Research on the Continuous Improvement of Curriculum Teaching Mode

Wenli Bao[1], Fei Xu[2]

[1]School of Economics and Management, Liaoning University of Science and Technology, Benxi 117004, Liaoning, China
[2]School of Humanities and Law, Benxi Open University, Benxi 117000, Liaoning, China

Abstract: Taking the Statistics course as the research object, this paper addresses the pain points in the traditional teaching mode, such as students' insufficient ability to apply knowledge, lack of innovative ability, weak grasp of basic knowledge, and limited effectiveness of ideological and political education in the curriculum. It proposes and implements a set of continuously improved teaching modes. The research confirms that the curriculum objectives can be effectively achieved through the support of information-based tools, process-based early warning, personalized guidance, and the integration of competitions and teaching. This paper demonstrates how to realize the feedback of scientific research to teaching, continuously optimize the teaching mode, and constantly improve the teaching quality, providing a replicable practical path for the reform of the Statistics course.

Keywords: Statistics; Teaching Mode; Continuous Improvement

Online publication: July 26, 2025

1. Initial Establishment of the Course

As a basic course for management-related majors, Statistics mainly teaches students to use statistical analysis software to collect, process, analyze, and interpret various types of data and draw conclusions scientifically[1]. In the first stage of teaching, the course mainly adopted the lecture method, and assignments mainly assessed students' ability to memorize and apply knowledge.

To improve the efficiency of classroom teaching, reduce repetitive work such as checking attendance and correcting assignments, shorten the time spent explaining low-difficulty knowledge points such as concepts and principles, and allocate more time to explaining key points and assessing students' mastery of key knowledge points, the course instructor vigorously promoted the informatization construction of the course. Eventually, a teaching mode featuring "one APP, one system, one website, one platform, and three software tools" was formed.

"One APP" refers to the Xuexitong APP, which is used for checking attendance, distributing learning materials, and correcting assignments. "One system" is the Shengteng Cloud System in the multimedia computer room for practical exercises during classes. "One website" is the Wenjuanxing website, used for the automatic correction of assignment banks. "One platform" mainly refers to the Guoxin Wang'an Data Platform, which is used to obtain practice data. "Three software tools" include SPSS, ROST, and Citespace, which are used for numerical data analysis, text data analysis, and data map analysis respectively. During the teaching process, several teaching pain points were identified:

Insufficient ability to apply knowledge: Nearly 1/3 of the students could not apply the knowledge points. This was reflected in the fact that some students used artificial intelligence to generate assignments, and there were cases of assignment plagiarism and perfunctory completion of assignments. Nearly 1/3 of the students could not accurately apply the existing knowledge and the knowledge learned previously.

Insufficient ability to apply knowledge innovatively: Nearly 4/5 of the students lacked innovation in knowledge application, and most of them only made low-level imitative applications.

Weak grasp of basic knowledge: The final exam mainly assessed the ability to memorize knowledge. When the number of question sets in the question bank increased from 3 to 30, the failure rate of students in the exam rose from about 5% to 22%. If the basic knowledge and ability objectives of the course were not achieved, it would be even more difficult to achieve the quality objectives and innovation goals.

Inadequate achievement of quality objectives: Although a large number of stories and pictures were used for ideological and political education in the curriculum during the teaching process, this method of in-class indoctrination had certain limitations and its effect was negligible.

2. Research on Teaching Pain Points

2.1. Research on the Construction of an Early Warning Mechanism for Improving Knowledge Memory Ability

Without the establishment of a learning portfolio, teachers usually ask students questions about the content of the previous class in the next class. However, in large-class teaching, it is impossible to question every student, making it difficult to promptly identify and provide assistance to students with learning difficulties. Therefore, the following questions arise: Is there a relationship between college students' exam scores and their usual grades? Can we promptly warn of potential failures in the final exam through key points of usual process assessment results, conduct timely interventions, and teach students in accordance with their aptitude to achieve the course objectives? The course instructor analyzed the relationship between the usual process assessment results and the final exam scores and put forward the following hypotheses:

Hypothesis 0: Students' usual process assessment results do not affect their final exam scores.

Hypothesis 1: Students' usual process assessment results affect their final exam scores; good usual process assessment results lead to higher final exam scores.

Over one year of teaching, a total of 77 samples were collected. The relationship between the usual process assessment results and the final exam scores was analyzed to verify the above hypotheses. The statistical results showed that students' usual attendance and survey report scores were significantly positively correlated with their final exam scores. This indicates that for this course, students' usual attendance and the quality of their survey reports can serve as a good early warning for their final exam scores. Hypothesis 1 was partially verified. By studying the relationship between process assessment results and final exam scores, the goal of "one student, one dataset" was achieved, an early warning mechanism for the learning process was established, and process assessment was able to promote teaching and learning through assessment.

2.2. Research on Improving Students' Knowledge Memory, Application, and Innovation Abilities from the Perspective of Personality

What factors affect the quality of students' survey reports? According to the competency assessment theory, an individual's success in doing things depends on three factors: knowledge, skills, and motivation[2]. Assuming that the level of knowledge imparted is the same for all students in a class of a course, the differences in the quality of survey reports mainly depend on application skills and motivation, which are mainly determined by personality factors.

College students' course learning scores were divided into three dimensions: knowledge memory ability, application ability, and innovation ability. The differences in personality between students with excellent scores and those with

poor scores in these three aspects were compared and analyzed to form an observable, quantifiable, comparable, and continuously improved teaching mechanism. This mechanism aims to targeted cultivate college students' application ability and innovative literacy and improve the level of course construction. The Five-Factor Personality Inventory was mainly used for personality measurement.

The results showed that students with a strong sense of morality had a higher level of application ability and demonstrated the ability to make good use of the knowledge they had learned in survey report writing. A strong sense of morality was manifested in strong self-control, a preference for quietness, punctuality, calmness, and decisiveness in doing things. Such students showed a higher level of execution[3].

Students with strong adaptability and low altruism performed better in exams without a review scope. This group of students often showed high self-control and concentration but lacked the ability to cooperate with others and were relatively indifferent.

Students in the high innovation ability group scored slightly higher in the wisdom dimension than those in the low innovation ability group, but there was no significant difference. To find out how to improve students' innovation ability and thereby enhance their award-winning level in discipline competitions, data were collected through competition experiments for research.

2.3. Experiment on Improving the Level of Discipline Competitions

Students were divided into three groups:

Group 1: There were 10 teams in total. Students were required to participate in discipline competitions related to the course. They were informed that they had to write a survey report to participate in the competition; otherwise, they would not receive process assessment scores. During the writing process, the instructor helped the 10 teams decide on topics and provided them with previous award-winning report cases uniformly. One of the teams was given a specific topic and a large amount of reference materials, while the other teams were not provided with specific project reference materials. Online guidance was provided to all teams.

Group 2: Students were informed about a competition and participated voluntarily. There was one team in total. The instructor helped the team decide on a topic, provided them with a large number of relevant books and materials, and offered online guidance.

Group 3: Students participated voluntarily with mandatory requirements. They voluntarily participated in the College Students' Innovation Training Program, and the project conclusion required winning an award in the competition. Therefore, students had to participate in the competition to complete the project conclusion. There was one team in total. The instructor helped the team decide on a topic, provided relevant books and materials, and offered face-to-face encouragement and online case guidance[4].

Finally, the innovation level of each group was determined based on the ranking of awards in the discipline competition. The report writing level of Group 2 was better than that of Group 3, and Group 3 was better than Group 1. Among Group 1, the team provided with materials performed better than the teams not provided with materials. This result indicates that the level of innovation is closely related to interest.

At the beginning of the teaching process, the instructor of Group 1 continuously encouraged the 10 teams to use the knowledge taught in the course to revise and improve their reports. One of the teams won an award in the provincial competition, and this team had a special feature—all members were students who had failed the course in the final exam and had to retake it. Generally, the creation of a course context is mandatory and linked to the final course score, so students must participate. The type of materials provided and the direction of guidance are important, but stimulating learning interest is even more crucial. Secondly, it is necessary for teachers to communicate with students continuously, establish a close teacher-student relationship, because only when students are close to their teachers will they believe in what the teachers say.

3. Redesign of the Curriculum Teaching Mode

3.1. New Design

A project-based teaching method was designed to solve a practical problem and present a complete teaching process. Students were divided into teams of 3-5 people. During the vacation before the course started, students were encouraged to focus on the three chapters of "Liaoning Industrial Heritage", "Liaoning Red Culture", and "Liaoning Economy", take the theme of "Offering Suggestions for the Development of My Hometown", select research topics, and write a business plan. Specifically, they were required to investigate the economic development of their hometown, the market sales of their hometown's characteristic economy, the existing problems, and put forward countermeasures and suggestions to promote the development of their hometown's characteristic economy.

This process trained students' ability to apply knowledge, cultivated their sense of responsibility, encouraged them to pay attention to social hot issues, and fostered their affection for their hometown, thus forming the course feature based on the analysis of economic data.

3.2. New Structure

The course structure was optimized and integrated to form 3 modules, namely "Macroeconomic Data Statistics", "Business Data Sampling", and "Business Data Statistics", covering 10 chapters including "Overview of Statistics and Data".

After the start of the semester, the class hour allocation was closely combined with the business plan tasks and knowledge points. Each class presented a complete content module. Students attended classes with questions, improved their vacation business plans after class, and in the next class, they gave presentations on the application of the knowledge learned in the previous class through a flipped classroom. The teacher provided comments, and students revised their plans repeatedly after class until they could apply the knowledge accurately. This process trained students' ability to apply knowledge and cultivated their sense of responsibility.

3.3. New Teaching Methods

A diversified integrated teaching method of "lecturing, investigating, doing, demonstrating, and discussing" was implemented. In each class, questions were raised first, then the teacher explained typical methods to solve the problems. After class, students searched for materials independently, conducted research, and made PPTs. In the next class, they gave presentations in class, participated in group debates, and the teacher provided comments. After class, students revised their works repeatedly, with the ultimate goal of achieving high-quality application of knowledge. Through constantly overcoming difficulties and challenging themselves, students improved their analytical ability and application ability and transformed their mental models.

3.4. New Assessment Method

The course assessment plan was reconstructed. The assessment must include three parts: knowledge memory ability, knowledge application ability, and innovation ability. Competition scores and continuous improvement scores were added to the process assessment to increase students' practice and efforts in after-class learning. A point deduction mechanism was implemented for daily absences and failure to complete assignments in the question bank on time to help students learn to make plans. A point deduction mechanism was also implemented for attendance to enhance students' sense of responsibility. Practical operation questions were added to the final exam to improve the training of students' usual application ability.

4. Curriculum Teaching Effectiveness

4.1. Significant Improvement in Exam Scores

When questions were selected from the same question bank, 77 students of the 2021 accounting major took the final exam of Statistics before the teaching reform, with an average score of 56.62. After the teaching reform, 78 students of the 2022

accounting major took the final exam of Statistics, with an average score of 64.94. From the score distribution chart, the score distribution changed from a normal distribution to a left-skewed distribution, indicating a significant improvement in students' scores.

The final written exam mainly assesses students' ability to memorize and understand knowledge. The establishment of the usual early warning mechanism can well improve students' final exam scores. However, this does not indicate the high level of the course; it only indicates that students have a good grasp of knowledge memory.

4.2. A Preliminary Test of Application and Innovation Abilities

One of the good platforms to test the course level is the provincial discipline competition platform, where students apply the knowledge they have learned to solve practical problems, and the teaching level and students' application and innovation abilities are tested through practice. Through teaching design, teachers encourage students to take action and keep busy, stimulating their interest in learning through practice.

During the teaching process of the second round of the semester, all 18 business plan survey reports of the whole class won awards in the school-level competition of the "Three Innovations" Competition. Among them, the works Liaoning Intangible Cultural Heritage Liaoyantai Communication Studio and New Media Marketing of Liaoning Industrial Heritage Sites won the first prize and the second prize of the Provincial Network Marketing Competition respectively; the work Decoding the Anti-Japanese United Army Secret Camp won the third prize of the provincial competition of the "Internet Plus" Competition; and the work Sweet Strawberries, Joy in the Heart won the third prize in the market research category of the Agricultural Economy Competition. The award-winning rate in the provincial competition was 22%, and there is room for further improvement in the award-winning ratio.

With clear teaching objectives, high-quality scientific research, a continuously improved teaching mode, distinctive teaching design, and a carefully built discipline competition exchange platform, students develop comprehensive qualities that are beneficial to their long-term career development through practice. This process requires repeated iteration and optimization of details, and the teaching quality is continuously improved by constantly optimizing and solving teaching problems, which naturally promotes the digitalization of teaching.

Funding

Disclosure statement

The author declares no conflict of interest.

References

[1]   Yuan W, 2022, Statistics (5th Edition). Higher Education Press.

[2] Lyle S, 2003, Translated by Wei Meijin. Competency Assessment Method. Shantou University Press, Guangdong.

[3] Don H, 2001, Translated by Yu Wenzhao, et al. Organizational Behavior. East China Normal University Press.

[4] Wu S, 2018, SPSS Practice and Statistical Thinking. Tsinghua University Press.

Publisher's note

Whioce Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.