Effectiveness of Students' Team Achievement Division on Students' Attitude Towards Physics

Asia Pacific Journal of Multidisciplinary Research
Vol. 3 No. 4, 112-117
November 2015 Part III
P-ISSN 2350-7756
E-ISSN 2350-8442
www.apjmr.com

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Date Received: August 25, 2015; Date Revised: October 12, 2015

Abstract - *This study aimed to find out the effect of Student Team Achievement Division (STAD) on Students' Attitude towards Physics. The Quasi Pretest- posttest Experimental design was used. The main research instruments used in the study were the Attitude Scale Inventory and a 50- item multiple choice having a reliability coefficient of 0.82. Data were statistically analyzed using mean, standard deviation and the t-test for independent means. Results revealed that before the intervention, the attitude of students towards Physics is neither favorable nor unfavorable whether they are taught using STAD or not as manifested in their pretest. The attitude of students in the experimental group significantly improve. Students taught with the use of STAD have better achievement.*

Keywords: *Physics, Achievement scores, Attitude scores*

INTRODUCTION

Grouping students to work together is becoming a more and more accepted practice by teachers. Dividing students into small groups provides them the opportunity to engaged in learning.Various roles are assumed by teachers in group activities. They may assume the role of an engineer, facilitator, director, resource person, and judge. Leadership functions are transferred from the teacher to the students. During group activities the following are assumed: a). Help teachers deal with differences among learners, b). Provide opportunity for students to plan and develop special projects on which groups can work together, and c). Increase students interaction and socialization.There are many ways for teachers to arrange activity in group(also called group projects). These include committee, brainstorming, buzz session , debate and panel discussion, symposium, Role playing and improvisation, Fish bowl, critiquing session**,** Round table, forum , Jury trial**,** Majority-rule decision making, Consensus decision making**,** composite report**,** and Agenda [1].

According to Piaget, learning does not takes place in a vacuum but occurs within social context. In school settings, these theories explain the effectiveness of Group work among peers.

There are four factors included in Piaget's theory which are: amaturation, physical experience, social experience, and self-regulation. Piaget believed that only peer collaboration could bring about true cognitive transformation. Peer are not as threatened by each other and can engaged in quality discussions, thereby forcing individuals to discard egocentric modes of thoughts and become aware of others' perspectives. Vygotsky, a Russian psychologist, offered a theory that applies on learning occurring in social settings. He emphasized that cognitive development starts when individual interacts. It becomes permanent at a later time. A key factor in learning according to Vygotsky is interaction and communication [2].

Both pragmatism and progressivism stressed the use of scientific method and viewed the classroom as a community. The teacher acts as a facilitator. They encourage the use of group discussion in learning.

Alkin [3] cited major reform movements in science such as Project 2061 and the emerging National Science Education Standards include cooperative learning when describing effective instruction . In cooperative learning, students divide the task among themselves, helps one onother (especially the slow members), praise and criticize one onother's effort & contributions , and receive a group peformance score.

Slavin and Karweit, as cited by Ornstein [1] have developed a step by step procedure for teaching

elementary and middle grade classes in mathematics, which can also be utilized for reading groups. The Program, called Ability Grouped Active Teaching (AGAT), uses two ability groups rather than the typical three to increase the amount of time the teacher can spend with each group. Steps involved are assign students into two groups, pace the lesson and teach them according to their ability, give quizzes frequently, and schedule activities to make the best use of teacher and students time.

Strategies such as committee, brainstorming, buzz session, debate and panel, fish bowl, forum, round table, critiquing session and jury trial are the most commonly used in teaching Science.

Science educators should do their share so as to contribute to the economic and social development of the country. Their commitment in teaching is very important.However, today's science education research focuses more on students than teachers. Wieman [4] emphasized the value of the educational experiences in measuring their effectiveness at changing the thinking process of the learner comparable to that of an expert when solving problems and making decisions relevant to the discipline . Learning in this sense is an active process occurring within the learner. Learning outcomes do not depend only on what the teacher presents. Rather, they are an interactive results of what information is encountered and how the students processes it based on perceived notions and existing personal knowledge. All learning is dependent upon language and communication. Teacher should, therefore, come up with good teaching materials that create a good social atmosphere inside the classroom. A teaching material would stimulate the thinking power of the learner and to react effectively to the subject matter.

Since the teacher is the facilitator in the teaching-learning process, he/she should be aware of the new approaches/ strategies in teaching science. Teachers should have the influence to effect the development of students' thinking skills.

International test measuring achievements, in comparative the Philippines ranks among the lowest in the developing world. In the IEA's science study, Filipino children scored egregiously low at 2 standard deviation below the mean. This means that Filipinos go to school, but do not learn as much as they should or, worse, do not learn at all (5).

In the response to this problem, there is as need to strengthen science education and science teaching. An important duty for science teaching will be to find activities which allow students to develop conversational practices. Applied to classroom setting, students should be given chances to speak, write, read and listen. In the culture of schools, teachers often obliged to guarantee that the studentsacquire socially accepted scientific understanding from the learning tasks.Ensuring maximum and active participation on the part of the learner, various learning strategies should be utilized in teaching. Some common strategies are PROBEX (Predict-Observe and Explain), concept mapping, concept attainment, role playing, brainstorming, practical work, open-ended problems solving, cooperative learning and others. The use of cooperative learning as they interacts one another. The use of cooperative learning as a strategy may help develop thinking skills among students.

Cooperative learning is a cooperative efforts where interest and involvement can be generated, where all members are tasked to work as a team. In cooperative learning, it involves small group of students (usually five to six members) of the different ability level working as a group for interaction to occur. Groups are usually changed weekly or biweekly. Chairs are usually arranged in informal type (in Cluster) for maximum participation and interaction of each member of the group. Students Team Achievement Division is a cooperative learning strategy that uses tutoring of slower members by members of higher ability level. In here, students divide the work among themselves, assist one another especially the slow members, praise one another's effort and contributions, and receive a group performance score.

With the use of teacher's designed teaching materials on cooperative learning strategies, the students may have better understanding and formulation of science concepts and can solve problems in science more effective. Research results indicated that better attitude yielded to better achievement [6], [7].

OBJECTIVES OF THE STUDY

Generally, this study aimed to find out the effectiveness of Student Team Achievement Division (STAD) on Students' Attitude towards Physics.

Specifically, it intended to determine the students' attitude towards Physics and their achievement in the experimental and control group; and compare the attitude of students towards Physics and their

achievementwhen they are exposed to STAD and traditional method.

METHODS

Research Design

The researcher made use of the Quasi Experimental Pretest-Posttest design. The design is Quasi experimental because respondents are from intact classes. There were two group of respondents namely the experimental group and the control group. The research design is presented below:

O1	**x**	**O2**
O3	**no x**	**O4**

Where:
O1- the pre test score of the experimental group
O2- Post Test score of the experimental group
O3- Pretest score of the control group
O4- Posttest score of the control group
x- Experimental Treatment (use of STAD)
no x- Traditional method

Respondents of the Study

The participating respondents in the study were two comparable first year students taking up college physics. The classes are assigned based on the sectioning made by the college registrar. There were 73 students (36 in the experimental group and 37 in the control group)

Research Instruments

A. Attitude Scale Inventory

The attitude scale inventory was designed and patterned by the researchers after models of attitude scales. It was validated by experts and pretested to other first year college students who do not belong to any group in the experimental and control group.

B. Achievement Test

The achievement test was administered to the experimental and control groups on a pretest and posttest basis. It consist of a 50- item test of a multiple choice type covering the topics on work, power and energy, simple machines, kinetic molecular theory and hydrostatic. Originally, there were 85 test items but were trimmed down to 50 items afteritems were subjected to validation and item analysis. These topics are covered in the midterm and final of college physics course. In order to achieve high degree of content validity, the suggestions of experts was sought. A table of specification was prepared which include the subject content, percentage or proportion of items in each area, and the cognitive processes involved.

To check on content validity, the initial draft of the instrument was given to a group of physics teachers. All suggestions for improvement of the instrument were incorporated. After finalization of the second draft, this was pretested to two physics classes. Item analysis follows to determine the item of discrimination and item difficulty. For the item analysis, there were two criterion groups, the top 27% and the bottom 27% based on scores. The accepted level of index of difficulty is 0. 25- 0.75. on the other hand, 0.20 – 0.40 is the acceptable level of discrimination for each item. 0. 40 and above is highly acceptable. Below 0.20 is not acceptable.

The reliability of the test was taken using the split half method. For every students, the number of correct answers in all even and odd items was counted and tallied in two separate columns. Another column was prepared for the students' total scores in the exams. To correlate the odd –numbered scores and the even – numbered scores, the Pearson's r was used. The result was the reliability of the half test. The reliability of the whole test was taken from the formula

$$rwt = 2\,rht / (1 + rht) \quad (1)$$

Where:
rwt- reliability of the whole test
rht- reliability of the half test

Teacher made test commonly have reliabilities somewhere between 0.60- 0. 85. Using split half method, the reliability coefficient of the whole test is 0.82

Research Procedure

Students' Team Achievement Division (STAD) was used in the experimental group in teaching the topics covered within the duration of the experiment. The control group was taught the same topics for the same duration of time using the traditional strategy. The researcher used the same textbook, and other reference materials, quizzes, assignments and learning conditions to the experimental and control groups other than the use of intervention.

The procedure in conducting the study are:

1. The teacher presents the lesson to class in one or two periods.
2. Group the students into 5-6 members in each group. Assign leaders who will help in the monitoring and controlling group activities.
3. Team study on the activity card provided by the teacher. Students who have already mastered the material tutor the slower teammates.
4. Presentation of output by any member of the group. They present in pairs or individually depending upon their choice.
5. Class quizzes are given to see if the students have learned the materials while in the group. Students return to their assigned seats. The students scores are averaged into team scores so that group member are most likely help each other.
6. Recognition is given to teams with the highest average scores and improvement to give opportunity to slow performing groups.
7. Teams are changed weekly or biweekly to give students an opportunity to work with others.
8. Chairs are arranged in circular form to maximize interaction among members.

Data Analysis

Mean and standard deviation were used to describe students response to each statement on the attitude scale inventory. The given adjectival scale was used to interpret the result of the study:
4.20-5.00: Strongly agree/Strongly positive; 3.40-4.19: Agree/Positive; 2.60- 3.39: Uncertain/ Neutral; 1.80- 2.59: Disagree/Negative; 1.00 – 1.79: Strongly disagree/Strongly negative.

The t- test for independent means was used to determine significant difference between achievement scores and attitude scores of the experimental and control groups in their pretests and posttests.

RESULTS AND DISCUSSION

Attitude of the Respondents towards Physics

To analyze the attitude of the respondents towards Physics as a subject, the mean and standard deviation were computed. Initially, both the control and experimental group have neutral attitude towards Physics as revealed in their pretest scores which are 3.13 and 3.11 respectively. After exposure to STAD, the experimental group exhibited a more favorable attitude towards Physics as revealed in their posttest mean score of 3.99. Both the mean scores of the control and experimental group increased from pretest to posttest. This means that there is a change in the attitude of respondents after they are exposed to the two teaching strategies. However, greater mean gain score is observed in the experimental group.

To compare students' attitude in the pretest and the posttest, the t-test for independent mean was employed. The result is presented in Table 2.

Table 1. Mean and standard deviation of Attitude scores

		Control	Expt'l
Pretest	Mean	3.13	3.11
	SD	0.51	0.49
Post test	Mean	3.16	3.99
	SD	0.33	0.49
Attitude mean gain scores	Mean	0.03	0.88
	SD	0.68	0.79

Table 2. Significant difference on the attitude scores

	Mean			
Test	**Expt'l**	**control**	**t comp**	**Decision**
Pretest	3.11	3.13	-0.19	Accept ho
Posttest	3.99	3.16	9.52*	Reject ho

**Significant at 5% level of significance; Critical Tabular Value: 1.671*

Table 3 shows that the students in their pretest have a mean difference of -0.02 in favor of the control group. The result of the t test reveals that the computed t value is -0.19 which is lesser that the critical value of t at 5% level of significance. This means that there is no significant difference in the attitude of the respondents towards Physics .

After STAD was treated to the experimental group, the result of the t- test shows that the difference on the mean attitude scores of the experimental and control group is significant with a computed value of 9.52. Therefore, the use of STAD is a good strategy to improve the attitude of students towards Physics. This finding finds support from Scott and Heller (8) when they pointed out that implementing cooperative learning (Jigsaw) leads to a more supportive and equitable classroom environment. This kind of environment improve students' achievement and attitudes as they learn to respect others differences and work together to solve problems more cooperatively and more creatively. However, Koemadji, Poniam and Fatmanissa [9] found out that Student Team

Achievement Division (STAD) does not improve students attitude towards Statistics. Their finding showed that it even to have more negative attitude. Students expectations on Statistics according to Koemadji, et.al are more on formula and number routines and that experiencing the subject in student centered learning situation may give them some discomfort due to their expectation on the subject.

Table 3. Mean and standard deviation of Students' achievement test scores in Physics

Group	**Pretest**		**Posttest**	
	Mean	**SD**	**Mean**	**SD**
Control	23.16	3.29	30.54	7.29
Experimental	23	3.96	35.27	6.57

The table shows that the mean scores of the control and experimental group are 23.16 and 23 respectively with a difference of 0.16. It can be noted that the control group are more intact than the experimental group as revealed in the pretest standard deviation.

Based on their posttest scores, the experimental group performed better than the control group with a mean difference of 4.73. It is also interesting to note that the experimental group became more intact as revealed in their standard deviation after conducting Students Team Achievement Division (STAD) . Slagle [10] found out that a slight increase in academic achievement in secondary social studies students were obtained after exposing them to cooperative learning strategy STAD. Further, students exposed to Student Team Achievement Division has better achievement than the control group in English achievement of Iranian EFL students [11].

Table 4. Differences in Pretest and Posttest

	Mean			
Test	**Exp'l**	**Control**	**t-value**	**Decision**
Pretest	23	23.16	-0.19	Accept Ho
Posttest	35.27	30.54	2.91*	Reject Ho

**significant at 5% level of significance; Tabular Value: 1.99*

To test whether the difference in their pretest and posttest is significant or not, the t- test is used. Basically, the experimental and control group have the same ability level as manifested in the computed t-value 0f -0.19. This value is lesser than the critical value of t at 5% level of significance. When the intervention (the use of STAD) was administered to the experimental group, the computed t value for the difference in their posttest is 2.91. Thus , the null hypothesis is rejected that is significant difference is observed in the posttest mean scores of the two groups.

STAD is a form of cooperative learning and that all the above results are supportive to the theory that cooperative learning helps enhance attitude and achievement of students as mentioned by Scott and Heller. This is further substantiated by Roblee [12] when she stated that real success of a team project is reflected in the tremendous increase in student motivation and self-confidence. Students were able to understand possible applications of the concepts they were learning.

CONCLUSION

Grouping students for instruction have been shown to be crucial in the classroom. Students are encouraged to work together as a team for the attainment of a common goal. Students are given the opportunity to maximize participation, decide and engage in constructive discourse. The development of positive attitudes toward Physics resulted to better academic achievement when students work together in cooperative learning strategy as manifested in the result of the study.

The study output revealed that the students in the experimental group (exposed to STAD) have better attitude towards Physics. Result also revealed that students exposed to Student Team Achievement Division have better academic achievement.

RECOMMENDATION

Teachers are encouraged to use cooperative learning for some selected topics in teaching Physics particularly problems solving (quantitative and open-ended investigation).. However, a thorough preparation of activity card and problem set should be planned and prepared ahead. In –service trainings should be conducted for the utilization of STAD and other strategies that enhance students' achievement and attitude. Test the effectiveness of other cooperative learning strategies in teaching Physics and other related subjects.

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