

---

## THE EFFECT OF PEER TUTORING ON THE PERFORMANCE OF FRESHMEN SSSTUDENTS IN COLLEGE ALGEBRA

*By Violeta L. Guillergan, MAEd and  
Norma Luz C. Vencer, MAT (Math)*

### ABSTRACT

---

---

*The study was conducted to determine the effect of peer tutoring on the performance in College Algebra of freshmen college students of Central Philippine University, Iloilo City. The study sought to find out whether freshmen college students taking Algebra exposed to peer tutoring method perform better than those who are under the usual lecture method. It further determined whether or not performance of students varies according to sex and the type of high school the student graduated from. The study also determined whether or not there is correlation between a) fourth year high school Math grades and Math placement examination scores, b) fourth year high school Math grades and final grades obtained in College Algebra, c) Math placement examination scores and final grades obtained in College Algebra, d) Math placement examination scores and posttests. The results of the study showed that there was a significant difference in the performance of freshmen students control group and the experimental group based on the mean final grades in Algebra and pretest posttest results. About 95 percent of the experimental group obtained passing grade in College Algebra while only 80 percent of the control group got passing marks.*

---

---

## INTRODUCTION

### *Background and Rationale of the Study*

Mathematics as a tool of almost all subjects in college is a requirement to obtain a Bachelor's Degree as indicated in the curriculum approved by the Commission on Higher Education. The government and organizations of mathematics teachers work hand-in-hand to help develop a better performance of the students in mathematics. As per result of tests given in the local, regional and national levels, mathematics is a subject which shows very poor performance of the students. Central Philippine University (CPU) sees this problem especially among college freshmen students. Based from the Mathematics and Physics Department records, 32 percent of the students enrolled in Math 5 in two school years (1996-1998) did not get a passing grade. Of the 68 percent of students who passed the course, more than half got a grade of 3.0, the lowest passing mark.

The alarming information of poor performance in Mathematics of college freshmen students made the researchers decide to conduct a study on peer tutoring as a teaching strategy to be incorporated with the usual routine of the teaching-learning process. The selection of peer tutoring as a teaching method was based upon what psychologists have stated that a peer has a strong influence to an individual. The researchers' observation attests to that fact.

### *Objectives*

In general, this study was conducted to determine the effect of peer tutoring on the performance in College Algebra of freshmen college students of Central Philippine University, Iloilo City.

Specifically, the study aimed to determine the following:

1. Whether or not the freshmen students taking College Algebra exposed to peer tutoring program would obtain better grades and posttest scores than those who were taught using the traditional method, or a teacher-centered class;
2. Whether or not the effect of peer tutoring varies according to sex and to the type of high school the student graduated from; and
3. Whether or not there is correlation between a) fourth year high school Math grades and Math placement examination scores, b) fourth year high school Math grades and final grades obtained in College Algebra c) Math placement examination scores and final grades obtained in College Algebra d) Math placement examination scores and posttests.

### *Significance of the study*

The results of this investigation can benefit primarily Central Philippine University and the country as a whole. The CPU administration can use the results of this study in planning for innovation, which may be implemented in the instruction. Teachers may use peer tutoring as a teaching style to help students improve their grades. Lastly, this study then can help other schools, which encounter the same problem of poor performance in College Algebra.

### *Theoretical Framework*

This research on Peer-Tutoring as a teacher strategy is anchored on the insights of Piaget's theory. Jean Piaget was a leading proponent of the Cognitive Development Theory (Morris, 1982). He saw all behaviors in terms of a person's adaptation to the environment. In his theory, he discusses thought as a psychological activity involving mental operations from their origin in infancy until they become internalized, reversible, and co-ordinated into lawful groupings of operations during adolescence. He distinguished four main stages in the development of operational thinking and in concept formation as follows:

1. The sensory-motor period (birth to 2 years)
2. Pre-operational thought (2 to 7 years)
3. Concrete operation (7 to 11 years)
4. Propositional or formal operations (11 to 17 years), during which the students become capable of logical thinking with abstraction, that is, with the "possible" as well as the "here and now".

Since many variables such as intelligence, experiences, and culture may affect the age at which a given stage of development can be observed in a particular child, the ages assigned by Piaget to the emergence of various stages are suggestive only. The sequence of the stages does not, however, vary (Laycock, 1960).

When an individual reaches one of these stages of development, he is said to be in a state of intellectual equilibrium. When a person discovers he can no longer assimilate experiences with his accommodative skills of the existing level, he begins to adjust. This reorganization is called dis-equilibrium and brings about a move to another level.

Through active participation, a person progresses from one stage to another, while he grows older. Progress is achieved through the continued adaptation of the individual to changes in the environment as he assimilates many new

experiences and accommodates his action and thought processes. The environment of a person could be people, which start from his mother and other members of the family. As he matures and goes to school, his environment becomes wider and mostly those whom he always goes with are his peers. Piaget observed that throughout their school years, children rely on their peers as an important source of information and many use peers as standards by which they measure themselves.

### *Conceptual Framework*

The fourth stage according to Piaget's Theory, the formal operations period (1 to 17 years), is practically the adolescent years when peer pressure is greatly felt. Our freshmen college students are mostly in their adolescence. At this stage we expect them to manipulate and understand abstract concepts, and algebra is always presented as an abstract subject. Since freshmen students are in their adolescence, it is important for them to share common fears and anxieties to help each other become more independent, and to cope with changes that occur at this stage. It is therefore in this context that we proceed to conduct this study. The assumed flow of relationship between variables is illustrated in Figure 1.

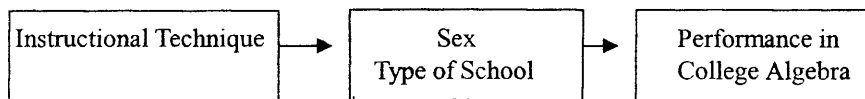


Figure 1. Assumed Flow of Relationship between the Two Variables

### *Hypotheses*

With the theoretical and conceptual frameworks in mind, the researchers tested the following hypotheses:

1. There is no significant difference between (a) the pretest and posttest mean scores of both the control and the experiment group, (b) the post test mean scores of the two groups, and (c) the mean final grade in College Algebra of the two groups.
2. Performance in College Algebra does not vary with sex and type of high school the students graduated from.
3. There is no correlation between (a) senior high school math grades and placement examination scores, (b) senior high school math grades and final grade in college algebra, (c) math placement examination scores and final grade in College Algebra and (d) math placement examination score and post test scores.

## METHODOLOGY

In the second semester of SY 1998-1999, the CPU Math and Physics Department materialized over twenty sections of College Algebra of 50 students each. Systematic sampling design was used to choose 50 out of 150 students enrolled in 9-10 am classes. A separate section was created for the 50 samples of this group. Using three criteria such as sex, senior high school math grade, and math placement results, artificial twins were taken from 150 students enrolled in 10-11 am College Algebra. The samples were again grouped in another section. Since there was a difficulty in producing exactly fifty twins, the researchers ended up to only 43 pairs, 36 females, and seven males in each group. The two sections were both handled by one of the researchers to eliminate teacher factor.

### *Experimental Design*

A 40-item pretest equivalent to 68 points constructed by the researchers was administered to both control and experimental groups. Coverage and test items included were discussed with fellow algebra professors for validity. The same test was conducted as posttest a week before the end of the semester. In a span of three months, seven topics were covered. The topics were basic concepts, polynomials, fractions, radicals and complex numbers, exponents, linear and quadratics equations, and worded problem application.

Traditional method, which includes lecture, note taking, and presentation of examples, seatwork, board work, and homework exercises, were used with the control group. The experimental group was taught with a combination of teacher's lecture and peer tutoring for seatwork and homework exercises. Peer tutors were chosen from the top 20 percent of the class based on the pretest result. The class for one hour is divided into the following activities with corresponding time allotment: 5 minutes for recap, 30 minutes for presentation of the new lesson, 15 minutes for peer tutoring seatwork and 10 minutes for synthesis. More student interaction was allowed in the experimental group.

Similar constructed tests were given to both groups on the same date and used as basis for the performance of the students and their final grades. Students were given the usual number of quizzes and long examination in a semester.

### *Statistical Procedure*

All data gathered needed for the study were encoded in the computer and were processed using the statistical software Statistical Package for the Social Sciences (SPSS). For the analysis, the study used the following statistical techniques: frequencies and percentages for proportion of students by college, sex, and type of

high school where students graduated; means, standard deviation, and t-value for significance of difference between groups in the different variables; and Pearson product-moment correlation for degree of interrelationship between senior high school math grades and placement examination scores, the students' fourth year high school math grade and college algebra grade, math placement exam results, and college algebra grade, and results of posttest and college algebra grade.

## RESULTS AND DISCUSSION

Results of the study revealed that there is no significant difference in the mean scores of the experimental and control groups in the pretest and posttest indicating a comparable performance of students in the two groups. However, there is a significant difference in the final College Algebra grade with students in the experimental groups generally getting better grades than those in the control group (Table 1). This implies that peer tutoring as a strategy significantly helped in improving the performance of freshmen students in College Algebra.

Table 1. Comparison of the Difference Between Posttest Mean Scores and Mean Final Grade in College Algebra in the Control and Experimental Group

Groups and Measurement used	Control		Experimental		t-value
	Mean	SD	Mean	SD	
Pretest Scores	17.30	6.83	19.58	8.42	1.28
Posttest Scores	26.26	9.08	28.47	9.39	0.87
Final Grade in College Algebra	3.22	1.0	2.73	0.65	2.88*

\* Significant at the 0.05 level of probability

As shown in Table 2, although the male students in the control group obtained a higher mean posttest score than the male students in the experimental group, the difference was not significant. There was also no significant difference in the final grades obtained by the students in the experimental and control groups at the end of the semester. This implies that peer tutoring did not make any significant improvement in the performance of male students.

Results of the study further revealed that the difference in the mean posttest scores of the female students in the experimental and control group was not significant. Again, this means that there was no significant difference in the performance of the female students who were taught under the traditional method and those who were exposed to peer tutoring (Table 2). There was, however, a significant difference in the performance of female students in terms of final grades obtained at the end of the semester. This implies that peer tutoring significantly improved the grade of female students in college algebra.

Table 2. Comparisons of the Mean Scores in the Posttest and the Mean Final Grades of Male and Female Students of the Control and Experimental Group

Group and Measurement Used	Control Group		Experimental Group		Mean Difference		t-value	
	Posttest	Final Grades	Posttest	Final Grades	Posttest	Final Grades	Posttest	Final Grades
Male								
Mean	31.00	2.61	25.14	2.79	5.86	0.18	0.90	0.70
SD	11.09	0.54	9.49	0.39				
Female								
Mean	25.44	3.33	28.61	2.72	3.17	0.61	1.45	2.93*
SD	8.53	1.04	2.72	0.70				

\*Significant at the 0.05 level of probability

Shown in Table 3 is the performance of students when grouped according to the type of high school they have graduated from. For those who graduated from private schools, results of the study revealed that there was no significant difference in the posttest scores of the students in the experimental group and the posttest scores of students in the control group. This means that in terms of posttest scores, the performance of students who graduated from private schools were practically the same regardless of the method of teaching used. In terms of mean final grades, however, results revealed that there is a significant difference in the mean final grades of the students in the control group and the mean final grades of the students in the experimental group.

When it comes to the performance of students who came from public schools, results revealed that there is no significant difference in the mean posttest scores of the students in the experimental and control group (Table 3). Results also show that although the mean final grade of students in the experimental group is higher than the mean final grade of students in the control group, the difference is not significant.

Table 3. Comparison of the Mean Scores in the Posttest and the Mean Final Grades of the Private and Public School Graduates of the Control and Experimental Groups

Group and Measurement Used	Control Group		Experimental Group		Mean Difference		t-value	
	Posttest	Final Grades	Posttest	Final Grades	Posttest	Final Grades	Posttest	Final Grades
Private School								
Mean	27.4	3.18	29.5	2.56	2.1	0.62	0.47	2.53*
SD	9.95	1.03	9.42	0.43				
Public School								
Mean	25.43	3.25	26.78	2.87	1.35	0.38	0.46	1.33
SD	8.37	1.00	9.39	0.78				

\*Significant at the 0.05 level of probability

The summary of correlation coefficient shown in Table 4 revealed that fourth year high school mathematics grades and math placement examination scores for control group have slightly positive correlation while the experimental group has substantial positive correlation. In the case of fourth year high school math grades and final grades in College Algebra, both control and experimental groups obtained a substantial positive correlation. Substantial positive correlation was also obtained from both control and experimental groups between math placement examination scores and final grades in College Algebra and also between math placement examination scores and posttest scores.

Table 4. Summary of Correlation Analyses Between Specified Variables.

Variables	Control Group		Experimental Group		Combined	
	r	r <sup>2</sup>	r	r <sup>2</sup>	r	r <sup>2</sup>
4 <sup>th</sup> year HS Math Grade and Math Placement Exam	0.34	11.56	0.55	30.25	0.46	21.16
4 <sup>th</sup> year HS Math Grade and Algebra Final Grade	0.68	42.64	0.63	39.69	0.66	43.56
Math Placement Exam and Algebra Final Grade	0.57	32.49	0.46	21.16	0.51	26.01
Algebra Final Grade and Posttest Score	0.68	46.24	0.51	26.01	0.59	34.81



Results further showed that 46.24 percent (control group) and 39.69 percent (experimental group) of the variations in College Algebra final grade can be explained by the linear function of the fourth year high school math grade. On the other hand, only 32.49 percent (control group) and 21.16 percent (experimental group) of the variations in College Algebra final grade can be explained by the linear function of math placement exam scores.

## CONCLUSIONS AND RECOMMENDATION

Based on the findings of this study, the following conclusions are drawn:

1. Exposure to peer tutoring technique improves students' performance and helped minimize failures.
2. Peer tutoring helped bridge the gap in the performance among students.
3. The male students' performance in College Algebra are not affected by the way they were taught, whether the usual type or peer tutoring strategy, however, the girls when aided by peer tutors can obtain better final grades than without peer tutors.
4. Both the usual teaching method and the employment of peer tutoring were as effective as each other in helping the students improve their performance in College Algebra whether they come from public schools or private schools.
5. Results of this study disproved the popular notion that private school graduates are better prepared academically than the public school graduates since no significant difference was found in the performance of private and public schools graduates in both posttest and final grades.
6. There is a substantial indication that the higher the math grade the students obtained in his senior high school year, the higher the Mathematics Placement Exam score is expected to be obtained and the better final grade the student will get in College Algebra. Likewise, the higher the placement exam score that the student gets at the beginning of the semester, the higher posttest score and final grade will he get at the end of the semester.

After considering the results of the study, the following are recommended:

1. Math teachers must be sensitive to meet the needs of the students and apply different teaching strategies like peer tutoring. A variation of strategies in an hour class must be used to break boredom.

2. Math teachers should train and supervise peer tutors and if possible, be present during peer tutoring sessions.
3. Students must study in groups to help each other and a peer tutor must be among them.
4. Further studies must be conducted on using peer tutoring to develop values and self-concept of the students, and attitude of students toward mathematics. Moreover, explore other techniques that will help students perform better in mathematics.

## REFERENCES

- Alindada, Francilyn. *Structural approach to cooperative learning: An alternate strategy in encouraging and developing students' critical and creative thinking in mathematics*. Paper presented at the 8<sup>th</sup> Southeast Asian Conference on Mathematics Education, 30 May- 4 June 1999. Ateneo De Manila University, Quezon City.
- De Leon, Lorenzo. (1973). *The effects of grouping on achievements, classroom participation and interaction of students in modern geometry at the Manuel Luis Quezon University*. Unpublished Master's Thesis. University of the Philippines, Diliman Quezon City.
- Laycock S. R. and B. C. Munro. (1966). *Educational psychology*. Toronto: The Copp Clark Publishing Co.
- Moris, Charles G. (1982). *Psychology, an introduction*. New Jersey: Prentice Hall.
- Roswal, Glen M., et al. (1995). The effects of collaborative peer tutoring on urban seventh graders. *The Journal of Educational Research*, 88 (5), 275-279.
- Slavin, Robert E. (1988). Cooperative learning and student achievement. *Educational Leadership*, 46, 31-33.