

EFFECT OF PEER COACHING AMONG TEACHERS ON THE MATHEMATICS PERFORMANCE OF JUNIOR HIGH SCHOOL STUDENTS IN THE PHILIPPINES

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Abstract

This research was conducted to determine the effectiveness of Peer Coaching among Teachers on the Mathematics Performance of Junior High School in the Philippines. A quasi-experimental design was used to establish the cause-effect relationship between the use of peer coaching among teachers and mathematics performance of the students. Random sampling was used for the students and for the teachers used were the mathematics teachers handling junior high school. Data were analyzed using frequency distribution, weighted arithmetic mean, standard deviation, paired t-test and independent samples t-test. The study revealed that the entry level of Mathematics performance of junior high school students in the control and experimental group is poor. The level of Mathematics performance in the control and experimental groups after peer coaching among teachers is fair. There was no significant difference in the level of Mathematics performance between the control group and experimental group before and after the peer coaching. There was a significant increase in the level of Mathematics performance in the control and experimental groups after the application of peer coaching. Disagreements occurred during class proceeding, with the application of peer coaching can be handled by making the math concepts more approachable. The students' interaction during class proceeding that has the most frequency is chorus or group interaction.

Keywords: Peer Coaching, Teachers Performance, Students Performance, Disagreements

INTRODUCTION

Difficulties of students in Mathematics about teacher's instruction remained despite of the different innovations where there is no effective motivation due to wanting creativity from the teacher to adapt his/her method to the learner's capability, teaching-learning process failed. Effective peer coaching is built upon a communication that is honest and open, with participants contributing an unbiased attitude and willingness to help each other to grow professionally. It is dedicated to working in a trusting relationship with an attitude to seek improvement in teaching skills, a better learning experience for students, and also sharing of classroom experiences.

In line with the implementation of Republic Act No. 10533, of the Enhanced Basic Education Act of 2013, the Department of Education (DepEd) issues the enclosed policy on "The Learning Action Cell (LAC) as a K to 12 Basic Education Program School-Based Continuing Development Strategy for the Improvement of Teaching and Learning". Through this policy, the DepEd fully supports the continuing professional development of its teaching personnel based on the principle of lifelong learning and DepEd's commitment to the development of teacher's potential aimed towards their success in the profession. This can be done through the school-based LAC, which primarily functions as a professional community for teachers that will help them improve practice and learner achievement.

Castillejos National High School Mathematics Department has been doing Peer Coaching among teachers resulting in the systematic use of appropriate strategies for delivering and assessing the targeted learning objectives most especially during Mathematics Competition. Mathematics teachers are helping one another in discussing every topic which aims to help students in understanding the lesson, lessen students' drop-outs, and several failing students. Thus, lack of appreciation, failure of students, and numerous drop-outs as one of the factors about resolving difficulties in the mathematics performance of the Grade 8 students of Castillejos National High School motivated the researcher to consider testing the effectiveness of Peer Coaching as an intervention.

STATEMENT OF THE PROBLEM

This study aimed to determine the effect of peer coaching among teachers on the Mathematics performance of Grade 8 students in Castillejos National High School, Castillejos, Zambales, Philippines. Specifically, it sought answers to the following questions;

1. What is the level of mathematics performance of Grade 8 students in the control and experimental groups before and after the application of Peer Coaching among teachers?
2. How is Peer Coaching as an intervention applied?
3. Is there a significant difference in the level of mathematics performance of the students in the control and experimental group before the intervention?
4. Is there a significant change in the level of mathematics performance in the control and experimental groups after the intervention?

MATERIALS AND METHODS

Research Design

This study used a mixed method of quantitative and qualitative research. Specifically, a quasi-experimental design was used to establish the cause-effect relationship between the use of peer coaching among teachers and mathematics performance of the students. For the experimental lay out, one teacher taught two sections with peer coaching while one teacher taught two other sections using the traditional way of teaching.

Respondents and Location

The study was conducted in Castillejos National High School. Specifically, the participants of this study consisted of Grade 8 students and three Grade 8 Mathematics teachers. The teachers involved include two Teacher I and one Master Teacher II. One of the teachers used the traditional way of teaching and the other teacher used peer-coaching. The two teachers I both teaching at Castillejos National High School and handling grade 8 students while the Master teacher II involved served as the coach. Four intact classes were randomly chosen from Grade 8 curriculum. There was a total of 200 participants as shown in Table I.

Table 1. Distribution of Student-Participants in Grade 8 curriculum

Group	Teacher	Students		
		Section 1	Section 2	Total
Control	1	50	50	100
Experimental	1	50	50	100
Total	2	100	100	200

INSTRUMENTS

The researcher used a teacher's made test comprised of the 40-items. The test was designed to measure the mathematical performance level of the students before and after the intervention. Specifically, the test was used by the researcher to measure the mathematical performance of the students. Test was checked and revised by the three Master Teachers of Castillejos National High School. The test was also validated using a pilot class of 30 Grade 8 students that did not undergo the study. Pilot Testing using the Spearman-Brown Split Half was used to validate the reliability of the instruments used. After performing Item Analysis on the test results, the Spearman Brown split-half reliability for original data (SB $r = 0.65$), indicated acceptable reliability of the test.

Two open-ended questions with regards to their behavior during the teaching-learning process were also answered by those students who got the highest scores.

There was a pre-observation and post-observation form filled-up by the teacher of the experimental group. The pre-observation form was filled-up by the experimental teacher before the observation while the post-observation was also filled-up by the experimental teacher after the observed lesson.

DATA COLLECTION

To find out the level of mathematics performance of Grade 8 students in Castillejos National High School, the researcher sought permission first by submitting a letter to the Division Office of Zambales, the Principal, the Mathematics Head-Teacher and the teachers involved.

To evaluate the mathematical performance of the respondents, the researcher administered a Pre-Test on the four intact Grade 8 sections to ensure the level of performance of the students prior to the intervention. The controlled group went through their lessons with their teacher having her own unique way of teaching while the experimental group went through the peer coaching.

Peer Coaching composed of the "coach" or the master teachers and the "inviting teacher" or the teachers I. The inviting teacher informed the coach of what to look for when visiting (child observed, curriculum matter, methods of class management).

There was a Pre-observation and Post-observation of the inviting teacher by the coach. The pre-observation form was answered by the inviting teacher before the observation and the post-observation form after the observation. The debriefing meeting was conducted every end of the lesson in the afternoon. Post-Test was administered to the students after the implementation of Peer Coaching. The students who got the highest score answered the two open-ended question.

Data Analysis

The data were then analyzed using the following statistical tools:

Frequency Distribution

This was employed to determine the frequency of scores obtained by the students in the pre-test and post-test scores.

Weighted Arithmetic Mean

This was utilized to determine the average scores of the students in the Pre-test and Post-test.

Standard Deviation

This measure was used to describe the spread of scores from the mean.

Paired t-Test

This was used to test for significant change in the students' scores from the pre-test and post-test.

Independent Samples t-test

This was used to compare the mathematics performance of students between the control and experimental groups.

RESULTS AND DISCUSSION

Students' Level of performance before the Intervention

The level of performance of Grade 8 students in Mathematics prior to the conduct of Peer Coaching was reflected by the result of their Pre-test. It was administered to evaluate the level of students' domain of learning. Class scores were described using frequency distribution and percentages.

Table 2: Frequency Distribution Pre-test Scores

SCORES	CONTROL GROUP	EXPERIMENTAL GROUP	DESCRIPTIVE RATING
1-8	48	51	Poor
9-16	52	49	Fair
TOTAL	100	100	
Mean	8.38	8.26	
SD	1.54	1.65	
OVERALL PERFORMANCE	Poor	Poor	

In the control group's scores in 40 items pre-test there are 48 participants considered poor while 52 participants were fair. In the experimental group, there are 51 participants considered to be poor while 49 were also fair. In summary, before the intervention of peer coaching strategy, in both control group and experimental group, students mean scores indicated poor level of performance thus indicating poor knowledge with regards to the lesson.

Student's Level of performance after the Intervention

The post-test after the intervention was administered to determine whether the students improved in their academic performance.

Table 3: Frequency Distribution of Post-test Scores

SCORES	CONTROL GROUP	EXPERIMENTAL GROUP	DESCRIPTIVE RATING
9-16	69	61	Fair
17-24	23	32	Good
25-32	8	7	Very Good
TOTAL	100	100	
MEAN	15.88	16.34	
SD	4.54	4.43	

LEVEL OF COMPETENCY	Fair	Fair	
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Table 3 shows the frequency distribution of the posttest scores of the respondents in the control group and experimental group. It shows the change in the students' level of performance at the end of the second grading period.

In the experiment group, 61 participants belonged to fair level while 32 participants were at good level. Seven participants had very good level of performance. In general, the Mathematics performance of the students in both groups after the intervention were fair as indicated by the computed means thus there is an increase in the level of performance of the students prior to the result of students' performance before the intervention.

Peer Coaching and Teaching Practices

Taking notes of students' and teachers' during intervention/observation in the teaching practices before and after the peer coaching gave insights on how the teachers' changed their techniques. There were 4 sessions of pre-and post-observation based on the lessons/topic being discussed.

Pre-observation of classes. A classroom observation is the purposeful examination of teaching and/or learning events through the systematic processes of data collection and analysis (Bailey,2001). The entire implementation of peer coaching was under the second grading period. The following observations were gathered:

1. The teacher in the experimental group specifically wanted to know how storytelling would affect the teaching-learning process. She also wanted to emphasize the importance of smooth discussion of the lessons specifically during giving examples or using a mathematical formula.
2. In the question if there was a particular student to be watched, the answer was none. This only means that the teacher can handle the behavior of her students inside the classroom.
3. Objectives and Expectations for the lesson were written on the Daily Lesson Log. The lesson should be well delivered having 75% of the class gets the lesson well because it was expected that many cannot follow the lesson.
4. The observation was done in the entire period in one of the experimental classes while the debriefing meeting was held after the last period in the afternoon.

Post-Observation

During the Post-Observation, the following were gathered:

1. The teacher of the experimental group felt wanting satisfaction as the lesson came to its conclusion. She expected that few would follow and understand the flow of the lesson. Though it might go slightly well, some of the students forgot the application of that they have studied.
2. The main problem was with the illustration of graphs. It happens due to the following reasons:
 - a) the students have easily forgotten ordered pair,
 - b) changing of the sign,
 - c) difficulty on addition property of equality and
 - d) problem solving for x and y.

Peer Coaching

During the peer coaching, the following was realized:

1. Story-telling was a good motivation to get or to call the attention of the students. Students got their focus when the story of Rene Descartes about slope was discussed.
2. Using Visual Materials or Instructional Materials can motivate student's attention. Students' noisiness lessens when the teacher uses IMs.
3. Art of questioning was also tackled. The teacher was direct to the point when asking and does not rephrase the question when nobody could answer.
4. Recalling the past lesson before the start of the new lesson is highly recommended. A student could not relate to the present topic if not being recalled with the past discussion.
5. Giving of easier to complex activities was also noted. For example, in plotting the points on the graph, let them determine first to be knowledgeable on quadrants rather than directly plotting them on the graph.

Student Interaction and Handling Agreements after Peer Coaching. Students' reactions to the intervention were observed during discussions as summarized in Table 4. These were analyzed as grouped in Three Themes – *Mixed interaction, Partner Interaction, and Calls or Group Interaction.*

Table 4. Students' Interaction during discussion

Theme	Sample Statement	Frequency
Mixed Interaction	<p>"Mix, because sometimes I talk to my seatmate and in my side, front and back to ask them that about that lesson that I don't know" G8S06</p> <p>"A mix for you to understand what teacher discussing and ask a teacher if you don't get the lesson or when you are confused" G8S019</p> <p>"Sometimes I am talking at one person and sometimes I'm talking at many people" G8S09</p>	7
Partner Interaction	<p>"I talk to one person at a time usually" G8S017</p> <p>"There are few people talking at one time" G8S04</p> <p>"I interact on one person talking at a time" G8S14</p>	5
Chorus or group Interaction	<p>"We're always talking to each other, many people at one time" G8S07</p> <p>"We interact with each other during class discussion, many people at one time like when we don't understand the steps on solving, we discuss as a group" G8S08</p> <p>"I interact at many people during class discussion" G8S016</p>	8

Theme 1. Mixed Interaction. By asking questions, the assumptions are being reflected upon and thinking being expanded. Like what students do, "Mixed, because sometimes I talk to my seatmate and in my side, front and back to ask them that about that lesson that I don't know" (G8S06). Fostering understanding through interacting with everyone made learning more fascinating for

the learners, “A mix for you to understand what teacher discussing and ask a teacher if you don’t get the lesson or when you are confused” (G8S019).

According to Hanum (2017) “It can be concluded that classroom interaction is beneficial for the teaching and learning process. Not only students would benefit, but the teacher might also improve the teaching process.” Student interaction in the small group has uncovered significant relationships in achievement (Webb, 1985)

Theme 2. Partner Interaction. Ontario (2005) Think – Pair – Share is a cooperative or partner strategy that can promote and support a higher level of thinking. The facilitator asks the students about a certain topic, partner with one another, discuss their ideas and share their conclusions. Like what students do, “I talk to one person at a time usually” (G8S017) and “I interact on one person talking at a time” (G8S14). According to the study of Sampsel (2013), the think–pair–share or partner interaction has benefits like the opportunity to learn from each other, practicing and developing their mathematics vocabulary, and practice mathematics reasoning skills.

Theme 3. Chorus or Group Interaction. According to Kukreja (2019) “Group discussion is an individual’s thought process influenced by the views and opinions of the other members.” Like what students do, “We interact with each other during class discussion, many people at one time like when we don’t understand the steps on solving, we discuss as a group” (G8S08) and “I interact at many people during the class discussion” (G8S016). The chorus interaction offers an equal opportunity to let the students express their perspectives while learning from others. With this, not that they only learn, but the teachers could assess and guide the direction of the learning.

On the other hand, in handling the disagreements that occurred Table 5 shows three themes surfaced as occurrent. These are 1) fixing the gaps, 2) approaching learners and 3) making math concepts easier.

Table 5. Handling the Disagreements Occurred

Theme	Sample Statement	Frequency
Students fixing their gaps	<p>“There are quite a few times of disagreements. About not understanding the lesson because of being absent. By asking the other students on what they talked when they weren’t there” G8S02</p> <p>“When our classmate is absent we tell them how to compute the math solving.” G8S04</p> <p>“Most of the times we cannot understand the lesson. We talked to our class the lesson.”G8S13</p>	3
Approaching the learners calmly	<p>“The teacher handles the disagreement. She talks the student with calm voice and she ask what argue or disagreements are” G8S03</p> <p>“It has about fighting of friends; they will talk to them why they’re fighting and then they will be okay.” G8S09</p> <p>“Well, its not often that there are disagreements and if there are, they are usually easily resolved by talking to us.” G8S17</p>	6

<p>Making the math concepts more approachable</p>	<p>“Sometimes, the problem is when the other student didn’t act the lesson. The instructors will give the other instruction but it is the same as before. She or he will clear the instruction to make it easy.” G8S07</p> <p>“Well we disagree often, about the steps on solving a problem and the differences of our answers. She makes the questions clear to us so we can get it easily.” G8S0</p> <p>“Sometimes our class had disagreements to our teachers but they always handle it because our teachers ask if there something wrong and if there has, they fix it. “ G8S15</p>	<p>11</p>
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Theme 1. Student's fixing their gaps. According to King (2012). “Cooperative learning improves students’ achievement, persistence, and attitude. Collaboration with fellow learners increases motivation and helps the students take responsibility for their own and their peers learning.” When the students experience difficulties in a mathematics lesson, they resolve them and fixed their gaps. “There are quite a few times of disagreements. About not understanding the lesson because of being absent. By asking the other students what they talked about when they weren’t there (G8S02).” “Most of the time we cannot understand the lesson. We talked to our class about the lesson. (G8S13).”

Theme 2. Approaching the learners calmly. Murphy (2017) stated that “A calm teacher benefits herself and her students in many ways. First, students tend to reflect their teachers. Calm teachers lead to calm classes, and calm classes allow for more focused work.” Teachers should be calmly approach students because disagreements most likely to happen. “It has about fighting of friends; they will talk to them why they’re fighting and then they will be okay, (G8S09).” “Well, its not often that there are disagreements and if there are, they are usually easily resolved by talking to us.” (G8S17)

Tension is bad for classroom management, causing students to become excitable, unfocused, and primed to cause trouble, (Linsin, 2012)

Theme 3. Making the Math Concepts Easier. Resilient Educator (2020) said that, “Math anxiety is one of the most challenging things math teachers have to overcome in the classroom, and trying to break down that mindset takes time and a lot of positive reinforcement.” The students experienced this type of anxiety, as they have narrated, “Sometimes, the problem is when the other student didn’t act the lesson. The instructors will give the other instruction but it is the same as before. She or he will clear the instruction to make it easy, (G8S07).” Addition to this, “Sometimes our class had disagreements to our teachers but they always handle it because our teachers ask if there something wrong and if there has, they fix it, (G8S15)” therefore, A good math instructor also knows the importance of student struggle and is always looking for new ways to engage students in the learning process.

Differences in the Students’ Level of Performance between Control and Experimental Groups before and after the Intervention

To determine the difference in the level of performance of the students in the control and experimental groups, pre-test and post-test scores were compared and subjected to t-tests. Table 6 shows the t-test for the difference in the pre-test scores of students in the control and

experimental groups.

Table 6: T-Test for Pre-Test Scores of the Control Group and Experimental Group

	<i>Experimental Group</i>	<i>Control Group</i>
Mean	8.26	8.38
SD	1.65	1.54
Observations	100	100
Hypothesized Mean Difference	0	
Df	198	
t Stat	0.5324	
t Critical two-tail	1.9720	
Decision	Accept Ho	

Based on the table, the computed t-value is 0.53 which is lower than the critical value 1.97 with 198 degrees of freedom. There is no enough evidence to reject the null hypothesis. Hence, there is no significant difference on the pretest scores of students. This indicates that both Control and Experimental Groups of Grade 8 students of Castillejos National High School have the same level of poor performance before the application of the intervention.

Table 7: T-Test of Post-Test Scores of the Control Group and Experimental Group

	<i>Experimental Group</i>	<i>Control Group</i>
Mean	16.34	15.88
Variance	19.62	20.49
Observations	100	100
Pooled Variance	20.0605051	
Hypothesized Mean Difference	0	
Df	198	
t Stat	0.76	
P(T<=t) two-tail	0.45	
t Critical two-tail	1.97	
Decision	Accept Ho	

Table 7 shows the difference in the post – test scores of both the control and experimental group after peer coaching. Based on the table, the computed t-value of 0.76 is lower than the critical value 1.97 with 198 degrees of freedom. There is not enough evidence to reject the null hypothesis that there is no significant difference on the scores of students in the post-test. Hence, this indicates the level of performance of both Control and Experimental Group in Grade 8 students of Castillejos National High School do not differ significantly after the application of the intervention.

Table 8: T-test for Pre-Test and Post-Test Scores of the Control Group

	Pre-Test	Post-Test
Mean	8.38	15.88
Variance	2.359191919	20.4988889
Observations	100	100
Pearson Correlation	0.736740218	
Hypothesized Mean Difference	0	

Df	99	
t-Stat	20.92234689	
P(T<=t) one-tail	2.02183E-38	
T Critical one tail	1.660391156	
Decision	Reject Ho	

Table 8 shows the difference in the level of performance of the students in the pre-test and post-test of the control group. Based on the table, the computed t-value is 20.92 significantly higher than the critical one tail value 1.66 with 99 degrees f freedom, there is enough evidence to reject the null hypothesis. It means there is significant change in the scores of students from the pre-test to the post-test of the control group. This indicates a significant increase in the level of performance of Grade 8 students of Castillejos National High School.

Table 9: T-test of Pre-Test and Post-Test Scores of the Experimental Group

	Pre-Test	Post Test
Mean	8.26	16.34
Variance	2.71959596	19.62212121
Observations	100	100
Pearson Correlation	0.744548652	
Hypothesized Mean Difference	0	
Df	99	
t-Stat	23.71660013	
P(T<=t) one-tail	6.38124E-43	
T Critical one tail	1.660391156	
Decision	Reject Ho	

Table 9 shows the difference in the level of performance of the students in the pre-test and post-test of experimental group. Based on the table, the computed t-value is 23.72 significantly higher than the critical value 1.66 with 99 degrees of freedom, there is enough evidence to reject the null hypothesis. It means there is a significant change on the scores of students from the pre-test to the post-test of the experimental group hence the level of performance of Grade 8 students of Castillejos National High School increased significantly after the application of the intervention.

CONCLUSION

First, the prior level of Mathematics performance of the Grade 8 Students in the control and experimental groups is poor; and the level of Mathematics performance of the Grade 8 Students in the control and experimental groups after peer coaching among teachers is fair.

Second, if disagreements occurred during class proceeding, with the application of Peer-Coaching, it can be handled by making the math concepts easier to understand. The students' interaction during class proceeding with the application of Peer-Coaching that has the most frequency is chorus or group interaction.

Third, there was no significant difference in the level of Mathematics performance of Grade 8 Students between the control group and experimental group before and after the peer coaching.

Fourth, there was a significant increase in the level of Mathematics performance of Grade 8

Students in the control and experimental groups after the application of peer coaching.

RECOMMENDATIONS

Based on the findings, this study humbly recommends the following:

1. Teachers could utilize the intervention in teaching math concepts.
2. Teachers may let the students formed small group discussion to improve math achievements and math reasoning skills while giving equal opportunity to everyone.
3. If disagreements occurred relative to the topic during class discussion, make the math concepts easier to understand.
4. Further studies for the improvement of methods, approaches or techniques, especially Peer-Coaching in teaching mathematics may be considered.

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