The Effects of Instructional Methods and Ability Levels on Students' Learning Achievement of Economics and Class Climate

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ABSTRACT

This study explores the outcomes of delivering economics courses in the senior vocational commercial high school. This study performed experimental teaching to determine the effects of instructional methods (including cooperative learning and didactic instruction) and ability levels on learning achievements of economics and class climate. The instruments of this study comprised "Class Climate Inventory" and "Achievement Test of Economics". 63 students (including 30 students in the experimental group and 33 students in the control group) were sampled from the department of data processing in commercial high school. This study applied the quasi-experimental unequal group design, and in addition to the means and standard deviation, conducted statistical methods, such as two-way Analysis of Covariance (ANCOVA) and one-way Multivariate Analysis of Covariance (MANCOVA), to analyze the data. Additionally, this study required classroom observation, teacher reflection journals, the creation of teaching files, and student feedback to examine the effectiveness of cooperative learning. The results revealed that students in the cooperative learning group significantly absorbed more information in Economics and displayed improved class climate compared to students in the traditional didactic instruction group, and that the practice of social skills in the process of cooperative learning is significant. The conclusions of this study list recommendations for teachers and future research regarding cooperative learning.

Keywords: cooperative learning, learning achievement of economics, class climate

1. Introduction

For students studying in commercial high schools, economics is a foundational and essential subject. Yu (2001) stated that the content of economics often covers abstract concepts and various relationships between variables. Expecting students to

gain in-depth knowledge of these materials with only one-way teaching from teachers is impractical. To enhance creativity, learning attitudes, and student motivation during the process of learning economics, past studies have employed various approaches, techniques, and new technologies in teaching, in an attempt to improve learning effectiveness. For instance, diverse teaching strategies were adopted to boost participant confidence in learning economics; spreadsheet calculations and charts were utilized to assist students learning abstract concepts and various relationships between variables; computer simulations and games were employed to enhance learning motivation and achievements; and Internet applications were incorporated into economics teaching to boost learning achievement, attendance rates, and learning motivation (Johnston, James, Lye, & McDonald, 2000; Schmidt, 2003; Yamarik, 2007). In Taiwan, Chen (2002) applied critical thinking in economics teaching and achieved significant effects on student critical thinking abilities and class climate; Lu (2002) applied the principles of constructivism in designing an economics course, and gained favorable responses. Though most studies regarding economics provide empirical bases with positive support, the effectiveness of computer-related skills in economics teaching is limited by a number of elements, such as equipment, budgets, teacher computer skills, and educational software (Yu, 2001).

In the past decades, cooperative learning has garnered much attention in academia as an approach requiring peer interaction. Teachers assign the responsibility of learning to the students; boosting class participation and thereby increasing the willingness of students to learn, converting them from passive recipients of knowledge to active participants of knowledge. Through cooperative learning, students can exchange learning experiences and ideas, enhancing learner conceptions. This consequently stimulates student interest in teaching materials, and constitutes higher learning achievement. Students simultaneously become more positive toward the subject, learning to accept the diverse range of opinions of their peers in a cooperative learning environment (Johnson & Johnson, 1989). The Educational Resources Information Center (ERIC), for instance, boasts over 5,000 works involving cooperative learning, the oldest of which dates back to 1966. Past empirical studies have generally supported that the instructional methods in cooperative learning are significantly beneficial to student learning achievements, learning attitudes, motivation, self-efficacy, interpersonal relationships, and class climate (Yu, 2001). Cooperative learning aids teachers in deviating from traditional and routine teaching, thereby bringing new vitality to teaching.

Another issue the study addresses is whether cooperative learning favors classroom management. At present, course schedules at vocational high schools in Taiwan are compact; teachers and students therefore have few opportunities to

interact with each other, and common consciousness among a class is difficult to develop. Whether to alter approaches to teaching is a noteworthy point, such as importing cooperative learning to enhance the building and cohesion of class climate, further improving the function of education.

2. Methods

Research Design

This study adopted a quasi-experiment nonequivalent group design using existing classes as sample units. The controlled variables were student qualities, teaching material qualities, and teacher qualities, which were controlled to be as consistent as possible during the process of the experiment.

This study examined two experimental variables: instructional method and an ability level of economics. In the instructional method, cooperative learning was applied on the experimental group, the model for which was student teams-achievement division (STAD). The authors designed lesson plans and teaching materials based on actual teaching circumstances, to meet the requirements for teaching economics, and utilized traditional didactic instruction for the control group. In ability levels of economics, the method for grouping the students by achievement was to divide the students in the experimental group and the control group according to their pretest scores in economics in the previous semester; two midterm scores, and one finals score. The students were then ranked by the average of the pretest scores. The top 25 % of the two groups were categorized as the high achievement group, the bottom 25 % as the low achievement group, and those between as the medium achievement group. During the experiment, the students with different achievements in the experimental group were assigned heterogeneously and evenly among the cooperative learning groups; the control group remained constant in terms of teaching style.

Research Hypothesis

This study proposed the following hypotheses:

H₁: Different instructional methods and ability levels of economics have no significant impact on the learning achievements of economics.

H₂: Different instructional methods have no significant impact on class climate.

Subjects

This study employed eleventh grade students in the data processing department at a national commercial high school in Central Taiwan as the study subjects. Due to restrictions from the current educational system and class placement teaching, the

study was unable conduct random selection for students as samples. Therefore, this study collected samples using classes as units. One class was randomly designated as the experimental group, and the other as the control group. Teaching was conducted using cooperative learning in the experimental group and traditional didactic instruction in the control group. The distributions in the samples are shown in Table 1.

Table 1 Distributions in the samples

	Control group	Experimental group	Total
man	9	10	19
female	24	20	44
Total	33	30	63

Instruments

This study employed two instruments: (1) an achievement test of economics; and (2) a class climate inventory. The process of preparing these two instruments is explained as follows:

- Achievement test of economics: Using a two-way specification table and the levels of the cognitive domain. A pretest was conducted by 61 twelfth graders in the department of accounting at the same school. To confirm the appropriateness of the test questions, the difficulty and discrimination of each question was evaluated. This study adopted a discrimination measure of .30 as the acceptance criterion; 12 questions with lower discrimination were eliminated, resulting in 33 remaining test questions.
- Class climate inventory: this inventory was based on the physics and chemistry classroom climate questionnaire by Chen (2008) and the class climate inventories by Hsu (1999) and Li (2001). The Cronbach's α of the four constructs (teacher support, peer support, satisfaction, and cohesion) were 0.74, 0.77, 0.80, and 0.82, respectively. That of the overall inventory was a high 0.92, indicating high reliability.

Data Analysis

To achieve the objectives of this study, this study employed SPSS for Windows 15.0 in data analysis and processing. A two-way ANCOVA was first performed to examine the influence of the two instructional methods on the economics learning achievements of the commercial high school students. A one-way MANCOVA was then conducted to investigate the effects of the two instructional methods on the class climate of the commercial high school students.

Instructional Implementation

The traditional didactic instruction given to the control group in this study was implemented. The cooperative learning for the experimental group was planned in three parts: a warm-up activity before the experimental teaching, instructional design, and cooperative learning. The warm-up activity included description of cooperative learning, group assignment and roles and tasks were defined, as well as class rules and group rules.

In coordination with the integrity and progress of the course content, each unit was covered over three periods in a week, comprising 145 minutes. The design of the unit activities contained the following six parts: (1) the theme of the unit; (2) an explanation of the teaching goal; (3) a summary of the content and main concepts; (4) specific goals; (5) unit activities, teaching aids, and time; (6) assessment activities. Finally, the authors compiled three chapters comprising international trade and finance, economic fluctuation, and economic development and growth into 7 teaching units, based on the content and format of the worksheets described above.

3. Results

Student Learning Achievement on Economics

In terms of the test for homogeneity, the F value was 1.18 and $p > .05$; therefore, the variances within each cell are homogeneous, conforming to the basic assumption for the analysis of covariance. The covariate of this study was the students' ability of economics, and the dependent variable was the economics posttest score. The correlation value between the two was .57 ($p < .001$), indicating significant correlation in accordance with the basic assumptions for the analysis of covariance.

With the satisfied assumptions, the analysis of covariance could thus be performed, to test whether the interaction between instructional method and ability level of economics is significant, and whether the main effects of each group are equal. Table 2 shows the mean, standard deviation of learning achievement and ability level of economics. In summation of the two-way ANCOVA shown in Table 3, "instructional method × ability level of economics" represents the statistical test for the significance of the interaction. As the F value is 1.83 and $p > .05$, the main effects of the instructional method factor, the level of significance was achieved. The F value was 14.35 and $p < .05$, indicated that different instructional methods induce varying economics learning achievements after the influence of the covariate is eliminated. In addition, the main effect of the ability level of economics factor did not achieve the level of significance with an F value of 1.92 and $p > .05$. A different ability level of economics has no significant impact on the learning achievement of economics once the influence of the covariate is eliminated. As the main effect of the instructional

method factor reached significance, a post-hoc comparison revealed that the adjusted means of different instructional methods reached significance, thereby supporting the notion that the learning achievement of students taught by cooperative learning are superior to those of students taught by traditional didactic instruction.

Table 2 Descriptive statistics of and ability and learning achievement of economics

Group	Ability level	N	Pretest		Posttest	
			M	SD	M	SD
Control group	High	8	75.25	11.50	57.50	21.95
	medium	17	50.35	7.82	47.00	10.63
	low	8	31.13	4.79	34.13	8.32
Experimental group	High	8	81.25	5.01	64.88	10.51
	Medium	14	61.00	9.82	67.93	11.70
	Low	8	35.00	8.25	54.75	7.01

Table 3 Summary table of two-way ANCOVA

Source	SS	df	MS	F
Covariance	1386.56	1	1386.56	10.82
Instructional method(IM)	1839.15	1	1839.15	14.35[***]
Ability of economics(BE)	492.91	2	246.45	1.92
(IM)×(BE)	470.25	2	235.13	1.83
Error	7177.62	56		
Total	204134.00	63		

$*p<.05; **p<.01; ***p<.001$

Class Climate

In the test for the assumption on homogeneity of regression (parallel regression lines), the interaction test between instructional method and the teacher support construct derived Wilk's $\Lambda=.78$ and $p<.05$, thereby reaching the level of significance and rejecting the homogeneity of regression assumption. This indicated that the teacher support pretest score was not appropriate as a covariate. Furthermore, the Wilk's Λ derived from the tests for the interactions between instructional method and peer support, satisfaction, and cohesion were .93, .95, and .85 ($p>.05$), respectively. These statistics did not reach the level of significance, supporting the homogeneity of regression assumption, and showing that the pretest scores for peer support, satisfaction, and cohesion were suitable as covariates. In testing the assumption for linear dependence of the dependent variables and covariates, Wilk's Λ was .22 and $p<.05$. The level of significance was thus reached, meaning that the common slope

was not 0. This indicated that the covariate influence of the peer support pretest score, the satisfaction pretest score, and the cohesion pretest score required adjustments using covariates. Using Box's Test of Equality of Covariance Matrices, the F value derived was 1.49 and p>.05, in accordance with the homogeneity of variance assumption.

Table 4 Summary table of one-way MANOVA

Source	df	SSCP				Wilk's Λ
Instructional method	1	1355.22	1259.10	1583.95	2056.45	.22***
		1259.10	1169.79	1471.61	1910.59	
		1583.95	1471.61	1851.29	2403.54	
		2056.45	1910.59	2403.54	3120.52	
Error	58	792.37	553.09	768.63	540.44	
		553.09	1489.81	1219.98	910.51	
		768.63	1219.98	1929.17	1021.08	
		540.44	910.98	1021.08	1059.11	
Total	59					

***p＜.001

Table 5 Summary table of one-way ANOVA

Source	Scale	SS	df	MS	F	Post hoc
Instructional method	teacher support,	1352.22	1	1355.22	99.20***	(1)＞(2)
	peer support	1169.79	1	1169.79	45.54***	(1)＞(2)
	satisfaction	1851.29	1	1851.29	55.66***	(1)＞(2)
	cohesion	3120.52	1	3120.52	170.89***	(1)＞(2)
Error	teacher support,	792.37	58	13.62		
	peer support	1489.81	58	25.69		
	satisfaction	1929.17	58	33.26		
	cohesion	1059.11	58	18.26		

***p＜.001   Note. (1) = cooperative learning; (2) = traditional didactic instruction

Table 4 shows that after eliminating and controlling the covariates, adopting different instructional methods in economics classes results in significant differences in class climate (Wilk's Λ=.22, p<.05), thereby rejecting null hypothesis H_2. Using one-way MANCOVA for multiple comparisons of the differences among each group, the results, as shown in Table 5, reveal significant differences in the teacher support, peer support, satisfaction, and cohesion constructs in the class climate inventories

obtained from the two classes. Finally, as presented in tables 5 and 6, a comparison of the adjusted means in each group after eliminating the covariate shows that the inventory scores in all the class climate constructs of the class employing cooperative learning were greater than those of the group employing traditional didactic instruction. In summation of the results from statistical analysis, application of cooperative learning when teaching economics to commercial high school students can significantly enhance the class climate during class, including the teacher support, peer support, satisfaction, and cohesion constructs.

Table 6 Adjusted mean and standard deviation of class climate

Method	Scale	N	M	SD	M (adjusted)	SD (adjusted)
Traditional didactic instruction	teacher support,	33	22.36	3.74	22.40	.66
	peer support	33	18.55	5.08	18.08	.91
	satisfaction	33	23.03	5.57	22.45	1.03
	cohesion	33	16.24	5.14	15.17	.77
Cooperative learning	teacher support,	30	32.00	3.55	32.26	.70
	peer support	30	26.73	5.86	27.25	.96
	satisfaction	30	33.33	5.57	33.98	1.09
	cohesion	30	29.90	5.14	30.59	.81

5. Discussion and Conclusions

Once the teaching experiment was completed, the results from the achievement test of economics administered to the experimental group and the control group revealed that the learning achievements of students in the experimental group were evidently superior to those of the students in the control group. This result supports the findings of most studies in which cooperative learning is contributive to the performance of learning achievements on economics (Johnston, James, Lye, & McDonald, 2000; Schmidt, 2003; Yamarik, 2007). Thus, the results of this study once more confirm the positive functions of cooperative learning on learning achievements.

Regarding achievement groups, however, the results of the achievement test showed no significant differences between the high, middle, and low achievement groups of both classes in economics learning achievements. According to the literature review, past studies indicate that most students benefit from cooperating experiences, regardless of prior abilities. Several studies (such as Anderson, 1970; Spilich, Vesonder, Chiesi, & Voss, 1979) have affirmed that cooperative learning is more advantageous to students with higher or lower abilities, but is more limited in promoting the learning achievements of students with middle abilities. Concerning

cooperative learning being more beneficial to students with higher or lower abilities compared to those with middle abilities, the results of this study do not correspond with this conclusion.

In conclusion, the time length of seven weeks for the teaching experiment in this study may be the crucial reason why significant differences were not obtained. After the teaching experiment, the results of the class climate posttest administered to the experimental group and the control group showed a significantly higher increase in the experimental groups in all constructs (teacher support, peer support, satisfaction, and cohesion) than those in the control group. Compared to the results of numerous domestic studies (such as Lin, 1992; Li, 2001; Nien, 2004) where significant differences were not achieved in one or two constructs, the results of this study strongly prove that cooperative learning positively and significantly influences affective attitudes, in particular, class climate.

Finally, according to the results of the meta-analysis conducted on cooperative learning by Huang and Lin (2002), cooperative learning is a significant instructional method. From a perspective of whether results exist, cooperative learning is a instructional method worth recognizing, which is a conclusion shared by this study. Regarding the effect size, though the mean effect sizes obtained by Huang and Lin (2002) were significant, the true effect sizes were not high, implicating a limited effect on learning achievement. A review of past studies revealed that most studies had utilized STAD as the cooperative learning strategy, which is identical to the strategy used in this study. Whether a better teaching strategy exists to enhance the true effect sizes under different circumstances or with different subjects is a question worth considering. Therefore, this study suggests that future studies devote efforts to different teaching strategies of cooperative learning or incorporate multiple strategies to enhance the true effect size of cooperative learning.

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