ENHANCING STUDENTS' PERFORMANCE AND ATTITUDE IN STATISTICS USING MEGASTAT

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ABSTRACT

With its aim to enhance students' performance and attitude in Statistics using MEGASTAT, this study made use of the quasi-experimental design. The pretest and posttest were given to both the experimental group participants as well as the control group with 15 participants in each group. The instruction in the experimental group was done using MEGASTAT. With the use of mean, standard deviation and t-test, the study ascertained that both groups had comparable Statistics performance in their pretest. Control group had "proficient" while experimental group had "developing" Statistics performance after the experimental group's exposure to the MEGASTAT; t-test unveils no significant difference in the performance of the two groups before the use of the MEGASTAT, while a significant difference exists in the performance after their exposure to the MEGASTAT; t-test shows a significant difference in the pretest and posttest of the experimental group; t-test reveals no significant difference on the attitude of the experimental group and the control group with respect to all four attitude subscale; for the experimental group, a significant improvement in their attitude with respect to the affective domain was observed. Generally, the study revealed that the use of the MEGASTAT has greatly improved the academic performance of students. By using the software, students exhibited significant improvement in their achievement by working on interesting problem situations which facilitated their achievement in a variety of higher-order learning outcomes, such as problem-posing, problem-solving, reasoning, decision-making and reflection. Utilizing the MEGASTAT increased the affective aspects of the students' attitude towards learning Statistics. Statistics in Higher Education Institution is better taught as a laboratory science. Teaching through learning packages and letting students perform relevant laboratory exercises helps the students learn all the aspects and extensions of the Statistics concepts in the context of the current real world situations.

Keywords: *Enhancing students' performance, attitude, statistics, MEGASTAT*

INTRODUCTION

In the Philippines, mathematics classrooms are still teacher-centered (Tan, 2012). Tan (2012) added that to finish the budget of work for a particular period, teachers tend to spoon-feed rather than allowing students to engage in meaningful and challenging practical work activities. In other words, there is less time spent for generalizations and inferences. Consequently, a teacher-centered instruction cannot encourage active learning and cannot foster a better understanding of statistical concepts and development of critical statistical thinking. Today teachers are no longer viewed as the center of the learning process. They are instead expected to play the role of a facilitator or guide of information and not so much as the information source. Instructional methods and techniques have changed due to the strong influence of technological advancements. More than ever, it is important to incorporate technology in instruction to help increase students' knowledge, skills, involvement, and enjoyment in the classroom. Determining the appropriate technology such as MEGASTAT has paved a new dimension in the teaching of Statistics. MEGASTAT is a widely used software program that performs statistical functions which give students more time to focus on understanding statistical concepts. It is a Microsoft Excel add-in that can calculate frequencies and handle normal distributions, descriptive statistics, probability, confidence intervals, hypothesis tests, Analysis of Variance, Correlation, regression, Chi-square cross-tab and other tests. While it is true that computer technology can be overwhelming, intimidating, frustrating, time-consuming and annoying, these should not be the reasons for Statistics teachers not to try new teaching methodologies using software and packages. If a teacher has a deep understanding of how young people learn and that his approach is geared towards exploratory and hands-on centered ways of teaching then, an increase in academic performance can happen with learners. If one loves to teach a subject, then, his students may very well love to learn it as well (Bulger and walls, 2002). The researcher believes that teaching with passion and enthusiasm is contagious. Heavy reliance of some Statistics teachers on textbooks might well discourage students from attending their classes. He added that the performance of the students in Statics ranges from 65% to 80% which could be unsatisfactory if something else is not done

to address this problem. For him, the use of the MEGASTAT could increase students' attendance and improve their performance in Statistics. It is on this premise that the researcher intends to conduct this research work. He is interested in enhancing students' performance through the use of MEGASTAT in teaching Statistics hoping to develop and nurture among students a positive and healthy attitude towards statistical work.

Conceptual Framework

In this computer facilitated instruction, learning was active, integrated, cumulative and connected. The teacher's role is supportive, not directive. The researcher acted as facilitator, provided resources, guidance and instruction to learners (King, 2005). The following paradigm illustrates the flow of the study.

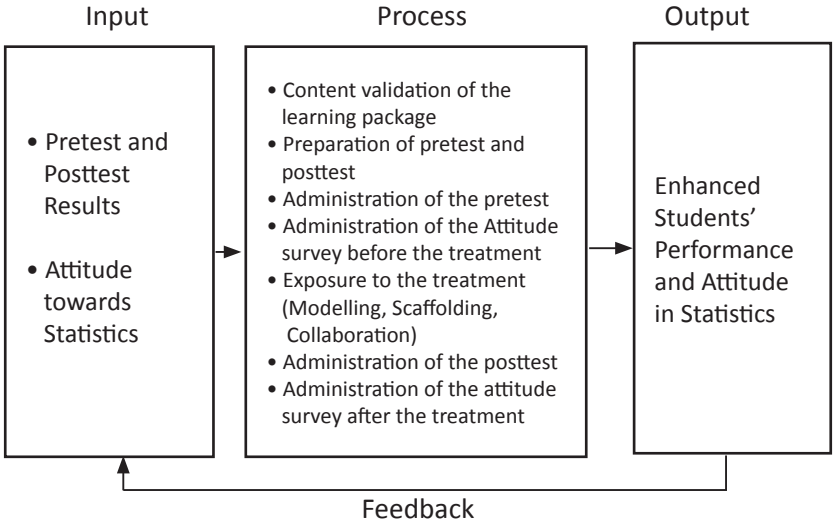

Figure 1. The Conceptual Paradigm of the Study

Figure 1. The Conceptual Paradigm of the Study showed the Input-Output-Process. The inputs are the pretest, posttest results and attitude towards Statistics. Moreover, the process involved are study content validation of the learning package, preparation of pretest and posttest, administration of the pretest, administration of the Attitudinize before the treatment, exposure to the treatment modelling, scaffolding,

collaboration, administration of the posttest and administration of the attitude after the treatment in order to gather the needed data for the fulfillment of this. The output of the study sought to enhance students' performance and attitude in statistics.

Statement of the Problem

This study sought to investigate the effectiveness of using MEGASTAT software package in enhancing the performance and attitude of students in Statistics.

Specifically, the study sought to answer the following questions:

1. What are the pretest scores of the control group and experimental groups?

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

3. What are the posttest scores of the control and experimental groups?

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

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

6. What is the attitude of the control and experimental groups towards Statistics before exposure to MEGASTAT with respect to the affective, cognitive, value and difficulty domains?

7. Is there a significant difference in the attitude of the control and experimental groups towards Statistics before the experimental group's exposure to MEGASTAT?

8. What is the attitude towards Statistics of the control and experimental groups after the experimental group's exposure to MEGASTAT with respect to the affective, cognitive, value and difficulty domains?

9. Is there a significant difference in the attitude of the control and experimental groups towards Statistics after the experimental group's exposure to MEGASTAT?

10. Is there a significant difference in the attitude of the experimental group towards Statistics before and after the experimental group's exposure to MEGASTAT?

METHODOLOGY

Research Design

The quasi-experimental research design was used to find out whether using MEGASTAT in the teaching of Statistics would enhance students' performance and attitude. Further, the pretest and posttest were given to both the control and experimental groups. The research participants in the experimental group were taught using MEGASTAT while the research participants in the control group were taught utilizing the traditional method of teaching.

Table1. illustrates the research design used in this study.

Groups	Pretest	Teaching Method	Posttest
Experimental	O_1	X	O_2
Control	O_3		O_4

Where:
O_1= pretest scores of the experimental group
O_2= posttest scores of the experimental group
O_3= pretest scores of the control group
O_4= posttest scores of the control group
X = MEGASTAT Software Application

Participants of the Study

The research participants consisted of the two classes of the third year Hotel and Restaurant Management students in the University of Cagayan Valley who were enrolled in Basic Statistics for the second semester A.Y 2014-2015. The researcher has considered the subjects as those who had completed their attendance during the preliminary and midterm period to avoid the threat in the validity of results. There were 15 students in the experimental group and so with the control group.

The schedule of the research participants in their statistics classes from the two sections were scheduled on the same time set but different days. The control group is scheduled 11:30 to 1:00 on Mondays and Wednesdays while the experimental group is scheduled at 11:30 to 1:00 pm on Tuesdays and Thursdays. The classes for in the control group were conducted in a regular classroom setting while for the experimental group stayed in the computer laboratory.

Instrumentation

The researcher used posttest to measure the effectiveness of teaching Statistics with the use MEGASTAT software package. The posttest was equivalent in form with the pretest. The pretest was administered to establish similarity in the competencies of the control and experimental group. The content of the test was obtained from the test bank collection of the researcher which were lifted and downloaded from varied sites and electronic sources, thus claiming no authorship of the text and questions. It is a fifty-item multiple-choice test which underwent test validation before its use. There were two sets of similar test questions used intended for the control and experimental groups. The test for the control group adopted the use of tabular value computation while the experimental group adopted the probability value analysis. For every worksheet, a summative test was given in the form of a quiz to ensure that learning has taken place. In validating the content of the test and the learning package, the researcher sought the help of his adviser, colleagues in the Mathematics Department and Statistics expert in the University where he is teaching. These people provided the researcher with constructive criticism and

doable suggestions for the enhancement and improvement of his materials. Samples of the worksheets were pilot-tested with the graduate school students. The researcher sought permission from the chair of the Mathematics Department to involve his class in the pilot testing to ensure the reliability and validity of the tools.

Data Gathering Procedure

After establishing the similarity in the entry competencies of the research participants in the control and experimental groups with the use of the pretest, the research participants in the experimental group were taught using the MEGASTAT software package, while the research participants in the control group were taught using the traditional approach covering the same set of topics for the two groups. At the end of the study, a posttest was administered to both groups, and a comparison of their posttest results was done to determine the effectiveness of the experimental treatment.

Data Analysis

The data gathered were subjected to statistical treatment which the researcher had summarized and interpreted using the following statistical tools.

Mean and Standard Deviation. This was used to describe the pretest and post test scores and attitudes towards Statistics of the research participants.

Independent Samples t-test. This was used to test for significant difference between:

a. Pretest and posttest mean scores of the control and experimental groups
b. Pretest and posttest attitude mean scores of the control and experimental groups about the attitude domain

Paired Sample t-test. This was utilized to test for significant difference between:

a. Pretest and posttest mean scores of the experimental groups
b. Pretest and posttest attitude mean scores of the experimental group about the attitude domain

RESULTS AND DISCUSSION

On Pretest Scores of the Research Participants in the Control and Experimental Groups

Majority or 66.67% of the participants in the control group and 73.33% of the experimental group had scores ranging from 11-20 in the 50-item pretest. The mean score of the participants in the control group is 19.73 while that of the experimental group is 19.87. Both mean scores are qualitatively described as "developing" which implies that both groups are comparable and possess the same entry level competence before their exposure of the participants to the use of the MEGASTAT in the teaching of topics on Inferential Statistics.

Test for Significant Difference in the Pretest Scores of the Research Participants in the Control and Experimental Groups before the use of the MEGASTAT in the Teaching of Topics on Inferential Statistics

T-test revealed no significant difference between the pretest scores of both groups. This implies that the two groups are comparable on their prior knowledge on the topics covered before they were exposed to the treatment.

On Posttest Scores of the Participants in the Control and Experimental Groups

Majority or 53.33% of the control group obtained scores ranging from 21-30. The mean posttest score of the research participants in the control group is 19.87 which is described as "developing." On the other hand, the majority or 80% of the experimental group have scores ranging from 31-40. The mean posttest score of the experimental group is 34.40 which is described as proficient performance. This implies that technology

driven instruction using MEGASTAT had enhanced students' performance in Statistics.

Test for Significant Difference in the Posttest Scores of the Research Participants in the Control and Experimental Groups after the use of the MEGASTAT in the Teaching of Topics on Inferential Statistics

The t-test showed a significant difference in the posttest scores of the two groups. This implies that the students in the experimental group significantly performed better than the control group. Hence, the use of the MEGASTAT had indeed increased learning and had enhanced students' performance.

Test for Significant Difference on the Performance of the Experimental Group before and after the use of the MEGASTAT in the Teaching of Topics on Inferential Statistics

T-test unveiled significant difference between the pretest and posttest scores of the experimental group. The inferential, test done implied that the use of MEGASTAT was effective in developing the students' clearer understanding of the statistical course (Franklin & Garfield 2006).

Attitude towards Statistics of the Two Groups of Research Participants before the use of the MEGASTAT in the Teaching of Topics on Inferential Statistics

With respect to the affective subscale attitude the participants in the experimental group have "favourable attitude" with a category mean of 3.22 while that of the control group has "highly favourable attitude" with a category mean of 3.66. This implies that the control group seemingly has higher positive emotional of feeling towards Statistics compare to the experimental group.

With regard to the cognitive subscale attitude, result showed that both groups have "favorable" to "highly favorable" as reflected in the category mean scores of 3.65 and 3.67. This means that the control group seemingly has a more favorable attitude regarding their statistical ability

and conceptual understanding of Statistics compare to the experimental group.

In terms of the value subscale attitude, result revealed that both groups "have highly favorable" attitude as reflected in the category means 3.65 and 3.67. This implies that the experimental and control groups have the same degree of favorable attitude.

With respect to the difficulty subscale attitude, result unveils that both groups have "favorable" attitude with a mean category score of 2.99 and 3.24. This implies that the two groups have the same degree of attitudinal feeling towards Statistics regarding the difficulty attitude subscale.

Test Significant Difference in the Attitude toward Statistics of the Control and experimental groups before the experimental group's exposure to MEGASTAT

T-test revealed that all four attitude subscale domains had stated remarks of "not significant." This implies that significant difference does not exist between the attitude towards Statistics of the research participants in the experimental and control groups before exposure of the experimental group to the use of MEGASTAT.

Attitude towards Statistics of the Two Groups of Research Participants after the use of the MEGASTAT in the Teaching of Topics on Inferential Statistics

Regarding the affective subscale attitude of the participants, result showed that both groups have "highly favorable" with a category mean of 3.53 and 3.64. This implies that the level of the attitude of the both groups is relatively the same as the values suggest.

In terms of the cognitive attitude subscale of the participants, result unveiled that both groups have "favorable" to "highly favorable" with a category mean of 3.30 and 3.42. This implies that experimental group had a more favorable attitude regarding their statistical ability and conceptual

understanding of Statistics over the control group after their exposure to MEGASTAT.

Result showed that both groups have "highly favorable" attitude regarding value attitude subscale with a category mean of 3.93 and 3.66. This implies that the experimental and control groups have the same level of attitude on the belief on the usefulness, relevance and worth of Statistics in their present life and the future after the experimental group's exposure to the MEGASTAT software.

Result revealed that both groups have "favorable" attitude regarding the value attitude subscale with a category mean of 3.15 and 3.21. This implies that even after the exposure to MEGASTAT software, both groups have the same favorable attitude towards quantifying their self-confidence and self-concept in Statistics.

Test Significant Difference in the Attitude toward Statistics of the Control and Experimental Groups after the Experimental Group's Exposure to MEGASTAT

T-test revealed no significant difference exist in the four attitude domains. This implies that there is no significant difference in the attitude of both groups towards Statistics. Further, the data mean that MEGASTAT did not have a significant effect on the attitude of the experimental groups towards Statistics.

Test Significant Difference in the Attitude Towards Statistics of the Experimental Group Before and After the Experimental Group's Exposure to MEGASTAT

T-test unveiled a significant difference in the attitude of the experimental group on affective attitude before and after the use of the MEGASTAT software. This implies that MEGASTAT developed in the students a more favorable attitude towards the emotional expression of feeling towards Statistics. On the other hand, there was no significant difference between the cognitive, value, and difficulty attitude of the experimental group before and after their exposure to MEGASTAT. This

implies that while MEGASTAT develops the affective attitude, in any way, it did not significantly have an effect on the students' cognitive, value, and difficulty attitude towards Statistics.

CONCLUSION

The use of the MEGASTAT has greatly improved the academic performance of students. By using the software, students exhibited significant improvement in their achievement by working on interesting problem situations which facilitated their achievement in a variety of higher-order learning outcomes, such as problem-posing, problem-solving, reasoning, decision-making and reflection.

Utilizing the MEGASTAT increased the affective aspects of the students' attitude towards learning Statistics. Statistics in Higher Education Institution is better taught as a laboratory science. Teaching through learning packages and letting students perform relevant laboratory exercises helps the students learn all the aspects and extensions of the Statistics concepts in the context of the current real world situations.

RECOMMENDATIONS

Based on the findings and conclusion of the study, the following recommendations are derived:

Teachers of Statistics are encouraged to use the MEGASTAT learning package to facilitate the teaching-learning process.

A proposed MEGASTAT seminar-workshop may be conducted for all teachers teaching Statistics to equip them with the technological skills needed to meet the demands of the 21st-century learners.

A proposed laboratory session may be included in the syllabus for all Statistics classes.

Other researches may be conducted in the same area with the inclusion of descriptive Statistics and non-parametric inferential Statistics.

The results of this study may be disseminated in a mathematics research conference to encourage Statistics teachers to use MEGASTAT and other software to facilitate their teaching and to enhance their students' performance.

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