An Empirical Study on the Three-Ring Teaching Method

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Abstract. This paper builds a three-ring pedagogy model framework in the form of "self-study-intensive lecture-practice". Focusing on the three-ring teaching method, the mode operation of the three-ring teaching method is proposed. In practice, the teaching experiment of the three-ring teaching method was designed with equal group experiments, and the method of statistical analysis was used to explain the exertion of the three-ring teaching method on students' subjectivity and the teaching effect of the three-ring teaching method with the support of data.

Keywords: Three-ring teaching method · experimental research

1 Preface

J.A.Comenius wrote on the title page of his classic "The Great Pedagogy": The main purpose of my "Great Pedagogy" is to find a teaching method in which teachers can teach less, but students can learn more [1]. Based on this, we try to explore the three-ring teaching method to give full play to students' subjectivity and improve the efficiency of classroom teaching. This issue has been studied for many years and has achieved initial results, Currently, we focused on further deepening the research on this issue from an experimental perspective and obtaining new test results.

2 Pattern Graphics and Operation of Three-Ring Teaching Method

2.1 Pattern Graphics of Three-Ring Teaching Method [2]

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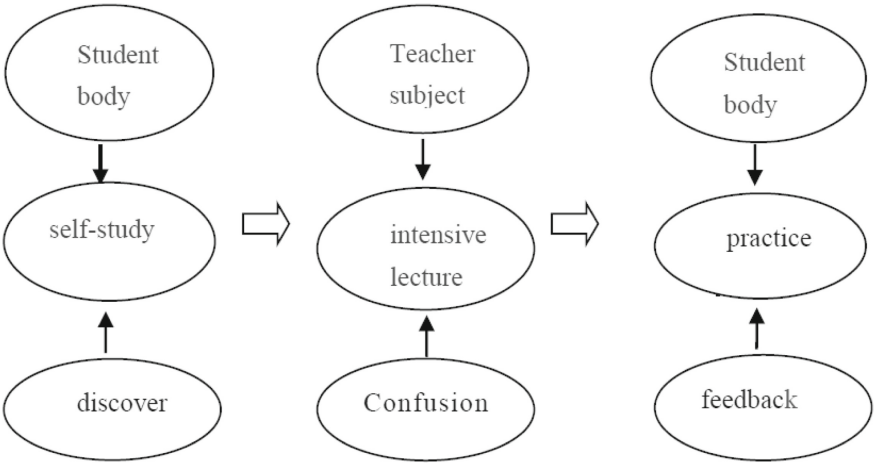

Fig. 1. Pattern Graphics of Three-Ring Teaching Method

2.2 Operation of the Three-Ring Teaching Method

The three-ring pedagogy highlights three teaching links: self-study - intensive lecture – test Self-study is to highlight the main role of students, give play to the leading role of teachers, and students find problems; Precise lecture is to highlight the leading role of teachers and solve key and difficult problems in teaching; The test is to highlight the role of teachers in leading students, and feedback motivates students to learn [4].

2.3 The Gradual Change of Subjectivity in the Application of the Three-Ring Teaching Method

The improvement of students' self-learning ability is a gradual process. Because the stronger the dominance of teachers, the more it suppresses and weakens the subjectivity of students, and the enhancement of students' subjectivity will naturally reduce the dominance of teachers, and the two restrict and influence each other. The gradient relationship between the two is shown in Fig. 2.

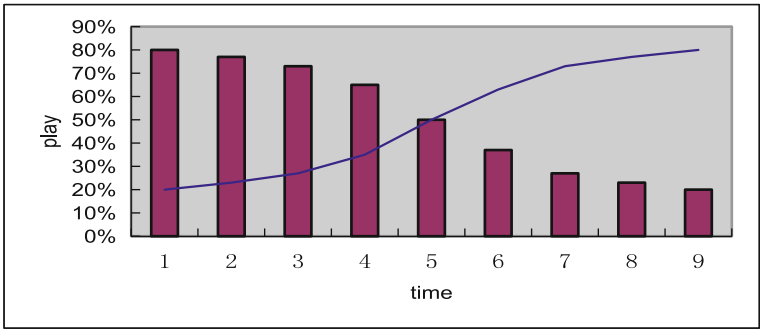

Fig. 2. Teacher-led and student-led gradual change

3 Three Ring Teaching Method Teaching Experiment

3.1 Experimental Purpose

In order to support the theoretical research of the three-ring teaching method, the empirical method is used to study the use value of the three-ring teaching method in the subject teaching of vocational colleges, and the influence of the three-ring teaching method on students' learning subjectivity is verified [5].

3.2 Experimental Assumptions

The experimental hypotheses are: (1) the three-ring teaching method can enhance students' active participation, that is, students' cognitive, emotional and behavioral active input in the teaching process; (2) The three-ring pedagogy can improve students' academic performance.

3.3 Experimental Design

1) Subject and Time

The experiment was designed using an equal-group experiment. The 3rd and 4th classes of the accounting major (69 people in the combined class) were identified as experimental subjects, that is, the experimental class, and the 1st and 2 classes of the accounting major (65 people in the combined class) were secretly designated as the comparison class. Using the textbook "Fundamentals of Statistics" (Second Edition) edited by Liu Ze, the main teacher of the experimental and comparative classes is the author himself. The experimental period is one semester, with 4 lessons per week for a total of 56 lessons.

2) Experimental Variables and Control

Independent variables: teaching using the three-ring pedagogy (comparing classes with traditional pedagogy).

Dependent variables: (1) student participation in classroom subjects; (2) Students' academic performance.

Irrelevant variable control: (1) Classes are held according to the statistics course standards; (2) Do not makepsychological hints and inducements to students in any class, and do not increase the amount of class hours and homework for any class [6].

3) List of Experimental Data
Semester results of experimental and comparative classes are shown in Table 1.

3.4 Experimental Results and Empirical Analysis

1) Comparison of Classroom Participation of Students in Experimental Class and Control Class

In order to compare and analyze the subjective participation of students in the classroom teaching of the experimental class and the comparison class, we divide the final examination results of the second semester of the 2017–2018 academic year, and consider the semester score (equivalent to the test paper score) above 55 points (including 55 points) as full participation in classroom teaching, while the semester score below 55 points is regarded as not fully participating in classroom teaching. Based on this, the number of participants in the classroom teaching of students in the experimental class and the comparison class is statistically obtained [7].

The comparison of students' classroom participation in the statistical experimental class and the comparison class is shown in Table 2.

Data analysis is as follows: through statistics, we can conclude that the percentage of total participants in the experimental class and the comparison class is 55.07% and 21.54% respectively. The difference between the two may be due to sampling error, or it may be the effect of the difference between the experimental and comparison classes.In order to determine the real reason, we first assume that class differences have no effect on students' participation in classroom teaching subjectivity, and we use the four-cell chi-square test. First calculate the percentage of student participation as $(38 + 14)/(38 + 31 + 14 + 41) = 38.81\%$.Then, the actual value and the theoretical value (the value in parentheses) are shown in Table 3.

The chi-square test is calculated as:

$$\chi^2 = \sum \frac{(A - T)^2}{T} = \frac{(38 - 26.78)^2}{26.78} + \frac{(14 - 25.23)^2}{25.23} + \frac{(31 - 42.22)^2}{42.22} + \frac{(51 - 39.77)^2}{39.77}.$$

$$= 15.85 > \chi^2 0.01(1) = 6.64.$$

For the chi-square test of the four-cell table, this example can also be completed using SPSS software, which needs to go through four steps: data entry - weight - contingency table setting - result display.

The results show that the difference between the experimental class and the comparison class is very significant, which confirms the main reason for this difference is the difference in the teaching methods of the two classes, and the experimental class using the three-ring teaching method is more active in participating in classroom teaching than the comparison class using traditional teaching methods.

2) Comparison of Students' Statistics scores between the Experimental Class and the Control Class

Table 1. Semester results of experimental and comparative classes

Experimental class (n stands for serial number, g stands for grade)														Comparison class (n stands for serial number, g stands for grade)													
n	g	n	g	n	g	n	g	n	g	n	g	n	g	n	g	n	g	n	g	n	g	n	g	n	g	n	g
1	79	11	96	21	75	31	73	41	68	51	66	61	69	1	84	11	66	21	62	31	65	41	75	51	69	61	75
2	68	12	72	22	100	32	72	42	77	52	67	62	71	2	87	12	68	22	64	32	68	42	70	52	77	62	69
3	71	13	69	23	66	33	99	43	70	53	68	63	71	3	69	13	65	23	71	33	69	43	68	53	73	63	68
4	99	14	69	24	100	34	88	44	83	54	64	64	67	4	64	14	65	24	67	34	68	44	69	54	67	64	68
5	67	15	71	25	98	35	71	45	72	55	70	65	67	5	65	15	63	25	67	35	68	45	68	55	68	65	68
6	73	16	69	26	74	36	71	46	68	56	70	66	68	6	60	16	64	26	67	36	72	46	68	56	71	-	-
7	100	17	100	27	99	37	68	47	67	57	64	67	67	7	66	17	100	27	70	37	63	47	67	57	68	-	-
8	100	18	91	28	75	38	80	48	72	58	68	68	71	8	68	18	100	28	63	38	80	48	64	58	65	-	-
9	100	19	100	29	89	39	78	49	67	59	74	69	65	9	64	19	77	29	68	39	63	49	67	59	100	-	-
10	67	20	71	30	75	40	97	50	66	60	80	-	-	10	68	20	65	30	65	40	66	50	67	60	71	-	-

Table 2. Comparison of classroom participation of students in experimental class and comparison class

group	Project		
	Number of participants in the whole process	Not all participants	Percentage of total participants
Experimental class	38	31	55.07%
Comparison class	14	51	21.54%
Inspection value	$\chi^2 = 15.85$		
Significance	$p < 0.01$		

Table 3. Actual and theoretical values of the number of student participants in experimental and comparative classes

group	Project		
	The number of people participating in the whole process of teaching	Number of people who did not participate in the teaching process	Total
experimental class	38(26.78)	31(42.22)	69
Comparison class	14(25.23)	51(39.77)	65
Total	52	82	134

Table 4. Comparison of two statistics scores between the experimental class and the comparison class

Project / Data / group	Pre-test			post test (final score)		
	Mean (N)	Mean value(X)	Standard deviation(S)	Mean (N)	mean value (X)	Standard deviation(S)
Experimental class	69	68.7	14.09	69	63.90	19.10
Comparison class	65	69.2	13.76	65	52.43	12.57
Inspection value	Z=0.21			Z=4.13		
Significant	P>0.05			P<0.01		

Note: The pre-exam is the study exam at the beginning of the semester, and the post-exam is the final exam at the end of the semester

As shown in Table 4, the number of students (sample size) in the experimental class and the comparison class is greater than 30, and the Z-test method is used to analyze

whether there is a significant difference between the experimental class and the post-test test of the comparison class.

STEP01: excel → "z-Test Analysis.xlsx" workbook → "Data" → "Data Analysis" → "Z-test: Two-sample mean difference test" → "OK".

STEP02: Open the Z-Test: Two-Sample Mean Difference Test dialog box, set the range of variable 1 and variable 2 in the Input list area, and set the value of the α to "0.05", then click to select the "New worksheet group" radio button in the Output Options list, and finally click "OK".

STEP03: At this point, the analysis results of "z-test: two-sample mean difference test" are displayed in the worksheet.

Take advantage of excel tools, where the calculation of standard deviation uses the STDEVP function [8].

$$Z = \frac{\left|\overline{X_1} - \overline{X_2}\right|}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} = \frac{|63.90 - 52.43|}{\sqrt{\frac{19.10^2}{69} + \frac{12.57^2}{65}}} = 4.13.$$

The average score difference between the two shifts in the pre-test is only 0.5,$|Z| = 0.21 < 1.96 = Z_{0.05}, P > 0.05$. It showed that the two parallel classes had roughly similar grades at the beginning of the experiment, and there was no significant difference between the two. In the post-test, the average score difference between the experimental class and the comparison class was 11.47, indicating that the difference between the results of the experimental class and the comparison class in the post-test was particularly significant, and the average score of the experimental class was higher than that of the comparison class [9].

For the experimental class alone, there are the following classification and comparison(see Table 5 and Fig. 3).

From the above Table 5 and the Fig. 3 before and after the test, it can be seen that there is a certain polarization phenomenon in the test class after the test. This phenomenon shows that the top students have strong self-learning ability, and the three-ring teaching method is more suitable for them. However, the "students in difficulty" have a serious

Table 5. Comparison of the classification of grades before and after the experiment in the experimental class

project / group	excellent	good	in	difference
	90-100	75-89	60-74	0-59
Before experiment	8 (11.59%)	15 (21.74%)	29 (42.03%)	17 (24.64%)
After the experiment	13 (18.84%)	4 (5.80%)	7 (10.14%)	45 (65.22%)

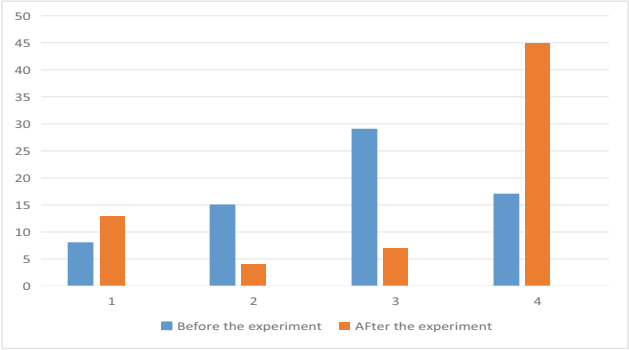

Fig. 3. Table 5 Data histogram

idea of "waiting, relying and wanting" in learning, and these students cannot fully get used to this teaching method within a certain period of time, and need to pay attention to and support them.

4 Conclusion

Through experiments, the experimental hypothesis is verified, and the three-ring teaching method has a good effect on teaching students to learn and actively learn, and cultivating students' good psychological quality and learning resilience [10].

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