A Comparative Study of Rain Classroom and Traditional Teaching in the Teaching of Financial Engineering

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Abstract: This paper compares and analyzes the impact of traditional teaching and rain classroom teaching mode on students' final examination results in the teaching of financial engineering. It also analyzes the correlation between rain classroom application and final examination results. Under the rain classroom teaching mode, students' final examination scores have been significantly improved. Students actively participate in the exercise test in class. This helps the students to improve their final examination scores.

Keywords: traditional teaching; Rain class; financial engineering; teaching model

1. Introduction

Financial engineering is the core professional course for undergraduate students majoring in finance. In 1998, John Finnerty, an American professor of finance, gave the formal definition of financial engineering for the first time. Financial engineering is to introduce engineering ideas into the financial field, comprehensively adopt various engineering technical methods (mathematical model, numerical calculation and mathematical simulation), design, develop and implement new financial tools, and creatively solve financial problems. Financial engineering involves a large number of financial mathematical models and also includes various new financial derivatives in the real world financial market. Students generally reflect that learning is difficult. Traditional teaching teachers complete teaching through ppt explanation, classroom questions and after-school exercises. In the teaching process, they can't grasp students' learning dynamics in real time and adjust the focus of explanation in time. How to adjust teaching methods, better mobilize students' learning enthusiasm and improve teaching quality is a major challenge for teachers' teaching of financial engineering.

Rain classroom is jointly developed by the school online and the Online Education Office of Tsinghua University, which aims to connect the intelligent terminals of teachers and students. "Rain classroom" gives a new experience to every link before, during and after class, releases the energy of teaching and learning to the greatest extent, and promotes teaching reform. Rain classroom integrates complex information technology means into PowerPoint and Wechat. It establishes a communication bridge between extracurricular preview and classroom teaching. It makes classroom interaction never offline. Using rain class, teachers can push pre class preview courseware with MOOC video, exercises and voice to students' mobile phones. Teachers and students can communicate and give feedback in time. Real time answer and bullet screen interaction in the classroom provide a perfect solution for the interaction between teachers and students in traditional classroom teaching. Rain classroom scientifically covers every teaching link before, during and after class, providing teachers and students with complete and three-dimensional data support, personalized reports and automatic task reminders to make teaching and learning more clear.

Some scholars have studied the application effect of rain classroom in classroom teaching. Taking the effective teaching theory and the course of "material physical chemistry" as an example, Dong Guiwei designed and constructed a teaching model based on rain classroom. The results show that this teaching model can significantly improve students' learning effect [1]. Liu Yong studied the motivation, problems and Countermeasures of rain classroom helping to build the "golden course" of Ideological and political education in Colleges and universities. He believed that rain classroom can promote the reform and innovation of Ideological and political education in Colleges and universities [2]. Taking the "Combinatorial Mathematics" course of Tsinghua University as an example, Yang Chunmei applied its flipped teaching based on rain classroom from three aspects: curriculum design, platform and tools and in class learning. The results show that this teaching model can combine traditional learning activities with mobile learning activities, so that students can invest and participate in learning to the greatest extent [3]. Zheng Yuying introduced the application of intelligent teaching tools in the teaching of chemical engineering principles from the aspects of pre class teaching design, in class interaction and test, after class review and information feedback, and curriculum evaluation mechanism. She believed that this teaching method can help teachers master the learning situation of each student and make teaching more personalized [4]. Tan Shitu analyzed the problems existing in the current teaching process of forage production, preliminarily analyzed the reform of the mixed teaching mode of forage production based on

rain classroom. He believed that this mode can realize the all-round interaction between teachers and students, so as to improve the teaching quality of the course [5]. Yang Zhen analyzed the characteristics of field practice teaching and the needs of information reform. Based on the rain classroom, he constructed the mixed teaching mode of geological geography field practice from four links: pre practice preview, interaction in practice, post practice expansion and end of practice evaluation, which expanded the application field of rain classroom [6].

In view of the many advantages of the rain classroom, combined with the teaching characteristics of financial engineering, we introduced the rain classroom into the teaching of financial engineering and constructed an online and offline mixed teaching mode, which has solved the problems existing in the traditional teaching methods. After the completion of the teaching of financial engineering, we took the final examination results as the statistical data and compared it with the traditional teaching.

2. Research Object and Method

2.1. Research Object

The 2016 and 2017 undergraduates majoring in finance in the school of economics and management of Yangtze University were selected as the research object. These students were the control group and the experimental group respectively and the final examination results of "financial engineering" course were taken as the dependent variables of statistical analysis. There were five classes in 2016, with a total of 216 students, including 162 liberal arts students and 89 boys. There were four classes in 2017, with a total of 154 students, including 120 liberal arts students and 66 boys.

The requirements for teachers, class hours, teaching plans and syllabus of the control group and the experimental group were the same. Standardized examination would be adopted at the end of the term and the papers would be marked uniformly. The examination paper had the same key points, question types and components. The objective question type was single choice with a total of 20 points. The subjective questions were blank filling questions, question answering questions, calculation questions and analysis questions with a total of 80 points. Basic questions accounted for 60%. Comprehensive questions accounted for 30%. Improved questions accountED for 10%. The test papers of the control group and the experimental group were equally difficult. Both of test papers belonged to medium difficulty.

Both 2016 and 2017 students were enrolled by the score line of one literature and history and one science and technology in each province. The average scores of students in the college entrance examination were close. There was no significant difference between the average scores of freshmen and sophomores in various courses. The score distribution also mainly presented a normal distribution. It indicated that the learning starting points of students in the two grades were basically the same and the knowledge reserve was at the same level.

2.2. Research Methods

2.2.1. Teaching mode

The 2016 "financial engineering" course adopted the traditional teaching mode. It used multimedia courseware in the classroom and focused on Teachers' teaching. It also set classroom questions for students to discuss and speak. It completed the teaching in combination with homework after class. In 2017, the course adopted rain classroom teaching mode. Teachers would first send the courseware to Wechat for students to preview. The whole course teaching was signed in by scanning QR code. In classroom teaching, teachers would explain each section first. In the process of explanation, students were allowed to send bullet screens and put forward confusion. After a section, the teacher would set up exercises for students to test on site. The types of exercises included single choice questions, multiple choice questions and blank filling questions. The questions included various basic knowledge, analysis and calculation contents. Standard answers would be set in advance to facilitate the automatic correction of the system and statistics of students' answers. After the students answered the class exercises, the software would timely analyze the statistical data of the answers. It would also find out the students' main learning difficulties and give targeted explanations. Exercises would also be arranged after class for students to practice. The teaching data generated synchronously would be included in the assessment scope of usual grades. Teachers would also analyze the knowledge points that students did not master well in this teaching according to the statistical data of rain classroom. Teachers would carry out overall simplification, review and emphasis at the beginning of the next classroom teaching to strengthen students.

2.2.2. Statistical methods

We used SPSS statistical software to conduct independent sample t-test to judge whether there were differences in the impact of different teaching modes on students' final examination scores. Using bivariate correlation analysis, this paper analyzed the correlation between students' various classroom statistical parameters and final final examination scores. Finally, it investigated the correlation between the final examination results and some functions of rain classroom under the rain classroom teaching mode.

3. Results and Analysis

3.1. Descriptive Statistics of Final Results

Table 1 shows descriptive statistics of students' final examination scores. By comparing the descriptive statistical results of each group, the average final examination scores of students in traditional teaching were 66.46 points and the average final examination scores of students in rain classroom teaching are 77.71

points. The final examination scores of students in rain classroom teaching were significantly improved. The standard deviation of students' final examination scores in traditional teaching and classroom teaching was close. The minimum final examination score of traditional teaching students was lower than that of rain classroom teaching students, and the maximum final examination score of traditional teaching students was also lower than that of rain classroom teaching students.

Table 1. Descriptive statistics of students' final examination scores.

Group	Mean	Standard deviation	Minimum	Maximum
Traditional teaching	66.46	8.217	23	87
Rain class	77.71	8.384	55	94

We also calculated the percentages of the final examination scores of students in each group. Table 2 shows percentage of students' final examination scores in different grades. The final examination scores of traditional teaching students were concentrated in 60 ~ 69 points, accounting for 54.17%, 70 ~ 79 points, accounting for 31.02%, less than 60 points, accounting for 11.11%, 80 ~ 89 points, accounting for 3.70%, and more than 90 points, accounting for 0.00%. The final examination scores of students in rain classroom teaching were 80 ~ 89 points, accounting for 42.21%, 70 ~ 79 points, accounting for 33.77%, 60 ~ 69 points, accounting for 18.83%, 4 ⩾ 90 points, accounting for 3.90%, and 5 < 60 points, accounting for 1.30%. If 80 ~ 89 points are good and ⩾ 90 points are excellent, the excellent rate of final examination results of students in rain classroom teaching is significantly higher than that of students in traditional teaching.

Table 2. Percentage of students' final examination scores in different grades.

Group	<60	60～69	70～79	80～89	≥90
Traditional teaching	11.11%	54.17%	31.02%	3.70%	0.00%
Rain class	1.30%	18.83%	33.77%	42.21%	3.90%

3.2. Analyses on the Difference of Final Examination Results

We use paired sample t-test to judge the impact of different teaching modes on students' final examination scores. Table 3 shows paired sample t-test of students' final examination scores. P = 0.000 < 0.05, there are significant differences in students' final examination scores under different teaching modes.

Table 3. Paired sample t-test of students' final examination scores.

Pair group	Mean	Standard deviation	t	P
Traditional teaching - Rain classroom	-10.455	11.230	-11.553	0.000

3.3. Correlation Analysis between Classroom Teaching and Final Examination Results.

2017's finance majors use rain classroom teaching in the whole process. This paper mainly focuses on the correlation between students' sign in times in rain classroom. The number of exercises submitted by students, students' scoring rate (classroom test score / total score of classroom test exercises) and final examination scores. Using Pearson bivariate correlation analysis, * * represents a significant correlation at the 0.01 level (bilateral). Table 4 shows correlation analysis between classroom teaching and final examination results. Pearson bivariate correlation analysis shows that there is a significant positive correlation between the final exam score of classroom teaching and the number of exercises submitted by students at the level of 0.01 (bilateral), and the correlation coefficient is 0.216. There is no statistically significant correlation between students' sign in times and final exam scores. We analyze that the reason may be that some students did come to class and scanned QR code to sign in, but they didn't listen carefully or listen but didn't understand in class. They didn't understand the confused problems in class in time after class, so the final exam scores are not ideal. There is a statistically significant positive correlation between the number of exercises submitted by students and the final examination results, indicating that students actively participate in listening and thinking exercises in class, which is helpful to master knowledge points and improve the final examination results. There is no statistically significant correlation between the student score rate (classroom test score / total score of classroom test exercises) and the final examination results, which shows that even if the knowledge points are tested for the first time in the classroom and the results are not ideal, as long as teachers explain in time, they can still enable some students to increase their understanding and mastery. The process is difficult and the results are good.

Table 4. Correlation analysis between classroom teaching and final examination results.

Correlation coefficient	Times of student sign	Number of exercises submitted by students	Student score rate
Traditional teaching - Rain classroom	0.067	0.216**	0.100

4. Conclusion and Discussions

According to our comparative analysis, compared with the traditional teaching mode, rain classroom teaching can significantly improve the final examination results. In class, teachers can grasp students' learning situation in real time. Teachers can answer questions and solve doubts in time. Students can watch videos after class to revisit what they don't understand in class. However, some students in the rain class do not actively participate in the thinking and solution of classroom exercises. Teachers need to timely analyze classroom statistical data after each class. Teachers need to communicate with

students who do not participate in interaction. Teachers should not give up each student so as to further improve the overall performance of students.

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