Student-Team Achievement Division (STAD) and Its Effect on the Academic Performance of Grade 8 Students

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Abstract. Student-Team Achievement Division (STAD) is one of the cooperative learning structures that make use of rewards or incentives to promote team collaboration. This study finds out the effects of STAD on the academic performance of Grade 8 students in physics in a public school. There were two groups in this study: the experimental group and the control group. The experimental group utilized STAD while the control group employed the Inquiry-Based Approach. Each group has thirty-two (32) respondents. The instrument of the study was a researcher-made achievement test. This study lasted for six (6) weeks which covers the entire first quarter of Science 8. This research made use of the true experimental design. The comparability of the experiment was tested using t-test. The result showed that there is no significant difference in the posttest mean scores between the experimental and control groups. However, students exposed to STAD posted higher gain scores compared to the students exposed to the Inquiry-Based Approach. Based on the findings of the study, the use of STAD has improved the students' academic performance through cooperation with their groupmates.

1. Introduction

The academic achievement in science determines how far our educational system has reached [1]. Students in the Junior High school with learning difficulties make small progress in Science especially when it requires mathematical skills like physics. By using group discussion, students develop their understanding of a topic [2]. Moreover, the key factor which can be cited to account for the weak performance of the Filipino student in science comprises the lack of science culture and deficiencies regarding the school curriculum, the teaching-learning process, instructional materials and teacher training [3]. These resulted in too many students who do not desire to continue to study Physics in many countries due to a lack of mathematical and thinking skills in Science [4]. For these reasons, [5] argued that physics has an image of being both annoying and confusing course to students.

Experts and teachers agree that the best way for students to learn science is through an active learning approach that engages them in developing scientific skills [6]. Student-Team Achievement Divisions (STAD) is a form of cooperative learning model that uses multi-ability teams to teach facts, concepts, and skills. [7] agrees on the results of their research that the STAD model is an effective method to be used in the classroom.

Meanwhile, the researchers’ teaching experiences provided ample time for an observation that students do not perform well in Science, specifically Physics. The student’s responses are very passive to the lessons, and sometimes they claim that they hardly understand how to apply simple concepts in Physics. They also perform poorly during evaluations, quizzes and periodical examinations especially when a question requires high-level thinking skills. This indicates that their comprehension of concepts was not established. The researchers sometimes feel discouraged when despite the effort put in delivering the lesson, the students still show little interest and difficulty in grasping the concepts. Those
observations of the researchers are similar to the views of [8] and [5] in teaching Physics. [9] claimed that the use of STAD would make the lessons in Science more attractive to students, even to those who are not inclined to Science.

This study employed the Social Learning Theory and Constructivism Theory. Social Learning Theory provides a useful method for improving the student’s behavior through the development of self-confidence. Constructivism is a theory in which people make their understanding of the phenomenon or experience through associating it with previous knowledge [10]. Hence, the student chooses facts, constructs hypotheses, and makes judgments, with the aim of assimilating new experiences into his existing facts and involvement.

This study explores the academic performance in Physics among Grade 8 students using STAD model. This might give solutions to the deteriorating school performance of students in Balocawehay National High School. The researchers believe based on the results and theories conducted by the experts that the grade 8 students in Balocawehay National High School, Abuyog, Leyte, Philippines will perform better in science when they work with their groups together.

2. Literature Review

2.1. Student-Team Achievement Division (STAD)
STAD develops student’s interpersonal skills. The students are more aggressive on participation during the lesson [13]. Furthermore, [14] claimed that STAD enables the students to communicate and interact with each other. They discuss ways and methods in Mathematics in their words of understanding, thus results in good performance of the individual members of the group. Meanwhile, [15] investigated the effect of STAD on students’ problem-solving ability. The study showed that problem-solving ability of the experimental group taught through STAD was significantly higher than the control group who learned using traditional teaching method. [16] determined the effect of STAD on students’ attitude towards Physics. They claimed a neutral attitude towards Physics as demonstrated in their pre-test. After the intervention, the attitude of students taught with the use of STAD becomes better. Moreover, this attitude leads to a more helpful and equitable classroom environment. This kind of setting improves students’ achievement and attitudes as they learn to value each other’s differences and work together to solve problems more cooperatively and more creatively.

2.2. Inquiry-Based Approach
The inquiry-based approach has a positive impact on increasing the academic performance of students. This strategy also lessens the gap between the low performing students and high performing students. An inquiry-based curriculum develops and validates ‘habits of mind’ that characterize a life-long learner. It teaches students to pose difficult questions and fosters the desire and skills to acquire knowledge about the world. Students have opportunities to take ownership of their own learning, a skill necessary for one to succeed in college and in most professional settings. Additionally, an inquiry-based approach allows students to draw connections between academic content and their own lives, which can be particularly important for culturally and linguistically diverse learners [17]. An inquiry-based approach in teaching enables students in different levels of academic performance achieve better than the ordinary strategies employed to them [18].

2.3. Academic Performance in Physics
Student’s academic performance is a fundamental indicator to consider when defining and planning educational intervention in both nationwide and classroom levels [19]. There was a significant decrease in students’ academic performance in Physics despite the fact that the course has made a significant impact on improving the lives of today’s generation [20]. The great influence on students learning in Physics is their attitude towards the course as revealed in the studies of [21]. Consequently, the children might not be able to develop a comprehensive understanding of the course due to teachers incompetence [22]. Furthermore, [8] stated that achievement anxiety is the relationship between study behaviors and academic achievement. A mistake or misunderstanding of a student is the responsibility of the entire team. Thus, the criticism to personal answer is limited and anxiety level decreases.
Moreover, students who work in cooperative groups learn more and develop positive attitudes towards the course.

3. Methodology

The schema illustrates the effects of classroom intervention to the academic performance in Physics among Grade 8 students.

![Schema Diagram](image_url)

**Figure 1.** A Schematic Diagram of the Study

This study utilized a true experimental method of research. The control group uses the Inquiry-Based Approach whereas the experimental group makes use of the STAD model of instruction. The academic performance of both experimental and control groups is compared to determine the thinking skills acquired by the students at the end of the study.

![Group Design](image_url)

**Figure 2.** Pretest-Posttest Group Design

In Figure 2, O1 and O2 represent the pretests of the experimental group and control group, while O3 and O4 represent the posttests of the experimental groups and control groups, respectively. Meanwhile, X means the treatment, which is the cooperative learning method (STAD) in teaching Physics in Grade 8 students, while the symbol O constitutes the teaching strategy employed.

The study was implemented in Balocawehay National High School (BNHS) located at Brgy. Balocawehay, Abuyog, Leyte. There were six sections of Grade 8 students in the school. Out of the six, the two sections were the respondents of the study. There was a toss of a coin in the selection of the experimental and control group.

The research instrument was a researcher-made Science achievement test. To ensure the fair distribution of the test items as stipulated in the K to 12-curriculum guide, the researchers constructed a table of a specification that covered the topics on Newton’s Law of Motion, Work-Energy Theorem, Heat and Temperature, Sound, and Electricity. The experts in the field of physics evaluated the instrument to test the face and content validity of the test items before pilot testing. The final instrument has a 40-item test that has a reliability of Cronbach Alpha of 0.727, which indicated a reliability within the acceptable values. The respondents took the researcher-made test before and after the intervention. In transmuting the raw scores to achievement scores:

| MPS                  | Descriptive Equivalent                  |
|----------------------|-----------------------------------------|
| 96 – 100%            | Mastered                                |
| 86 – 95%             | Closely Approximating Mastery           |
| 66 – 85%             | Moving Towards Mastery                  |
| 35 – 65%             | Average                                 |
| 15 – 34%             | Low                                     |
| 5 – 14%              | Very Low                                |
The mean percentage score (MPS) were used to measure the achievement level of the experimental and control groups before & after the intervention.

The analysis of the students’ scores in pretest and posttest were the main data in this study. The comparison of the pretest scores and posttest scores of the two groups was analyzed using t-test — the same statistical tool in determining the significant difference between the mean scores of the two groups before and after the intervention. The use of t-test for a dependent sample was to measure the significant difference in the pretest and posttest scores per group. To determine the significant difference of the posttest mean scores between the experimental and control group, use t-test for the independent sample.

4. Results and Discussion

The achievement level between the experimental and the control group is in Table 1. Both groups are within the average level based on the descriptive equivalent of their pretest and posttest, although the experimental group is higher than the control group in the posttest. However, both teams have increased their MPS after the experiment.

| Table 1 | Mean Percentage Score (MPS) of the Pretest-Posttest of both the Experimental and Control Group |
|---------|------------------------------------------------------------------------------------------|
|         | Pretest (MPS) | Descriptive Equivalent | Posttest (MPS) | Descriptive Equivalent |
| Experimental | 33.125 | Average | 45.78 | Average |
| Control | 34.063 | Average | 39.92 | Average |

The experimental and control groups have a pretest mean percentage scores (MPS) of 33.125 and 34.063, respectively which are interpreted both as average. Meanwhile, the posttest means percentage score (MPS) of the experimental group was 45.78, and the control group was 39.92. The MPS of the posttest is higher than the MPS of the pretest, but it has an average descriptive equivalent. Having a no significant difference of the pretest mean scores before the start of the experiment was a good indicator for equality of knowledge and skills of the two groups in Physics as a matching process is concerned. Thus, this balance of the student-respondents performance at the start of the experiment strengthens the validity of this study.

Table 2 presents the mean scores of the students to determine if there was a significant increase in the performance of the students in their pretest-posttest mean scores in the experimental and control groups.

| Table 2 | Mean Score of the Experimental and Control Group in the Pretest and Posttest |
|---------|--------------------------------------------------------------------------------|
|         | Pretest | Posttest | t |
|         | Mean | S.D | Mean | S.D |  |
| Experimental Group | 13.25 | 4.18 | 18.31 | 5.36 | 0.003 |
| Control Group | 13.63 | 2.95 | 15.96 | 5.64 | 0.032 |

Table 2 showed that there was a significant increase between the pretest and posttest mean scores in the experimental group that has a p-value of 0.003 and in the control group having a p-value of 0.032 at 0.05 level of significance. The substantial increment in the pretest and posttest of the two groups signifies that both teaching method is effective in increasing the academic performance of the students.

Table 3 below illustrates the comparison of the mean gain score in pretest and posttest in both groups. The data compared the effectiveness of the two strategies in terms of their mean gain scores.
Table 3

| Group          | Mean Gain | SD  | p. value |
|----------------|-----------|-----|----------|
| Experimental Group | 6.22      | 8.07| 0.068    |
| Control Group   | 2.96      | 5.74|          |

Significant at α=0.05

In the experimental group, the mean gain is 6.22 with a standard deviation of 8.07 and the control group means gain is 2.96 having the standard deviation of 5.74. The p-value is equal to 0.068 at 0.05 level of significance. This indicates no significant difference in the posttest scores between the experimental and control group. Moreover, STAD and Inquiry-Based Approach have the same effect regarding developing the academic performance of students in Physics. Both techniques ensure an active learning, which encourages the student in both groups to engage in learning activity actively. In the Inquiry-Based Approach, students are involved in the discovery of the concepts through Engagement, Exploration, Explanation, Elaboration, and Evaluation, which enabled them to understand the topic. The students’ authentic experience during the conduct of experiment helps them to develop their critical thinking skills. These critical thinking skills are necessary for the improvement of the academic performance of the students in Physics.

5. Conclusion

1. Both STAD and Inquiry-Based Approach in teaching are equally effective in affecting academic performance in Physics. Moreover, the two teaching methods give a higher improvement in comprehension, application, analysis, synthesis, and evaluation questions. Exposure of students to STAD method posted a higher mean gain score than in the control group, but the difference is not significant. Based on the cognitive level difference between the two groups, the experimental groups posted more skills developed during the intervention compared to the control group.

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