditional teaching concept is often knowledge-centered to build the curriculum, and the OBE teaching concept is transformed into a competency-centered curriculum system.

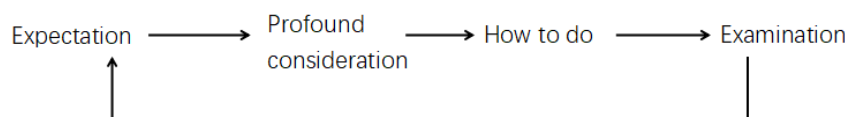


Figure 1: The Four Links of OBE Education Concept

The OBE education philosophy is mainly divided into four links, one is what results you want students to achieve, the second is why students should achieve this kind of results, the third is how to effectively help students achieve these learning outcomes, and the fourth is how to know that students have achieved these learning outcomes. To summarize it simply, it is a four-step process: allow, reflect, how to do, and test, as shown in Figure 1.

Most of the educational objects of the university are adults, which is more suitable for the

implementation of OBE education philosophy, and science subjects such as probability theory and mathematical statistics are relatively easy to test whether students have the ability to have relevant subject knowledge modules, which also provides a platform for the implementation of OBE education philosophy.

4. Build a hybrid teaching model of probability theory and mathematical statistics under the OBE education concept

4.1 Change from discipline-oriented to goal-oriented

The courses of probability theory and mathematical statistics are the core basic courses of mathematics majors, and also the basic courses of mathematics in many universities that are not mathematics majors. For mathematics students, the study of probability theory and mathematical statistics is only an ordinary course in the mathematical talent training program, which is an application course of calculus and linear algebra, and it is also a preparatory course for subsequent courses such as mathematical modeling, operations research, cybernetics and so on. The study of probability theory and mathematical statistics only learned a lot of formulas, concept theorems and other knowledge points, and the learning of knowledge is mainly memory and lack of application.

The OBE teaching philosophy emphasizes ability-based, and applying what you have learned is the true meaning of learning. The study of probability theory and mathematical statistics is to let students learn what is the use of this course after learning, so it is necessary to reconstruct the orientation of the course and change the probability theory and mathematical statistics course from discipline-oriented to goal-oriented. Establish course goal orientation from the levels of knowledge goals, ability goals, emotional attitudes and value goals, and ideological and political goals.

The knowledge goal is to learn the course of probability theory and mathematical statistics, so that students can understand the historical evolution of statistics, learn the challenges faced by statistics, and the development trend of statistics in the future, and understand the importance of probability theory and mathematical statistics courses for data analysis.

The ability goal is to use ANOVA, regression analysis, hypothesis testing, etc. to solve data analysis and processing problems, and to apply these data processing technologies to real life and solve practical problems in life.

The goal of emotional attitude values is to enable students to learn theoretical knowledge while further discovering and analyzing problems, linking theory and practice, and accumulating theoretical and practical foundations for future job search and work.

The ideological and political goal is to cultivate students' positive ideological values and patriotic enthusiasm, and lay a solid foundation for students' further study, work and life in the future.

Only by designing and reconstructing the content of probability theory and mathematical statistics courses according to these goal orientations, and optimizing teaching methods can improve teaching quality and achieve scientific education.

4.2 Transform the teaching center from teacher-centered to student-centered

In the traditional teaching concept, the teacher's teaching is the center of teaching, especially in the theory of probability theory and mathematical statistics. The main teaching method is that teachers use blackboards or PPT to show students knowledge, argue theories, explain exercises, the classroom is basically full of forms, students just passively learn. The learning effect is also only to show the good and bad academic performance of the student through the paper score of the final exam. Student engagement is low throughout the process.

The OBE teaching philosophy emphasizes student-centeredness, so that students can exert their subjective initiative and actively participate in teaching. Relying on online resources and online course platforms, the online and offline hybrid teaching reform of probability theory and mathematical statistics can well reflect the construction of student-centered courses. In blended teaching, students must build student-centered courses through online resources in advance. In blended learning, students must learn about the course content through online resources in advance. Active learning, in offline classroom teaching, is not the teacher's words, but the use of peer discussion. New teaching methods such as flipped courses and communicative learning complete offline teaching in the classroom. Students have a wide

voice with engagement and students actually learn twice. Therefore, the main points of knowledge can be cut to the point in class discussions, which is often much more effective than the deduction of teachers only in traditional course teaching. Moreover, after class, students can also use the online platform to further discuss their learning experience and gains with classmates and teachers. It can be said that from before, during and after class, the extensive participation of students is reflected, so that students truly become the masters of learning.

The OBE teaching philosophy emphasizes that everyone can succeed, and the learning of the course is either a high score on the scale or a successful study, what is learned from the course and how to use it in life is the most important.

In the construction of student-centered teaching, the assessment of courses should also be adjusted from the traditional pure scale assessment to the personalized assessment mode composed of modules such as roll + paper + experiment + learning experience + online learning.

Only by allowing students to become the protagonists of the classroom and teachers to play an auxiliary or guiding role can we cultivate mathematical and scientific talents who are more suitable for society.

4.3 Reasonably design teaching hours to improve teaching effectiveness

The OBE teaching philosophy emphasizes proficiency and performance responsibility, and the lesson design should be centered on students' expected learning outcomes. The study of probability theory and mathematical statistics courses should enable students to master the preliminary data analysis ability, understand the frontier of the discipline, be proficient in the use of subject knowledge, and let students feel the personal literacy and the feelings of home country in the course. Therefore, when designing course hours, it cannot be purely arranged as theoretical hours. Taking the 72 hours of probability theory as an example to allocate course hours, the online and offline teaching of the knowledge part of the general course still occupies most of the credit hours and generally accounts for a higher proportion, which can be designed as 54 hours.

Except for the examination paper assessment module, which is placed at the end, the rest of the learning hours can be interspersed with each other, as shown in Figure 2.

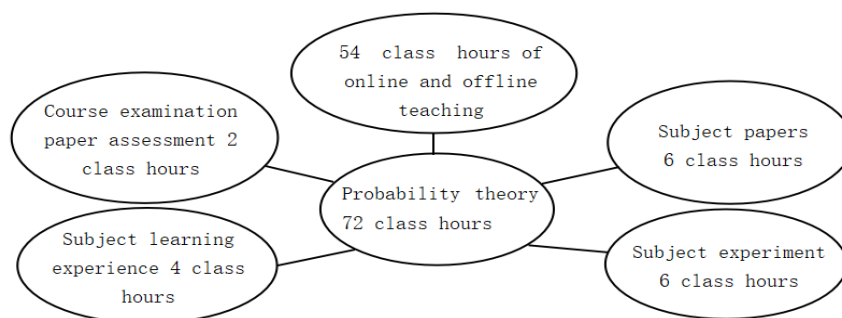


Figure 2: Probability theory time distribution diagram

In fact, it can also be subdivided according to the level of students, the allocation of hours of online and offline teaching modules can be subdivided, generally 18 hours of online tuition, 36 hours of offline teaching is appropriate, offline hours include teachers' lectures and answers to questions and students' group discussions, etc. generally take more time than online learning modules.

Of course, the allocation of hours in the mathematical statistics part can also be roughly allocated according to this ratio, and it is easier to refine the 4-fold teaching objectives of the course through the detailed allocation of hours.

It also embodies the implementation principles of OBE educational philosophy, clear focus, expanding opportunities, raising expectations, and reverse design.

Through the refinement of the learning hours, it can be clear that the concerns of students in different academic periods are inconsistent, and the expected goals should be expanded in the corresponding academic period, and the teaching objectives of the corresponding period should be completed, and then the next plan and goal of students' learning should be designed according to the theory of generation, and

the cycle should be repeated, layer by layer.

The allocation of hours is not fixed and can be adjusted appropriately to achieve the purpose of improving teaching effectiveness.

4.4 Shift from quality monitoring to continuous improvement

The online and offline hybrid teaching mode of probability theory and mathematical statistics based on OBE teaching concept is like a closed loop and has excellent effects.

However, in the actual teaching development, teachers should also continue to track the teaching effect, collect students' evaluation opinions on teaching, and actively use the students' course assessment to reflect on whether there is room for further improvement in teaching design and design better teaching design. In order to further improve the effectiveness of the course, the construction of online course resources should also be dynamically updated, and the course explanation should be combined with the frontier of the discipline, and there should be continuous updates.

The four core OBE problems faced by the probability theory and mathematical statistics courses designed for OBE teaching philosophy.(1)What school effect do you want students to achieve.(2)Why do you want to achieve such results.(3)How to effectively help students achieve these learning results.(4)How to know that students have achieved these learning results. Course teaching is not unchanged, the times are developing, the discipline is constantly at the forefront of new disciplines, and it is hoped that the ability students will acquire through the courses of probability theory and mathematical statistics is also constantly evolving.

Only by adhering to the continuous improvement of the curriculum can the course be made into a golden course and the value of the course can be passed on.

5. Conclusions

This model integrates the development of information technology with the teaching of courses, reasonably allocates online and offline teaching hours, makes full use of students' in-class and extracurricular time, changes the center of teaching from teacher-centered to student-centered, transforms the previous science subjects of the course to the goal of student ability, and builds a new teaching mode of probability theory and mathematical statistics courses by combining the assessment mode of experiments, papers, and learning experiences with the construction of online and offline course resources.

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References

- [1] Yang Miaomiao. *Case Design of Probability Theory and Mathematical Statistics Course Teaching Innovation Based on OBE Concept in the Context of New Engineering* [J]. *Journal of Higher education*, 2007, 17:22-25.
- [2] Zhang Shuili, Qu Cong. *Exploration and practice of teaching reform of probability theory and mathematical statistics* [J]. *Science and Technology Wind*, 2022, 8:97-99.
- [3] Ding Mengzhen. *Course Design of Probability Theory and Mathematical Statistics Based on R Language* [J]. *Journal of Pingxiang University*, 2022, 3(39):96-99+110.
- [4] Gao Faling, Yao Zhonghua, Sun Jianying. *Research and Practice of Hybrid Teaching of Probability Theory and Mathematical Statistics by Introducing MATLAB Experiments* [J]. *Cansu Science and Technology*, 2022, 9(38):66-68+72.
- [5] Huang Yujie. *Exploration of Mixed Learning Mode of Probability Theory and Mathematical Statistics Based on MOOC* [J]. *University*, 2022, 11:79-82.
- [6] Ma Zhanyou, LÜ Shengli. *Exploration and Practice of Hybrid Teaching of Probability Theory and*

Mathematical Statistics [J]. College Mathematics, 2022, 3(38):37-41.

[7] Chen Min, Pang Liuyong, Zhang Zhenkun, Gao Fengxin. *Mixed Classroom Teaching Reform of Probability Theory and Mathematical Statistics Based on Peer Discussion [J]. Journal of higher education, 2022, 7:123-127.*

[8] Xi Li. *Research on the Hybrid Teaching Mode of Online Course + Offline Teaching: A Case Study of Probability Theory and Mathematical Statistics Course [J]. Journal of Qinghai Normal University (Natural Science), 2020, 1:83-87.*

[9] Mao Shisong, Cheng Yiming, Pu Xiaolong. *Course of Probability Theory and Mathematical Statistics [M]. Beijing: Higher Education Press, 2011.*