EFFECTIVENESS OF CONCRETE-LANGUAGE-SYMBOL MODEL IN TEACHING PROBABILITY AND STATISTICS AMONG SECOND YEAR COLLEGE STUDENTS OF ST. PAUL UNIVERSITY PHILIPPINES

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ABSTRACT

This empirical study investigated the effectiveness of the Concrete-Language-Symbol (CLS) model in the Teaching of Probability and Statistics among second-year college students of the School of Information Technology and Engineering. The total enumeration was employed in the selection of the students enrolled in Probability & Statistics, as subjects of the study. The researcher made use of the quasi-experimental method. Activity sheets on selected topics along Probability and Statistics were prepared and used for the experimental group. A pre-post test was administered to both control and experimental groups based on the topics covered during the midterm period, which was drawn from the researcher's bank and subjected to test item analysis. The results of the pre-post test were treated using the t-test for independent means and paired samples to determine the significant difference in the posttest mean performance scores of both groups. The findings of the study revealed that there is a significant difference in the performance of the two groups. Students' exposed to the Concrete-Language-Symbol model performed better than those exposed to the lecture-discussion method. From the preceding findings, the researcher concluded that through CLS model, Mathematics learning is facilitated as the students are exposed to learning situations that are concrete and realistic, thus making learning more meaningful, interesting and engaging.

Keywords*: CLS model, quasi-experimental method*

INTRODUCTION

In the verge of societal innovations, people live in an era filled with complexities, economic and technological advancements. With these rapid developments and changes, it becomes imperative for any individual to be equipped with the desired competencies and skills for them to confidently face more challenging and difficult tasks ahead of them and to meet the demands of the rapidly changing society.

Present day society collectively needs a great deal of the most sophisticated kind of mathematics for its functioning and survival. The highly complex problems of the technological society require complex mathematics to solve them. The demand, therefore, for increased competencies in Mathematics has become a reality for many. Corollary with this is the fact that Mathematics has become indispensable to any person's daily life. Now and then, one is faced with problems that need mathematical solutions be it with the simpl e buying of goods in the store or budgeting the expenses for the day, to a more complicated problem that needs wise and instant mathematical solutions/answers.

Thus, in the previous years, tremendous efforts have been made at the national level to enhance the mathematics curriculum in response to the challenges of the 21st-century learning. The Department of Education has been undertaking continuous curricular development since 2002 geared towards enhancing the Science and Mathematics curricula in order to comply with national and global standards. One of its concerns is to focus on the strategies that will enhance the students' ability to handle abstractions and on the approach to problem-solving. Furthermore, proposals have been made not only on the content of Mathematics but also on instructional materials. New courses of study have been organized, and new text and learning modules have been produced. Many teachers have been back to school to upgrade their knowledge of Mathematics and to learn more innovative and effective teaching-learning strategies, models or approaches to teaching.

However, despite these tremendous efforts made by the Department of Education, that the Philippine educational system achievement rate at the secondary level in Science remained low, and Mathematics was lower in the past two years [2]. Compared to other Asian countries, as cited by King & Guerra (2005),

the Philippines is lagging behind in Mathematics and Science. This is further supported by the results of the study of Martin (2004) and report from the Trends in International Mathematics and Science Study (TIMSS, 2004), which was conducted among eighth (8th) graders. Results revealed that the Philippines ranked 36th among 38 countries in 1999 and 43rd among 46 countries in 2003. Further, according to the National Education Testing and Research Center (NETRC), the achievement rates in Mathematics from AY 2005-2006 to AY 2009-2010 were as follows: 47.82%, 39.05%, 42.85%, 38.03% and 39.64%, all of which are below 50% mastery level. (DepEd F-act Sheet, 2011).

In St. Paul University Philippines, it has been a common observation that freshmen college students have not fully mastered the competencies of Secondary Mathematics as revealed in the Math Proficiency Test which is administered upon admission to the University. The results showed that only about 10-20% would obtain 50% mastery level every year, the results of which are alarming [2]. In particular, considering the sample of 54 SITE freshmen students who took the examination, a mean score of 15.31 was obtained out of the 50 item questions; the highest score was 34, and the lowest was 7. Such result reveals poor performance in the Mathematics Proficiency Examination. This further supports the results of educational surveys which indicated that most of our high school graduates do not manifest the 75% mastery level as prescribed by the Department of Education. One of the reasons behind this is their inability to meaningfully comprehend the lessons presented, thus resulting in low performance in Co llege Mathematics [2]. It is also a common classroom observation that students have a short span of attention which causes their limited participation in the classroom activities in Mathematics.

At present, many teachers in college are faced with the alarming fact that a great number of college students do not perform well in Mathematics. Considering, for instance, the performance of the subjects of this study in Algebra and Trigonometry last year, their mean grades were 77.98 and 78.88 respectively. This implies poor performance in the aforementioned subjects. "Studies have shown that poor performance in Mathematics has been caused by the traditional teaching approaches/strategies employed in the teaching-learning process where the students are not adequately provided with meaningful activities and real life experiences, thus, making it difficult for them to understand and master mathematical concepts and processes.", [10].

Research has shown that teaching strategies which are interactive, integrated, experiential, varied, and which show connections of lessons to the students' daily lives, are effective in enhancing students' academic performance in Mathematics. If mathematics is taught in a manner where students are engaged in concrete activities that are meaningful and interesting, then this will lead to the developmental process of learning and meaningful understanding of Mathematics, thereby improving students' Mathematics performance or achievement. Mathematics teachers, therefore, need to explore effective and innovative ways of making mathematics learning more meaningful, interesting, and engaging.

In this regard, students should be provided with activities and experiences that will help them visualize relationships and applications as they are immersed in any mathematical endeavor. This may be realized through the use of the Concrete–Language-Symbolic (CLS) model which is a versatile framework for teaching mathematics. A strategy that is anchored on this model begins with a real-life application of the concept to make the lesson more meaningful to the learners. It uses concrete or visual materials to illustrate the concept before proceeding to the operation of symbols [10].

It is for these reasons that the researcher has thought of coming up with a study that would investigate the effectiveness of the CLS model in the Teaching of Probability and Statistics, particularly in enhancing understanding of mathematical concepts and processes among the second year college students of the School of Information Technology & Engineering.

Statement of the Problem

This study attempted to investigate the effectiveness of the Concrete-Language-Symbol (CLS) model in the Teaching of Probability and Statistics among second-year college students of the School of Information Technology and Engineering (SITE).

Specifically, it sought to find answers to the following questions:

1. What are the pretest and posttest mean scores of the control and experimental groups in Probability and Statistics?

2. Is there a significant difference in the pretest mean scores of the control and experimental groups?

3. Is there a significant difference in the posttest mean scores of the control and experimental groups?

4. Is there a significant difference in the pretest and posttest mean scores of the subjects in the experimental group?

METHODOLOGY

Research Design

The study made use of the quasi-experimental method, specifically, the pre-post test design. This design involved two groups, the control, and experimental groups. A pretest was administered to both groups to ensure equality of their entry requirements before the experimental stage. The lecture-discussion method was employed for the control group while the CLS model was utilized with the experimental group.

Subjects and Sampling Procedure

The study involved two classes of which 30 students were assigned heterogeneously to each class of second-year college students of the School of Information Technology and Engineering who were currently enrolled in Probability and Statistics for the Second Semester of the Academic Year 2012-2013. The total enumeration was employed in the selection of samples since the population of said year level is fewer.

Research Instruments

In order to gather the necessary data for the study, and to facilitate the conduct of the experiment, the following instruments and materials were employed.

Activity Sheets

Activity sheets on selected topics in Probability & Statistics were carefully prepared and used with the experimental group. These served as tools in delivering the topics covered during the midterm period and in facilitating the development of the concepts and processes. These activity sheets were subjected to content validity by the researcher through consultations made with fellow Mathematics teachers and research adviser. Revision and enhancement were done based on their comments and suggestions.

A pre-post test was administered to both control and experimental groups based on the topics covered during the midterm period. The test items were drawn from the researcher's test bank. These items have undergone test item analysis.

To facilitate the selection of the items in the pre-post test which were drawn from the Midterm Test Bank and to ensure the proper distribution of the items in terms of the Higher Order Thinking Skills (HOTS), a table of specifications was prepared. For the content validation of the test items, consultations were made with fellow Math teachers and research adviser.

Data Gathering Procedures

The researcher employed the following procedures in the conduct of the experiment.

1. Pre-treatment Phase

The activity sheets for the CLS model were carefully prepared by the researcher which was based on the course content and competencies as prescribed in the curriculum.

The pre-test was administered to both groups prior to their exposure to the teaching methods. The results of the pretest were recorded and later compared with the results of the post-test.

2. Treatment Phase

The researcher conducted the classes with the two groups employing the lecture-discussion method and CLS teaching model with the control group and

the experimental group respectively. Both classes were conducted on the same schedule (3:00-4:30 pm), but the control group was scheduled on Mondays and Thursdays, while the experimental group, Tuesdays, and Fridays, under the same learning environment.

3. Post- Treatment Phase

After exposure to the teaching method/model, the researcher administered the posttest to both the control and the experimental groups. The results of the post-test were compared with the results of the pre-test scores in order to determine whether a significant difference exists in the performance of the two groups and to ascertain which method/model of teaching is effective.

Data Analysis

The data obtained were classified, analyzed and interpreted making use of the following statistical tools such as frequency count, mean and percentages to interpret the pre-post test performance scores of the two groups while t-test for independent means and paired samples was used to determine the significant difference in the following:

1. Pretest mean performance scores of the control and experimental groups.

2. Pretest and posttest mean performance scores of the subjects in the experimental groups.

3. Posttest mean performance scores of the control and experimental groups.

RESULTS AND DISCUSSION

On the basis of the analysis of the data gathered, the following findings were established:

A. Prior to the conduct of the study, the control and experimental groups performed fairly on the items in the pre-test. After the intervention, the control group obtained a satisfactory performance, while the experimental group obtained a very satisfactory performance.

B. There is no significant difference in the pretest mean performance scores of the control and experimental groups. The two groups were comparable with respect to prior knowledge on the topics included in the study before they were exposed to the treatment.

C. There is a significant difference between the posttest mean performance scores of the control and experimental groups. The results revealed that the students who were exposed to the use of the Concrete-Language-Symbol teaching model performed better than those who used the lecture-discussion method.

D. There is a significant difference between the pretest and posttest mean performance scores of the students in the experimental group. The posttest mean performance score of the students is significantly higher than that of their pretest mean performance score. This means that the use of CLS model enhanced students' performance or achievement in Probability and Statistics.

CONCLUSION

From the foregoing findings, the researcher arrived at the following conclusions:

The exposure of the students to the Concrete-Language-Symbol (CLS) teaching model resulted in better performance of the students in Probability and Statistics. This then implies that through the CLS teaching model, Mathematics learning is facilitated as the students are exposed to learning situations that are concrete and realistic, thus making learning more meaningful, interesting and engaging. Effective learning takes place when real life situations are connected to the students' life as this develops a meaningful understanding of mathematical concepts and processes. Students learn best when they are engaged in activities that will lead them to discover concepts and relationships from given tasks. Group work encourages students to learn from each other and make connections.

The CLS model, therefore, tends to enhance students' motivation and enjoyment in learning. It encourages students to actively engage themselves in classroom activities, manifest enthusiasm, learn from each other and make connections.

RECOMMENDATIONS

On the basis of the findings and conclusions derived from the study, the following recommendations were made:

1. Teachers should be encouraged to employ the Concrete-Language-Symbol teaching model, and other innovative teaching-learning approaches in order to enhance students' critical thinking and facilitate conceptual understanding of mathematical concepts and processes. This can be done through the conduct of more meaningful and engaging activities in the classroom, thereby improving their Mathematics performance or achievement.

2. Mathematics teachers should be encouraged to prepare/develop activity sheets for their Mathematics classes as these will facilitate the teaching and learning of Mathematics

3. The administration should continuously support the use of CLS teaching model and other innovative teaching-learning models/approaches/strategies in the teaching-learning of Mathematics in order to achieve the goals of 21st-century learning.

4. Future researchers may conduct parallel studies to verify the results of this investigation not only in Probability and Statistics but also in other Mathematics courses.

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