

Exploration on the Teaching Reform of Sense of Gain in Mathematical Statistics Classroom

Wenqin Cao

School of Mathematics and Statistic, Shandong University of Technology, Zibo, China

Abstract—This paper explores the reform of the teaching paradigm of student-centered and subjective college classroom acquisition in the teaching of mathematical statistics. This reform helps to stimulate students' learning motivation, promote the transformation from traditional knowledge oriented classroom to literacy oriented classroom, and effectively improve the effectiveness of classroom teaching reform. With the goal of meeting students' needs and realizing students' value, we have built a multi-level curriculum system, updated teaching and assessment methods, established experiential classroom, actively promoted students' subjective participation in curriculum evaluation, and improved students' sense of classroom access.

Keywords—*Mathematical statistics; Student centered; Sense of classroom acquisition; Teaching research*

I. INTRODUCTION

The course of mathematical statistics has a rigorous theoretical system and strong applicability. Teachers and students are faced with various challenges in the process of teaching and learning. In order to cultivate students' learning initiative, initiative and independence, improve students' innovative quality and creative potential, and meet the needs of contemporary high-quality data processing and statistical analysis talents, it is of great significance to reform the teaching and evaluation methods of mathematical statistics.

In the palace of higher education, many scholars are tirelessly exploring the reform of classroom teaching. The tide of modern science and technology and advanced teaching tools have injected new vitality into the teaching scene. The Internet has opened the door for students to share countless teaching resources without leaving home. Under the guidance of the new education concept, innovative teaching reform terms such as flipped classroom, project-based teaching and virtual simulation teaching emerge in endlessly, just like the spring breeze blowing, waking up the sleeping education soil. However, in spite of this, most of the classes still stay in the simple knowledge teaching, satisfied with the superficial interest stimulation, but fail to go deep into the depth of thinking. The root cause lies in the lack of students' sense of gain in classroom learning. The so-called sense of classroom acquisition refers to the positive psychological experience and emotional resonance that students feel through the acquisition of knowledge, the forging of ability and the honing of character when participating in classroom activities. This sense of acquisition can not only improve students' satisfaction with the classroom, but also stimulate their internal desire for knowledge and learning motivation, and guide students from passive acceptance to active exploration.

II. RESEARCH STATUS AND SIGNIFICANCE AT HOME AND ABROAD

Many university teachers have discussed the teaching mode and evaluation system, and achieved remarkable results. In 2024, Xie Xiping et al^[1] constructed the innovative measures of "five integrations and five removals" according to the problems existing in the teaching of probability theory and

mathematical statistics, following the education and teaching philosophy of student-centered, achievement oriented and continuous improvement. Under the concept of "less teaching and more learning", Song Chao et al^[2] conducted a mixed teaching practice research on probability theory and mathematical statistics, which effectively improved the pass rate of the course and students' learning ability, and promoted the development of students' thinking. Chen Lina^[3] discusses the teaching reform of probability theory and mathematical statistics based on mathematical modeling. With the help of mathematical modeling thinking and methods, she reshapes the course structure, stimulates students' interest in learning, and improves their ability to solve practical problems. Lu Chunyan et al^[4] discussed the reform and practice of "Statistics" Teaching under the multi perspective framework in the era of big data, focusing on the cultivation of interdisciplinary big data innovative talents and effectively stimulating students' learning initiative.

As a widely used course, mathematical statistics aims to cultivate students' solid basic theoretical knowledge, statistical modeling thinking and data science vision, so that they have excellent quantitative analysis ability and deep feelings of serving the country. This paper is committed to the transformation from teaching as the center to learning as the center, focusing on ability training and emphasizing the transformation of achievements. By adhering to the principle of student-centered and ability based, we should deepen the reform of teaching mode and evaluation, and improve the sense of acquisition of the course. Cultivate students' ability to conduct statistical analysis based on facts, and cultivate high-quality data processing and statistical analysis talents for the society.

III. CLARIFY STUDENTS' NEEDS AND EXPECTATIONS, AND FOCUS ON COLLEGE STUDENTS' SENSE OF CLASSROOM ACCESS

Every college student entering the classroom has specific needs and expectations in their hearts, which profoundly affect their initiative and enthusiasm in the classroom. Before the course, we accurately grasped the students' expectations for the course through interviews, questionnaires and other methods, based on which we formulated teaching objectives, carefully planned teaching contents, optimized the teaching process and improved the teaching evaluation system. On the basis of in-depth understanding of students' needs, we should create a classroom atmosphere and teacher-student relationship full of support and trust, guide and exceed students' expectations through an efficient communication mechanism, help students build a scientific and reasonable cognition of college classroom, and promote the formation of a sense of classroom access.

(1) Encourage participation and experience, take students as the center, and create an experiential classroom

Experience is personal experience, and the generation of emotion is inseparable from personal experience. The sense of gain, as a subjective experience based on objective things, also follows this principle. The sense of classroom acquisition is not given by teachers unilaterally, but by students' personal

experience and feelings. Stimulating students' subjective initiative and the spirit of ownership, encouraging them to actively participate in the classroom as independent individuals, and perceiving the value of knowledge and internal emotions through personal experience are effective ways to promote the generation of College Students' sense of classroom acquisition.

Experiential classroom emphasizes that students perceive, understand and verify the teaching content through personal practice. It involves not only physical participation, but also the depth of thinking. This classroom model helps students combine objective knowledge with subjective emotional experience, and promotes the generation of classroom acquisition. In order to build an experiential classroom, we should strengthen the practice orientation, encourage students to transform perceptual knowledge into rational thinking through observation, experiment, research and other practical activities, and realize the internalization and activation of knowledge. At the same time, we should strengthen the problem orientation and task driving, take the situation, problems and projects as the carrier, guide students to experience the rigor and interest of learning in the process of solving problems, and enhance learning interest and experience. In addition, the experiential classroom should highlight the central position of students' learning, follow the principle of "teaching is for learning", ensure that learning behavior really occurs in the classroom, and cultivate students' autonomous learning habits and abilities.

(2) Actively accept and identify, and obtain a continuous sense of classroom access

As a subjective experience, the formation of sense of gain depends on individual self awakening and perception. Research shows that positive acceptance and identification can make individuals feel belonging, love and respect, stimulate the power of individuals from self perception to self awakening, and activate the initiative of life. In teaching, the acceptance and recognition of students are reflected in the deep understanding and respect for the uniqueness of each student, the tolerance and understanding attitude towards all students and their problems, and the real realization of teaching students in accordance with their aptitude.

In the process of teaching, when students' actual acquisition matches their needs, they will form emotional recognition and positive evaluation, resulting in a sense of acquisition and satisfaction. This feeling not only affirms and sublimates students' self cognition, but also stimulates new needs and exploration motivation, and opens a new learning journey. In this process, students can continue to experience the sense of gain and form the motivation to move forward. The ultimate goal is to help students grow on the road of active exploration and become a comprehensive and intelligent person.

IV. BUILD A TARGETED MULTI-LEVEL CURRICULUM SYSTEM

In the current rapidly developing educational environment, it is particularly important to build a curriculum system that meets the needs of talent training and highlights professional characteristics. We are committed to creating a new curriculum system, selecting and refining distinctive teaching content, constantly updating teaching strategies and improving the curriculum evaluation system to meet the development of the times and the needs of students.

(1) Broaden the teaching content

In order to enable students to adapt to the challenges of the era of big data, our teaching content not only covers the core knowledge of time series analysis, but also extends to the latest

achievements of time series analysis in the field of big data. Classroom teaching has changed from traditional knowledge orientation to problem orientation, paying attention to the elaboration of method logic, and emphasizing the importance of mathematical statistics process, including data collection, analysis, modeling and the application of conclusions. This teaching mode aims to help students understand the application of mathematical statistics in solving practical problems and improve their analysis and application ability.

(2) Reforming teaching paradigm

We use case teaching as a breakthrough to highlight the characteristics of modern statistical methodology in the information technology era. Through the combination of statistical quantitative analysis tools and actual data, students can not only learn theory, but also apply it to practical problems and establish statistical modeling awareness. In addition, the online platform provides students with rich teaching resources and a continuous learning and communication platform, which enhances the flexibility and sustainability of learning. Through reform, we have achieved four improvements.

- Cultivate students' autonomous learning ability: through the teaching mode of MOOC and flipped classroom, encourage students to master basic knowledge before class, so as to cultivate their habit of autonomous learning
- Cultivate students' scientific spirit and inspire patriotism: teach high-level knowledge of the course by using teaching modes such as high-quality case teaching and mixed teaching. Introduce social hot topics and guide students to pay attention to the practical application value of data analysis. Stimulate students' patriotic feelings through the analysis of social practical problems. Combined with the history of discipline development, guide students to practice the scientific spirit of bold exploration.
- Create a seminar class, expand the scope of learning, and cultivate the thinking of statistical modeling: create a "seminar class" dominated by discussion, guide students to carry out collective innovation in the discussion, and expand the breadth and high level of learning.
- Improve teachers' professional quality and professional accomplishment: in combination with the actual teaching content of the course, constantly reflect on teaching, optimize teaching design, and infiltrate implicit ideological and political education in simple terms, so as to cultivate morality and enrich people and things silently.

(3) Improve the evaluation system

In order to cultivate data analysis talents more suitable for the development needs of the times, the assessment method should be more scientific, pay attention to the learning process, strengthen daily investment, grasp the direction of efforts, and enhance self positioning. The assessment is divided into two directions.

- Innovate the evaluation system and incentive mechanism: implement the whole process assessment, covering the usual performance, mid-term report and final examination, to comprehensively evaluate the students' learning progress.
- Accurately grasp the learning growth trajectory: at the end of the initial period, use questionnaires, interviews and other methods to measure learning

attitude; Use the data analysis method to describe the learning situation and analyze the teaching effect.

Our teaching evaluation system not only pays attention to the learning results, but also pays more attention to the learning process. By constructing a diversified learning evaluation and feedback mechanism, the organic combination of process assessment, quantitative assessment and qualitative assessment is realized. This evaluation system encourages students to change from passive acceptance of evaluation to evaluation subject and active participant, and improves students' autonomous learning and innovation ability.

(4) Improve the application ability of statistical software

In classroom teaching, combined with computer practice, we focus on the basic operating skills of SPSS and R language statistical software in the process of data analysis. Through case analysis and practical teaching, students can master various methods of mathematical statistical analysis, and improve their data processing ability and statistical analysis level.

(5) Creating a virtuous circle of mutual promotion between scientific research and teaching

Through characteristic scientific research activities such as the study of frontier scientific papers, we have defined the direction of discipline development, and strive to create a virtuous cycle of mutual promotion between scientific research and teaching, so as to improve students' scientific research ability and innovative thinking.

In short, our curriculum system aims to cultivate students' comprehensive quality and practical ability through targeted multi-level teaching and evaluation methods, so that they can adapt to the needs of the future society and become excellent talents in the new era.

V. PAY EQUAL ATTENTION TO KNOWLEDGE AND ABILITY, AND IMPROVE THE QUALITY OF ALL ASPECTS

In today's era of rapid development, improving personal quality has become the core task of education. This paper aims to cultivate students' autonomous learning ability, scientific thinking ability, mathematical modeling ability and scientific and technological information ability through the teaching concept of paying equal attention to knowledge and ability.

(1) Autonomous Learning Ability: in the teaching process, we continue to expand the field of knowledge and strengthen students' autonomous learning and independent thinking ability. We encourage students to develop a rigorous academic attitude, clearly state the research content in the discussion class, show the learning results, and improve their learning initiative. Using task driven teaching form, arranging learning tasks, realizing group cooperation system, and promoting communication and cooperation among students. Teachers create problem backgrounds, propose tasks, guide students to actively collect, process and analyze data, interpret the analysis results, integrate data awareness, knowledge and skills, enable students to carry out a series of experience and exploration activities in real situations, use a variety of disciplinary knowledge and skills to solve practical problems, and display, report and share the final learning results. The independent topic selection and completion of the course ending essay is a bridge to transform the knowledge learned into theoretical research and practical work.

(2) Scientific thinking ability: we focus on cultivating students' abstract thinking, inductive and deductive ability and scientific computing ability, and through heuristic teaching, let

students deeply understand the ideas and methods of time series analysis. In the form of project-based teaching, with research and discussion as the main part and special lectures as the auxiliary part, students independently choose the research content of small papers, complete the steps of scheme design, data collection, data analysis and modeling, and conclusion application under the guidance of teachers, and submit a complete report. Through students' independent practice and research, promote the development of their own data literacy ability.

(3) Mathematical modeling ability: through simple modeling cases, students can use the time series analysis theories and methods they have learned, analyze and calculate with the help of statistical software, and solve practical problems. In order to create a good learning atmosphere and improve the ability of data mining, students are actively trained in various statistical modeling events, and students are guided to participate in various competitions, which effectively improves students' data analysis ability and statistical modeling ability, makes the combination of theory and practice more intensive, and strengthens students' practical innovation ability.

(4) Scientific and technological information ability: the teaching content closely follows current events, and a large number of Chinese and English literatures are consulted to exercise students' literature access ability and improve their scientific and technological information retrieval ability. The development and construction of online learning platform has further expanded learning resources and promoted the application of information-based teaching means and methods. Participating in innovative practical activities is a bridge combining theory with practice. Through these activities, students will learn to connect data with practical problems, explore the laws behind the data, extract and summarize information, and build the relationship with the problem background, so as to form knowledge and decision-making, and guide the solution of practical problems.

CONCLUSION

In order to improve college students' sense of classroom access, we must adhere to the educational concept of "people-oriented", and promote classroom teaching from traditional knowledge teaching to educational practice aiming at cultivating comprehensive literacy. This change will effectively improve the effectiveness of classroom teaching reform and make every class a journey to enlighten wisdom and expand thinking. In this paper, the student-centered, classroom sense of gain as the guide, to explore the teaching mode of mathematical statistics. To build a targeted multi-level curriculum system, broaden the curriculum content, improve the assessment system, so as to cultivate students' quality in many aspects. The ability of data collection, preprocessing and statistical modeling using time series analysis theory will be included in the training target system to make it the core skill of students and meet the demand for data analysis talents in the era of big data.

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