

An Experimental Research on Traditional and Collaborative Approaches of Selected Groups of Grade Eight Learners in a Sample of Secondary School

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Submitted: 15-01-2021

Revised: 27-01-2021

Accepted: 31-01-2021

ABSTRACT: This study was designed to investigate the effect of collaborative approach through eight graders mathematical performance. Profile of the respondents in terms of sex and age were also considered in the study. A quasi-experimental method was used in the study to determine its effectiveness. Using the different research instruments, the researcher obtained 0.88 through t-test on the pre-test result, which interpreted as not significant while on the post-test result the researcher obtained 5.70 through t-test, which implies significant difference between the post-test results of the control group and the experimental group. As a conclusion, it was found by the researcher that the collaborative approach in teaching geometry was effective. In reference, it is recommended by the researcher that: teachers of mathematics are encouraged to make their students get involve in various activities collaboratively, teachers may use collaborative approach through every grading period for every lesson, module developer can consider the results of the study, and further study for future researcher in using the approach into the subject matter to determine its effectiveness.

Keywords: Mathematical Performance, Collaborative Approach, Grade Eight Students, and Quasi-Experimental Research

I. INTRODUCTION

Teachers and experts believe that the best way to teach math is to immerse the learners to actively participate by analyzing and synthesizing math problems or general ideas. In specific perspectives, mathematics is considered as one of the essential field in school. According to National Council for Teachers in Mathematics (NCTM, 1989), mathematics literacy is the capacity to relate specific skills and concept using mathematical problem solving. Chua (2006) defined mathematics

as one of the major subjects in the Philippines but a lot of students find it very hard.

According Johnson and Johnson (1999), one of the effective strategies in mathematics is the collaborative learning where learners can brainstorm their ideas and concepts to a group, which promotes enhancement of their critical and creative thinking and to know other perspective in solving mathematics and analyzing concepts.

In contrast, Johnson, Johnson, and Smith (2007) posited that throughout the most recent research on collaborative learning could advance scholarly and social instructive results. Notwithstanding, research likewise shows that the execution of collaborative learning is not generally satisfactory in every day homeroom practice. Additionally, educators likewise experience difficulties while arranging collective exercises, for example, planning suitable gathering undertakings, creating gatherings, overseeing class time (Gillies and Boyle, 2010), and improving and observing beneficial cooperation.

Findings in the application of collaborative learning see a flaws and challenges in either the teacher or the students. The challenges have not tackle comprehensively because we only rely of the problems of teacher and students experience during performing collaborative learning (Popov et al., 2012).

Barron (2003), explore the collaborative learning of elementary students, discovered bad quality coordination among individuals when they partook in critical thinking assignments. Barron's examination indicated that individuals did not focus on others' suppositions, intruded on them, and dismissed elective recommendations without support. These wrong practices hindered working and individual learning. Moreover, Ross (2008) noticed that the nature of learners' clarifications in collaboration in essential and auxiliary study halls

is frequently under a level that empowers shared information development.

In prior findings they had found the problems underlying in the use of collaborative learning. These are the effectiveness of collaborative learning including the activities and organization and the assessment part of collaborative learning that includes the student outputs.

To begin with, educators frequently face difficulties while organizing collective exercises, for example, observing students' on-task conduct, overseeing bunch work time, giving significant materials, appointing singular jobs, and building up collaboration convictions and practices (Gillies and Boyle, 2010).

In spite of the fact that past considers highlighted a few issues instructors experience when applying collaborative learning, these ponders have explained the basic causes or predecessors of these issues (e.g. Gillies & Boyle, 2010; Lopata, Mill operator, & Mill operator, 2003). Besides, the issues that instructors experience will likely moreover influence collaborating students. This relationship between issues experienced by instructors and by students is, be that as it may, seldom tended to amid past investigate (Van De Pol, Volman, & Beishuizen, 2011; Van Leeuwen et al., 2013; Webb, 2009).

On the other hand, collaborative learning can be made accessible through specific advances, for example, email, weblogs, message sheets, visits, and remotely coordinating (Ruiz et al. 2006). There are a few preferences of collective learning: for instance, community learning permits the cultivating of a feeling of participation among the students, upgrades the capability of the students, and expands their capacity to discuss. Moreover, the mission of the shared learning configuration is to give occasions to students to impart adequately to energize common help to dominate the reason for the exercise. Nook and Richards (2006) expressed that there were a few aptitudes benefits, which have largely affected shared learning pressure, similar to the development of in general association impacts, compassion, and collaboration. This weight relies upon the instructor not as the significant provider of data or control, however as a facilitator.

According to Dooly (2008), acquiring knowledge in-group is established to meet the target and objectives in the group learning and to see how students work in unison. In this type of learning the facilitator have the power to control

the classroom and can able to see students who are not participating.

According to Felder and Brent (2007), collaborative learning is a model of instructing where children cooperate with others to diminish the negative results and increment the satisfaction that gets through the activity at a significant level of the gathering's execution. Cooperative learning is a successful learning model in advanced education. This kind of learning gives numerous favorable circumstances to children: for instance, helpfully taught students need to exhibit higher scholastic achievement, improved elevated level thinking and basic reasoning aptitudes, and energize more certain conduct toward theme fields and progressed confidence, more profound comprehension of scholarly subjects, extra sure and steady cooperation with associates, expanded time spent on undertakings and diminished issue conduct in the homeroom, improved inalienable inspiration toward instructing and more noteworthy capacity to think about circumstances from others' points of view and decreased degrees of uneasiness and stress.

Cooperative learning is a part of a group of training/learning techniques, while students co-work with one another to pick up targets and to address shared learning goals. Helpful learning is altogether more than setting students together in sets and seeking after the best. It is a broad authority method for orchestrating activities in a learning climate that contains specific elements intended to give the possibility to viable and unadulterated investigation for the students. The basic bit of leeway of helpful learning is its capacity to manage various conditions in a systematic way and that makes it simpler for students to move starting with one stage then onto the next (Dooly, 2008).

According to Tsay and Brady (2012) contended that the viability of peer assessment can be restricted in case the learners feel a sense of competition toward one another, as this may unfavorably influence the unwavering quality of input. Additionally, students may still stress approximately the way they and their colleagues are positioned. In arrange to address such concerns, moving learners absent from their group once teams' examinations have been completed will likely lead to more solid responses. An extra figure that might increment competition and inspiration for participation is to apply a rule referenced ranking framework to evaluate cooperation rather than rating on a bend.

Collaborative Learning

According to Swan et al. (2006), collaborative learning is an instructing procedure that incorporates a little gathering of students cooperating to build up the instructive experience to the greatest degree conceivable. Collaborative learning is characterized as crafted by people as individuals from gatherings, and every understudy of the gathering is connected to mental, passionate, and social capacities to accomplish the destinations of the network and frameworks whose unmistakable goals help students in the dynamic cycle and increment the feeling of network.

Collaborative learning remains on the possibility that learning is a normally social act where students talk among them, and among the discussion the learning happens. Collaborative learning is “a case, where such a case incorporates the taking after primary viewpoints: to begin with, two or more students learn or attempt to memorize something together; moment, ‘two or more’ may be clarified as a combine, a little gather (3-5 subjects) or a lesson (20-30 subjects); third, ‘learn something’ may be clarified as take after a course or perform learning exercises such as issue understanding. At last, ‘together’ may be clarified as numerous shapes of interaction which may be face-to-face or computer mediated”.

Collaborative learning relies upon constructivist hypothesis, which places that information is manufactured and interpreted through learners. The learning cycle must be acknowledged as something learned through enactment of the current intellectual structures or by building new psychological structures that adjust to new information. Rather than inactively procuring information, learning occur between all the understudies and educators simultaneously.

Seemingly collective learning means to help the best showing workable for the best number of understudies. According to Laal and Laal (2012) called attention to that there are five essential components in a synergistic learning climate:

Collaborative adapting clearly sees positive relationship: individuals in the work bunch are resolved to rely upon each other to pick up the objective. What's more, if any part neglects to play out their errand or duty, all individuals in the gathering endures the outcomes. This implies the educator must plant in the hearts of the students the significance of synergistic instructing to construct a shared learning climate.

Great correspondence and association: creating compelling relational abilities to collaborate with others adds to a trade of data and

thoughts through different channels to accomplish the objectives. Besides, fruitful correspondence relies upon a few factors, for example, the collaboration between the instructor and the student and the methods for conveyance notwithstanding the impacts of the environment.

Person responsibility and individual duty: each understudy within the group is mindful for performing their assignment and coming to a tall level of dominance.

Social abilities: understanding conduct of each understudy is basic to succeed. There are a set of social aptitudes learners ought to have such as certainty, calm, decision-making, sympathy, grins, and communication.

Group self-assessing: to improve the instructing and learning cycle and advancement, this should zero in on the significance of an instructor competency standard in instructive cycle and learners evaluation, for example, reasoning of training objectives, characterizing educational program substance and course readings viable, recognizing destinations and examining their substance, and information on their learning styles.

Additionally, collaborative learning requires working together towards a joint point. This sort of learning is additionally known as collective learning, agreeable learning, peer learning, learning communities, group learning, collaborative learning, or peer instructing. In any case, collaboration is more than cooperation. Collaboration implies the full prepare of learning, which comprises of understudies instructing the educator, understudies instructing one another and the educator educating the understudies. More altogether, it too implies that understudies have a duty towards another learner in expansion to themselves, such that achieving collaborative learning strategy objectives includes understudies helping each other to memorize and get it (Dooly 2008).

According to Garrison and Cleveland-Innes (2005) interaction is the vital segment of the instructive cycle and is a chief spotlight on schooling through online techniques to encourage preceded with instructive correspondence. Post and Cleveland-Innes expressed that the objective of the instructive cycle, paying little mind to the strategy for training, is to make the instructive cycle powerful, achieving explicit learning results. In any case, collaboration must be more deliberate and organized

Moreover, in the synergistic homeroom, it is fundamentally through the cooperation and connections between students that information is

made. Hence, to be fruitful, this learning cycle needs to focus on building up a feeling of network among the students. Internet learning incorporates exercises intended to make a social environment that speaks to help for communitarian learning. All through the execution stage, the instructors support and energize a feeling of network among students.

At the end of the study, the researcher is expected to determine the impact of collaborative approach method in teaching geometry and its influence by the other factors with the use of some statistical treatment. In this light, if this will be effective, teaching geometry among the students will be easy for the teaching and learning process and a high performance are expected to diagnose students' ability through mathematical analysis.

Statement of the Problem

This study aimed to determine the effect of collaborative approach in teaching geometry among the selected groups of grade eight students of Telesforo and Natividad Alfonso High School for the school year 2018-2019. Specifically, this study sought to answer the following questions:

1. What are the profile of the respondents in terms of:
 - a. Age; and
 - b. Sex?
2. What are the pre-test results of the control group and experimental group?
3. Is there a significant relationship between the pre-test results of the control group and experimental group as to their profile?
4. Is there a significant difference between the pre-test results of the control group and the experimental group?
5. What are the post-test results of the control group and experimental group?
6. Is there a significant relationship between the post-test results of the control group and experimental group as to their profile?
7. What is the effect of collaborative approach to the students' mathematical performance based on the difference between the post-test results of the control group and the experimental group?

II. METHODS

Research Design

To attain the objectives of the study, the researcher used quasi-experimental method in analyzing the data. This method includes the use of pre-test and post-test between the control and experimental groups. It was essential for the researcher to have knowledge about the nature of

the local study thus, the quasi-experimental design was considered as the relevant and applicable method to use.

Respondents and Target Group

The respondents of this study were the grade eight students of Telesforo and Natividad Alfonso High School, Sta. Maria, Sta. Ana, Pampanga, Philippines for the school year 2018-2019, both heterogeneous sections, with geometry lessons this third grading period particularly triangle congruence postulates, deductive and inductive reasoning, and conditional statements. The respondents were the grade eight – section rose (23 male, 23 female, 46 total) for the control group and grade eight – section orchids (20 male, 23 female, 43 total) for the experimental group. The researcher used random sampling in choosing the two groups (43 male, 46 female, 89 total).

Names of the subjects were withheld and instead represented by respondents' numbers arranged in an order for reason of confidentiality. The lists of the respondents' names were requested from the advisers of each section.

Research Instrument

The primary instruments that were used for the gathering of data were the pre-test and post-test examination papers that was provided by the researcher and validated by the different professionals in order to make the document valid and reliable. The test paper was divided into two: the first part was the profile of the respondents with regards to their age, and sex; the second part was the test proper with 50 multiple-choice items.

Data Gathering Procedure

The following procedures were made to come up with the necessary data needed in this study: (1) the researcher asked the permission of the school head to conduct an action research; (2) after the approval of division office, the researcher proceeded the study; (3) first, administered a pre-test for both the control and experimental groups; (4) After the checking, tallied and analyzed the given data; (5) collaborative approach was used in teaching geometry to the experimental group wherein each person respectfully and briefly presents their understanding of the issue or of the decision that needs to be made. While each person is presenting this, the other people are listening, using active and reflective listening and respectfully asking clarifying questions. This discussion continues until each person is clear about each other's understanding of the issue and

each person feels heard. The issue is defined specifically and as non-personally as possible. And for the control group, the researcher used the traditional method in teaching mathematics. These were employed throughout the whole third grading period; (6) Once through, post-test was administered for both the experimental and the control groups; and (7) After collecting all the necessary data, the researcher analyzed and tabulated them following the objectives of the study.

Statistical Treatment of Data

The following statistical tools was used to analyze and interpret the quantitative data that was gathered from the study: (1) **Random Sampling** was used to choose the group of respondents from the existing four sections; (2) **Mean formula** was used to determine the arithmetic average of the profile of the respondents and their mean scores; (3) **Frequency, tally, and percentages** was used as representation of the profile of the respondents. (4)

Pearson-r was used to determine the relationship among the pre - test and post – test results of the control and experimental groups as compare to their age and sex; (4) **t-test for Independent Samples** was used to determine the difference between the control group and experimental group as to their pre-test and post-test results.

III. RESULTS AND DISCUSSION

I. Profile of the Students at to Sex and Age

Table 1 shows the sex, and age of the students in which 52.81% (47) were females while the remaining 47.17% (42) were males from a total of 89 students. The data showed that the female students outnumbered the male students. As to age, 38.20% (34) of the students were 13 years old, 46.07% (41) of the students were 14 years old, 12.36% (11) of the students were 15 years old, 2.25% (2) of the students were 16 years old, and 1.12% (1) of the students were 17 years old.

Table 1. Profile of the students as to their Sex and Age

	Frequency	Percentage
Sex		
Male	42	47.19%
Female	47	52.81%
Total	89	100%
Age		
13	34	38.20%
14	41	46.07%
15	11	12.36%
16	2	2.25%
17	1	1.12%
Total	89	100%

II. Pretest Results of the Control Group

Table 2 shows the results of the pretest of the control group. Boys from the control group got the mean score of 10.77 and interpreted as Fair (Fa) with the standard deviation of 2.72 while girls got

the mean score of 11.82 which was also interpreted as Fair (Fa) with the standard deviation of 3.04. The grand mean score of the control group was 11.29, which was interpreted as Fair (Fa) with Standard Deviation of 2.90.

Table 2. Pretest Results of the Control Group

Control Group	Mean Score	Descriptive Rating	Standard Deviation
Boys	10.77	Fair (Fa)	2.72
Girls	11.82	Fair (Fa)	3.04
Total	11.29	Fair (Fa)	2.90

Legend:

Raw Scores	Descriptive Rating
39.50 – 50.00 -----	Excellent (E)
29.50 – 39.49 -----	Satisfactory (S)
19.50 – 29.49 -----	Good (G)
9.50 – 19.49 -----	Fair (Fa)
0 – 4.49 -----	Failed (F)

III. Relationship between the Pretest Results of the Control Group as to their Sex and Age.

Table 3 shows the relationship between the pretest results of the control group as to their profile in terms of sex and age. Relationship

between the pretest results of the control group as to their sex revealed that the obtained test statistics, which was 0.22, was not significant. As to the age of the control group, it was 0.91, which was also not significant.

Table 3. Relationship between the Pretest Results of the Control Group as to their Sex and Age

Variables	Results	P - Value	Remarks
Sex	0.22	0.96	Not Significant
Age	0.91	0.99	Not Significant

Legend: Level of Significance @ 5%

IV. Pretest Results of the Experimental Group

Table 4 shows the results of the pretest of the experimental group. Boys from the experimental group got the mean score of 11.63 and interpreted as Fair (Fa) with the standard deviation of 2.22 while girls got the mean score of

11.21 which was also interpreted as Fair (Fa) with the standard deviation of 2.84. The grand mean score of the experimental group was 11.40, which was interpreted as Fair (Fa) with Standard Deviation of 2.56.

Table 4. Pretest Results of the Experimental Group

Control Group	Mean Score	Descriptive Rating	Standard Deviation
Boys	11.63	Fair (Fa)	2.22
Girls	11.21	Fair (Fa)	2.84
Total	11.40	Fair (Fa)	2.56

Legend:

Raw Scores	Descriptive Rating
39.50 – 50.00 -----	Excellent (E)
29.50 – 39.49 -----	Satisfactory (S)
19.50 – 29.49 -----	Good (G)
9.50 – 19.49 -----	Fair (Fa)
0 – 4.49 -----	Failed (F)

V. Relationship between the Pretest Results of the Experimental Group as to their Sex and Age.

Table 5 shows the relationship between the pretest results of the experimental group as to their profile in terms of sex and age. Relationship between the pretest results of the experimental

group as to their sex revealed that the obtained test statistics, which was 0.59, was not significant. As to the age of the experimental group, it was 0.579, which was also not significant.

Table 5. Relationship between the Pretest Results of the Experimental Group as to their Sex and Age

Variables	Results	P-Value	Remarks
Sex	0.59	0.87	Not Significant
Age	0.579	0.65	Not Significant

Legend: Level of Significance @ 5%

VI. Difference between the Pretest Results of the Control Group and the Experimental Group.

Table 6 shows the difference between the pretest results of the control group and the experimental group. Using the t-test as an indicator the value obtained between the two variables was

0.88, which was respectively not significant. This means that there was no significant difference between the pretest results of the control group and the experimental group showing that the two groups were both having the same level of knowledge regarding geometry.

Table 6. Difference between the Pretest Results of the Control Group and the Experimental Group

Result	Critical Value	Remarks
0.88	1.96	Not Significant

Legend: Level of Significance @ 5%

VII. Post-test Results of the Control Group

Table 7 shows the results of the post-test of the control group. Boys from the control group got the mean score of 12.87 and interpreted as Fair (Fa) with the standard deviation of 2.77 while girls

got the mean score of 14.43 which was also interpreted as Fair (Fa) with the standard deviation of 4.21. The grand mean score of the control group was 13.65, which was interpreted as Fair (Fa) with Standard Deviation of 3.76.

Table 7. Post-test Results of the Control Group

Control Group	Mean Score	Descriptive Rating	Standard Deviation
Boys	12.87	Fair (Fa)	2.77
Girls	14.43	Fair (Fa)	4.21
Total	13.65	Fair (Fa)	3.76

Legend:

Raw Scores	Descriptive Rating
39.50 – 50.00 -----	Excellent (E)
29.50 – 39.49 -----	Satisfactory (S)
19.50 – 29.49 -----	Good (G)
9.50 – 19.49 -----	Fair (Fa)
0 – 4.49 -----	Failed (F)

VIII. Relationship between the Post-test Results of the Control Group as to their Sex and Age

Table 8 shows the relationship between the post-test results of the control group as to their profile in terms of sex and age. Relationship

between the post-test results of the control group as to their sex revealed that the obtained test statistics, which was 0.06, was not significant. As to the age of the control group, it was 0.48, which was also not significant.

Table 8. Relationship between the Post-test Results of the Control Group as to their Sex and Age

Variables	Results	Critical Value	Remarks
Sex	0.05	0.23	Not Significant
Age	0.48	0.38	Not Significant

Legend: Level of Significance @ 5%

IX. Post-test Results of the Experimental Group

Table 9 shows the results of the post-test of the experimental group. Boys from the experimental group got the mean score of 31.37 and interpreted as Satisfactory (S) with the standard deviation of 3.14 while girls got the mean score of

33.50, which was also interpreted as Satisfactory (S) with the standard deviation of 2.76. The grand mean score of the experimental group was 32.56, which was interpreted as Satisfactory (S) with Standard Deviation of 3.03.

Table 9. Post-test Results of the Experimental Group

Control Group	Mean Score	Descriptive Rating	Standard Deviation
Boys	31.37	Satisfactory (S)	3.14
Girls	33.50	Satisfactory (S)	2.76
Total	32.56	Satisfactory (S)	3.03

Legend:

Raw Scores	Descriptive Rating
39.50 – 50.00 -----	Excellent (E)
29.50 – 39.49 -----	Satisfactory (S)
19.50 – 29.49 ----p-----	Good (G)
9.50 – 19.49 -----	Fair (Fa)
0 – 4.49 -----	Failed (F)

X. Relationship between the Post-test Results of the Experimental Group as to their Sex and Age.

Table 10 shows the relationship between the post-test results of the experimental group as to their profile in terms of sex and age. Relationship

between the post-test results of the experimental group as to their sex revealed that the obtained test statistics, which was 0.08, was not significant. As to the age of the experimental group, it was 0.347, which was also not significant.

Table 10. Relationship between the Post-test Results of the Experimental Group as to their Sex and Age

Variables	Results	Critical Value	Remarks
Sex	0.08	0.77	Not Significant
Age	0.347	0.62	Not Significant

Legend: Level of Significance @ 5%

XI. Effect of Collaborative Approach in Students' Mathematical Performance Based on the

Difference between the Post-test Results of the Control Group and the Experimental Group

Table 11 shows the difference between the post-test results of the control group and the experimental group. Using the t-test as an indicator, the value obtained between the two variables was

5.70, which was respectively significant. This means that there was a significant difference between the post-test results of the control group and the experimental group showing that the collaborative approach in teaching geometry was effective.

Table 11. Difference between the Post-test Results of the Control Group and the Experimental Group

Result	Critical Value	Remarks
5.70	1.96	Significant

Legend: Level of Significance @ 5%

IV. CONCLUSION

Based on the findings of the study, the researcher arrived to the following conclusions: The female dominate male respondents. Most of them were 14 year old. Both the mean scores to the pretest results of the boys and girls of the control group got an interpretation of Fair (Fa). There was no significant relationship between the pretest results of the control group as to their profile in terms of sex and age. Both the mean scores to the pretest results of the boys and girls of the experimental group got an interpretation of Fair (Fa). There was no significant relationship between the pretest results of the experimental group as to their profile in terms of sex and age. There was no significant difference between the pre-test results of the control group and the experimental group.

Both the mean scores to the post-test results of the boys and girls of the control group got an interpretation of Fair (Fa). There was no significant relationship between the post-test results of the control group as to their profile in terms of sex and age. Both the mean scores to the post-test results of the boys and girls of the experimental group got an interpretation of Satisfactory (S). There was no significant relationship between the post-test results of the experimental group as to their profile in terms of sex and age.

Finally it was found that there was a significant difference between the post-test results of the control group and the experimental group. Which shows that experimental group performs well in the lesson using the collaborative approach thus, collaborative approach has an effect to the students' mathematical performance based from the result of the findings.

In reference to the foregoing summary of findings and conclusions, the following recommendations are hereby provided: Teachers of mathematics are encouraged to make their students get involve in various activities collaboratively. Teachers may use collaborative approach through every grading period for every lesson. Module developer can consider the results of the study.

Mathematics teachers should continuously propose instructional strategies and techniques that will be effective in helping more students learn and develop their performance and achievement on mathematical concepts. Further study may be suggested for future researchers in using the approach into the subject matter to determine its effectiveness.

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V. RECOMMENDATION

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**International Journal of Advances in
Engineering and Management**

ISSN: 2395-5252



IJAEM

Volume: 03

Issue: 01

DOI: 10.35629/5252

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