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RESEARCH ARTICLE

COOPERATIVE LEARNING IN TEACHING SCIENCE: ITS EFFECT ON ACADEMIC PERFORMANCE

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ABSTRACT

This study ascertained the usage of cooperative learning in teaching Science. Students were randomly selected and equated wherein each group has equal number of subject-respondents. Data needed for this quasi-experimental research were obtained through a fifty-item teacher-made test then scores in the pre-test and post-test were used to determine the significant relationship and difference between the groups. As to comparing the groups, paired t-test and independent sample t-test was used in determining the significant difference of the two test mean scores between groups. After data were tabulated and analyzed, found were: the performance level of the control and experimental group during the post-test were average and very high, respectively as indicated by their means; there is a high significant difference in the pre-test and post-test of the experimental group; a high significant difference in the pre-test and post-test of the control group; a significant difference in the pre-test between the control and experimental group; lastly, there is a significant difference in their pre-test and post-test mean gains. The patterns and strength of the findings suggest that Cooperative Learning is more effective in attaining optimum learning compared to the lecture–discussion method.

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INTRODUCTION

Over the past decade cooperative learning has emerged as the leading new approach classroom instruction. Cooperative learning is described as the instructional practice of placing students into small groups and having them work together toward a common goal. Each group member learns new materials and helps other group members learn important information (Slavin, 1987). Cooperative learning strategy consists of social interactions between students based on equal partnership in the learning experience, as opposed to fixed teacher-learner roles. Lessons are designed around tasks, problems and projects, which students work through in small mixed ability groups (Slavin, 1987). Furthermore, the perspective of students working as *academic loners* in classroom is very different from that of students working cooperatively and collaboratively in and as *cooperative learning academic teams.* It is when students, as small teams, work together to solve challenges in a student-centered fashion, they not only understand the information better but they retain it for a much longer period of time than they do with teacher-centered instruction (Slavin, 1987; McKeachie, 1988; Johnson *et al.,* 1991). Proponents of cooperative learning claim that the active exchange of ideas within small groups not only increases interest among the participants but promotes critical thinking. There is persuasive evidence that cooperative teams achieve at higher levels of thoughts and retain information longer than the students who work quietly as individuals. The shared learning gives students an opportunity to engage in discussions, take responsibility for their own learning, thus becomes critical thinkers (Totten *et al.,* 1991). Each member of a team is responsible not only for learning what is taught but also for helping teammates learn, thus creating an atmosphere of achievement. Cooperative learning is an instructional approach that integrates social skills objectives with academic objectives in education. When allied with the purposes of teaching thinking in the classroom, cooperative learning becomes an extension of cognitive research and the pursuit of more intelligent learning outcomes from instruction. Such an alliance seems natural and, in many ways, an expected outgrowth following years of cognitive-developmental psychological theory development. Instruction in the cooperative learning classroom requires students to share how they think, thus to act as mediators of other students' thinking. Such discussion with peers often calls for an elaboration of the meaning first ascribed to a situation – perhaps need to express ideas in exemplary, parallel structures. During cooperative learning, aids may be used as soon as formal contacts have been made with a group of prospective learners and the use of audiovisual methods including models, at an early stage such as during the lesson presentation do much to help consolidate a regular study group by providing materials to stimulate thought and discussion (Olarewaju, 2012). These different theories have given the researcher a sense of direction to conduct this study on Cooperative Learning in teaching Science.

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Objectives of the study

This is an experimental study that determined the effectiveness of the use of cooperative learning in teaching Science as compared to the traditional method. Particularly, this study sought answers to the following questions: (1) Is there a significant difference in the level of performance in Science in the post-test and pre-test of the control group? (2) Is there a significant difference in the level of performance in Science in the post-test and pre-test of the experimental group? and (3) Is there a significant difference in the post-test mean gains of the experimental and control group?

METHODS

The study adopted the quasi experimental research. Two groups were used in the experimentation, the experimental group wherein cooperative learning strategies was used and the control group wherein traditional method was employed. The researcher herself conducted the actual experimentation or classes for both the experimental and control groups.

Respondents

The respondents of this study were college students taking up Bachelor of Science in Business Administration. These students were chosen randomly. The respondents were equated in a manner wherein each group has equal number of subject-respondents.

Instruments

To determine the effectivity of the cooperative learning, outlined lesson plans were constructed and a forty-item teacher-made pre-test/post-test was constructed. Both the lesson plan and the fifty-item teacher-made pre-test/post-test were checked by the Science Coordinator for content validation. Suggestions were incorporated in the draft of the forty-item teacher-made pre-test/post-test. Item Analysis was conducted to determine the difficulty and discrimination indices of the items together with the lesson plan prepared for this study.

Data Analyses and Statistical Treatment

Scores in the pre-test and post-test, the mean and the simple percentage was computed both for the experimental and control group. The responses to the 50-item teacher-made pre-test/post-test were given one point to every correct answer and their total scores in these tests were used to determine the significant difference between the two groups. To compare the two groups, paired t-test was used to determine the significant difference of the post-test and pre-test mean scores of the experimental group. Also, paired t-test was used to determine the significant difference of the post-test and pre-test of the control group. Independent t-test was used to determine the significant difference in the post-test mean gains of the experimental and control groups.

Data Gathering

In order to obtain the data needed for this research, the researcher undertook the following activities. The researcher selected the respondents for the experimental and control groups. Groupings of below average, average, above average and excellent students were considered using their grades in Physical Science. A random sampling was used for both the experimental and control group – heterogeneous grouping. Pre-test then was administered, one schedule at a time both for the experimental and control group and same with the post-test.

RESULTS AND DISCUSSION

The respondents were grouped and were distributed equally into two group. The control and experimental groups were both given pre-test to determine the level of their performance in Science before the intervention. The control group then was exposed to the traditional, lecture-discussion, method of instruction while the experimental group was exposed to Cooperative Learning. At the culmination of the experiment, the data gathered were compared in order to determine if there exists a significant difference in the level of performance in the pre-test and post-test in Science of both the control and experimental groups. The data gathered are presented, analyzed and interpreted in the following order.

Level of Performance in Science in the Post-Test and Pre-Test of the Control Group

First objective of this study was to establish if there is a significant difference in the performance of the control group in the post-test and pre-test. Table 1 presents the data needed.

Table 1. Comparison on the Level of Performance in Science in Post-Test and Pre-Test of the Control Group

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Control Group Post-Test - Control Group Pre-Test	4.95000	4.73368	.74846	3.43610	6.46390	6.614	39	.000

Table 1 shows the difference between the level of performance in Science of the control group in the pre-test and post-test. It showed that the post-test of the control group has a trivial increase of 4.95 (95% CI, 3.44 to 6.46) compared to the pre-test of the same group. Indicatively, the post-test scores of the control group statistically has a slight significant increase compared to the pre-test scores of the same group, $t(39) = 6.614$, $p<.0005$. The result conforms that traditional teaching is when a teacher directs the students to learn through memorization and recitation techniques thereby not developing their critical thinking, problem solving and decision-making skills [UKE ssays, cited Sunal, 1994].

Level of Performance in Science in the Post-Test and Pre-Test of the Experimental Group

One objective of this study is to establish if there is significant difference between the level of performance in Science of the experimental group in the post-test and pre-test.

Table 2. Comparison on the Level of Performance in Science in Post-Test and Pre-Test of the Experimental Group

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Experimental Group Post-Test - Experimental Group Pre-Test	15.45000	5.01766	.79336	13.84527	17.05473	19.474	39	.000

As shown on the table above, the post-test of the experimental group elicited an increase of 15.45 (95% CI, 13.85 to 17.05) compared to the pre-test of the same group. Post-test scores of the experimental group elicited a statistically significant increase compared to the pre-test scores of the same group, $t(39) = 19.474$, $p<.0005$. Active participation of the students in a cooperative atmosphere encourages verbalization and increase the atmosphere of team learning as shown in a highly significant difference between the post-test and the pre-test of the experimental group. In conformity that shared learning gives students an opportunity to engage in discussions, take responsibility for their own learning, thus becomes critical thinkers (Totten, *et al.,* 1991). The result presented indicates that the use of Cooperative Learning contributed to the performance of the experimental group. Thus, supports the conclusion made by Parchment (Parchment, 2009), that when Cooperative Learning is implemented there is an increase student achievements and direct student-centered learning. According to the findings of Fetalvero (Fetalvero, Lucila Ravelo, 2013), the most effective predictors of student academic achievement is determined through the multiple correlation and regression analysis are: the use of motivation to start the lesson, students' attitude towards the subject, the motivational strategy-keeping students busy, and making a summary and conclusion of the lesson at the end of the period. Thus the significant difference between the mean score of the experimental group and the control group supports the findings of Fetalvero.

Comparison of Mean Gains of Post-Test Performance in Science of Experimental and Control Groups

The ultimate objective of the study is to establish if there exist a significant difference between the performance of the control and experimental group at the culmination of the study.

Table 3. Comparison of Mean Gains of the Post-Test Performance in Science of Control and Experimental Groups

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
PostTest	Control	40	27.6500	6.34298	1.00291
	Experimental	40	37.4500	4.54578	.71875

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PostTest	Equal variances assumed	4.553	.036	-7.942	78	.000	-9.80000	1.23387	-12.25645	-7.34355
	Equal variances not assumed			-7.942	70.699	.000	-9.80000	1.23387	-12.26045	-7.33955

Table 3 presents the comparison of mean gains of the post-test of the control and experimental group. There is a significant difference in the post-test of the control group and experimental group, control group (27.65, ±6.343) and experimental group (37.45, ±4.546), $t(78)=7.942$, $p=0.000$. Results presented above signify that the subjects differ significantly in the level of performance, with the experimental group having better performance. A significant difference on the level of performance of both the control and experimental groups can be imputed to student's response towards the utilization of Cooperative Learning during the conduct of the study. The result substantiates the findings of Light that students in teams spoke more often, asked more questions, and were more engaged than those in non-grouped, teacher-directed classes. Moreover, it strengthens the theory of Killen (Killen, 1996) that Cooperative Learning is an instructional technique and teaching philosophy that encourages students to work in small groups with peers to learn at optimum level. Thus, students completing Cooperative Learning group tasks tend to have a higher academic test scores, higher self-esteem, greater numbers of positive social skills, fewer stereotypes of individuals of other races or ethnic groups, and greater comprehension of the content and skills they are studying as pointed out by Slavin (1987).

Conclusion and recommendation

The main objective of the study was to determine the effectiveness of Cooperative Learning in teaching Science. Specifically, it aimed to establish the following: (1) Level of performance in Science in the pre-test and post-test of the control group, (2) Level of performance in Science in the post-test and pre-test of the experimental group, and (3) Comparison of the mean gains of the post-test performance in Science of experimental and control groups.

Conclusion

Based on the foregoing findings, it can be concluded that the use of cooperative learning in teaching science is more effective than the traditional method.

Recommendations

The following recommendations were identified based on the findings and conclusions: teachers are encouraged to use cooperative Learning in teaching Science to obtain optimum result in academic performance of students. Further researches can be conducted to consider other variables which may impact the learning level of students in the subject of Science.

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