

# The Effect of Peer Tutoring on Achievement of Students in Discrete Structures

Joseph B. Campit (MAEd)<sup>1</sup>, Joel Cayabyab (Ed.D),  
Elbert Galas (MIT)

Pangasinan State University - Bayambang Campus, Philippines  
josephbcampit@gmail.com<sup>1</sup>

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**Abstract** - Mathematics is a difficult subject, however, the researcher believes that Mathematics teaching can be made easy depending upon several factors like the teaching strategy in Mathematics instruction. This study investigated the effect of peer tutoring strategy on the students' achievement in Discrete Structures of second year college students at the Pangasinan State University Bayambang Campus, Philippines. More specifically, it attempted to determine and compare the achievements of the students exposed to peer tutoring and conventional teaching. The experimental method of research was used in the study particularly the posttest control group design. Two intact classes were randomly assigned to experimental and control group and were subjected to six weeks treatment period. Valid and reliable researcher-made achievement test was used as the data gathering instrument. The mean, standard deviation, skewness and analysis of covariance were computed to determine and compare the achievement of the two groups. The result of the study revealed that the students exposed to peer tutoring significantly achieved better than those exposed to conventional teaching. Based on the finding, it is concluded that the achievement of the students is enhanced when exposed to peer tutoring strategy. It is recommended that peer tutoring strategy should be used by mathematics teachers in order to improve the performance of their students in the subject. Furthermore, further studies should be conducted to find out the effect of peer tutoring in other subject areas.

**Keywords:** peer tutoring, peer learning, peer mentoring, cooperative learning

## INTRODUCTION

Teachers have always been concerned with their teaching strategies to improve the level of performances of their students. Many educational approaches are being utilized to make teaching especially mathematics interesting because typical practice in teaching mathematics tends to be uninteresting as it does not require inquiry or higher thought process and does not encourage cooperative learning and brain storming [1]. According to McCarron, Sean and Robert [2], teaching and learning activities have to be modified to facilitate both cognitive and social gains in both high performing and low-performing students in an individualized or positive way.

One of the recognized as an effective method of instruction to help students increase their academic performance compared to a group of traditional classroom environments is the use of peer tutoring [3]. Peer tutoring consist of students teaching other students of the same or different age, on one-on-one

basis or one tutor working with two or three students simultaneously [4]. Likewise, Power and Dunphy [5] defined the peer tutoring environment as a "safe and non-threatening interactive learning situation".

Peer tutoring has been broadly used across academic subjects and has been found to result in academic achievement for a diversity of learners within a wide range of content areas just like academic and cognitive gain [6]. Moreover, Cuseo [7] and Drapper [8] and Kalkowki [9] list benefits of peer tutoring programs. These include the academic and cognitive gains like it positively affects mathematics performance, improves reading achievement for students of all levels, accommodates diverse students within a classroom and promotes higher order thinking. In social and behavioral gains, its benefits include results in positive effects on social, self-concept and behavioral outcomes, and increase students' sense of control and responsibility for their academic achievement.

From the literature review conducted by Henderson, Fadali and Johnson [10], concluded that peer tutoring has a positive effect on student performance, retention and positive attitude towards tutoring. A study executed by Magin and Churches [11] concluded that the use of peer tutoring in engineering is a useful, viable teaching strategy for achieving course goals. Multiple case studies [12], [13], [14] have shown the positive impact that tutoring provides on the tutee performance.

With these great advantages and benefits that can be derived, the use of peer tutoring is one of the best option for teachers to adopt. This study then aimed to determine the improvement of achievement of BSICT students in Discrete Structures through the use of peer tutoring. To realize this, the study determined the achievement of the students exposed to peer tutoring and conventional teaching. It also investigated if there is significant difference between the achievements of students exposed to the different strategies.

This research is guided by the assumption that peer tutoring in Discrete Structures enhances students' learning and the hypothesis that there is a significant difference in the achievement of the students exposed to conventional teaching and peer tutoring. The null form of this hypothesis was tested at .05.

## METHODOLOGY

### Research Design

The post-test control group experimental design was used in the study. According to Ariola [15], this design involves two groups of which are formed by random assignment. Two intact classes were used – one for the control group and other one for experimental group and this is done by random assignment. After the experiment, the achievement test in Discrete Structures was administered to measure the student achievement. The result of the test was the basis for describing and comparing their achievement.

### Subjects of the Study

The second year BSICT students of section 1 and section 2 enrolled in Discrete Structures during the 2<sup>nd</sup> semester of the school year 2013-2014 composed of 30 students each were used. BSICT II-1 students were assigned to experimental group while the BSICT II-2 students to conventional teaching group. The subjects were not aware that the experiment is taking place to make the classroom activities be as normal or

possible, thus eliminating the effect of some extra factors that would affect the result of the experiment.

### Data Gathering Instrument

The 50-item test constructed by the researcher which measured the achievement of the students in Discrete Structures was the main instrument used in this study. A table of specifications was prepared to ensure representativeness of subject matter. The achievement test includes propositional logic, predicates and quantifiers, nested quantifiers, rules of inference, proof methods and strategy, sets, functions and matrices. The achievement test was subjected to content validity. Five faculty members teaching mathematics and competent in test construction were tapped for the content validation. The result of the content validity revealed that the questionnaire is highly valid with a rating of 4.15. Similarly, the questionnaire was subjected to reliability test using cronbach test. The results revealed that the questionnaire has a reliability index of .874 which is considered high reliability for teacher-made test. This implies that the questionnaire form a scale that has high internal consistency reliability.

### Procedure

The experiment was conducted for a duration of six weeks, during the regular schedule of the students in Discrete Structures, that is three times a week (Monday, Wednesday, Friday) one hour per meeting.

To control the time element of the study the following schedule was used:

| Week                              | Conventional Teaching (BSICT II-2) | Peer Tutoring (BSICT II-1) |
|-----------------------------------|------------------------------------|----------------------------|
| 1 <sup>st</sup> – 3 <sup>rd</sup> | 8:00 – 9:00                        | 1:00 – 2:00                |
| 4 <sup>th</sup> – 6 <sup>th</sup> | 1:00 – 2:00                        | 8:00 – 9:00                |

Hence, for the first three weeks conventional teaching was held from 8:00 – 9:00 and peer learning was from 1:00 – 2:00. On the 4<sup>th</sup> to 6<sup>th</sup> weeks, their schedule was interchanged. This was possible because both groups were available on such periods, being their vacant period.

The experimental group used the same instructional materials and underwent the same instructional process except in the fixing skills. The two groups have the same exposure from review to development of the lesson. In fixing skills, however, the students in peer tutoring group solved exercises by

pair with a peer and they are free to discuss by themselves. In conventional group, the teacher as usual, continued his discussion. As the students answered the exercises individually, the teacher goes around to monitor their work.

The conduct of the experiment is summarized as follows:

| Conventional Strategy  | Peer Tutoring                               |
|--|---|
| 1. Review  | 1. Review                                   |
| 2. Motivation  | 2. Motivation                               |
| 3. Development of the lesson   | 3. Development of the lesson                |
| 4. Fixing Skills<br>(Teacher goes around while students answer the exercises individually) | 4. Fixing Skills<br>(Students work by pair) |
| 5. Evaluation  | 5. Evaluation                               |

**Selecting learning pairs.**In the peer tutoring group, the students worked by pair in the fixing skills portion of the lesson. The pairing was done at random by drawing of lots. Each student wrote his name on a piece of paper then rolled and put it in a box. Then the teacher drew two rolled paper at a time. This composed a pair. The same process was done until all the rolled papers had been drawn.

**Statistical Treatment of data**

To obtain the validity and reliability of results of the study, appropriate statistical tools were used. The following statistical tools were used in the study.

Descriptive statistics such as mean, standard deviation, and skewness were used to determine the achievement of the students. ANCOVA was used to test if there is a significant difference between the achievement of the students exposed in the experimental group and those exposed in conventional teaching group with their average grade in the college algebra and statistics as the covariate.

**RESULTS AND DISCUSSIONS**

**Achievement of Students to the Different Teaching Strategies**

**Table 1.**Achievement of Students Exposed to Peer Tutoring and Conventional Teaching

| Statistics | Peer Tutoring | Conventional Teaching |
|------------|---------------|-----------------------|
| Mean       | 36.43         | 30.52                 |
| SD         | 5.35          | 5.83                  |
| Skewness   | -.064         | .450                  |

Table 1 presents information about the achievement of the students exposed to peer tutoring and conventional teaching group.

Table 1 shows that the students exposed to the peer tutoring obtained a mean score of 36.43 out of 50 items achievement test and a standard deviation of 5.35. This indicates that the achievement of the students were mostly 5.35 units below and above the mean (36.43). The skewness of -.064 indicates that the distribution is negatively skewed. This means that there are more students who got scores above than below the mean. This implies that the students exposed to peer tutoring performed well in the achievement test.

Table 1 further shows that the mean achievement of the students exposed to conventional teaching is 30.52. The standard deviation is 5.83 which indicate that their scores were mostly within 5.83 below and above the mean. It was observed from the same table that the scores of students in conventional teaching group are more varied than the scores in the peer tutoring group. This is shown by the computed standard deviation of their scores under the two methods. The distribution is positively skewed as indicated by the skewness of .450. This signifies that there are more students who got scores below than above the mean. This implies that students exposed to conventional teaching had low performance in the achievement test.

**Testing for the significance of the difference between the achievements of the two groups**

Table 2 show the summary table of ANCOVA test of significance of the difference between the achievement of the two groups and the average grade in algebra and statistics that served as covariate.

**Table 2.**Summary Table of ANCOVA Test

| Source                                  | F     | Sig  | Observed Power |
|---|-------|------|----------------|
| Teaching Strategy                       | 15.27 | .004 | .891           |
| Average Grade in Algebra and Statistics | 9.05  | .006 | .852           |

It can be gleaned from the table that the teaching strategy generated an F-ratio of 15.276 with a significance of .004 which is lower than .05 level of significance. This implies that the null hypothesis which states that there is no significant difference between the achievement of the students exposed to peer tutoring and those exposed to conventional

teaching is rejected. The probability of rejecting the hypothesis is 85.2% as indicated by the observed power of .852. Therefore, the achievement of the students exposed to peer tutoring and those exposed to conventional teaching were significantly different, that is, the students exposed to peer tutoring had significantly higher achievement than those in conventional teaching. This finding could be attributed to the cooperative undertaking of pair of students in practicing basic skills [16] and sharing not only the answer but the process used to reach answers [3]. Thus, working in pair is better than that of working individually in solving problems because misunderstanding can be quickly identified and corrected.

Table 2 further shows that the average grade in Algebra and Statistics obtained an F-ratio = 9.05 and has a significance of .006. This implies that their average grade in Algebra and Statistics is a good covariate.

#### SUMMARY OF FINDINGS

The group mean of the students exposed to peer tutoring is 36.43, with a standard deviation of 5.35. The distribution of their scores is negatively skewed ( $Sk = -.064$ ), while the students exposed to conventional teaching have a mean of 30.52 and a standard deviation of 5.83. The distribution of their scores is positively skewed ( $Sk = .450$ ). The students exposed to peer tutoring strategy performed better than students exposed to conventional teaching.

There is significant difference between the achievements of students exposed to peer tutoring and those exposed to conventional teaching ( $F=12.587$ ,  $p=.001$ ), that the students exposed to peer tutoring had significantly higher achievement than those in conventional teaching.

#### CONCLUSIONS AND RECOMMENDATIONS

The achievement of students in Discrete Structures is enhanced by their exposure to the peer tutoring strategy. The peer tutoring strategy is more effective than the conventional teaching strategy in teaching Discrete Structures.

From the conclusions formulated, the researcher recommends the use peer tutoring in order to improve the performance of the students in the subject. Follow up study should be conducted to find out the effect of peer tutoring on the other subject areas or other group of respondents or another peer grouping.

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