Recommendations and suggestions for future research education essay

5. 1 Introduction

The data collected and findings from the analyses discussed in the previous chapter will be used to serve the purpose of providing answers to the research questions for this study. There should be a stress on the emphasis that the findings from this particular study to be viewed as tentative and suggestive rather than conclusive. The conclusions drawn from this study are restricted to the methodology used and appropriate recommendations are made to improve this study with suggestions for future research purposes.

5. 2 Findings and Answers to Research Questions

In this section, answers to all the research questions will be provided based on the findings in the previous chapter.

Research Question 1

“ To what extent does learning Trigonometry with ICT-enhanced activities improve students’ achievements in Trigonometry?”

Summary for Research Question 1

Initial analysis of comparing the means of the test scores achieved by both the experimental and control groups in the pre-test scores showed that although the mean scores obtained were almost at par but it was the control group that performed slightly better. However, the post test scores revealed that the experimental group had achieved better scores compared to the control group which led to the belief that ICT enhanced activities did improve the students’ achievements in the learning of Trigonometry.

After carrying out the analysis of the post-test scores using ANCOVA and having the pre-test scores used as covariates, it was found that the experimental group performed better compared to the control group but the result obtained was not significantly different. This indicated that using ICT enhanced activities in Trigonometry might not improve students' achievements significantly in the experimental group. A possible explanation could be that time factor definitely had an impact in order for ICT enhanced activities to be effective in improving students' achievements in Trigonometry.

In addition to the time factor, teachers' and students' lack of experience in using the software may affect the significance of the results obtained.

Using the results obtained by comparing the mean scores out of 100% in the experimental group, it can be concluded that majority of the students had understood the lessons covered during the intervention which was the part of main objective. It could not be concluded if the improvements from the mean scores were affected by the ICT based activities or from the effort produced by the students in revising the topic covered.

The National Mathematics Advisory Panel (2008) reported that " the use of technology-based drill and practice has shown some promising results in the teaching and learning of Mathematics as compared to instructions without the incorporation of technologies."

From the video analysis of the classroom teachings, it was found that using ICT based activities did allow students to engage themselves in a new

learning environment and learning was seen to take place. Students were also seen to have fun working on the activities prepared.

Research Question 2

“ Is there a correlation between having done Additional Mathematics at O-Levels and students’ achievements in the learning of Trigonometry?”

Summary for Research Question 2

Initial comparison of the mean and standard deviation of the scores achieved from both the pre-test and post-test between students with and without any Additional Mathematics knowledge in each sample group showed improvements in the mean score percentages. It was even more astonishing that the most improved percentage in the mean scores came from students who had not done Additional Mathematics in their O-Levels.

After analyzing the correlation coefficients both Pearson’s and Spearman’s rho, it proved that students with Additional Mathematics background knowledge do not necessarily score higher than those without. This meant that it was possible that students who did not have the required pre-requisite knowledge did put in more effort in trying to understand the topic taught.

However, the reason was suggested and made based on the sample of the study and the results of the findings from this research and should only be used as a guideline for future research.

Research Question 3

“ Is there a correlation between gender and students’ achievement in the learning of Trigonometry?”

Summary for Research Question 3

Initial comparison of the mean and standard deviation of the scores achieved from both the pre-test between male and female students overall showed that the male students performed slightly better. However when the post-test scores were compared, it was found that the female students scored higher compared to the male students.

After analyzing the data using independent sample t-test, results showed that there was no significant difference between male and female students on the test scores in both pre-test and post-test.

Results from the analysis of correlation between gender and the test scores were used as additional support to the results obtained from the independent sample t-test which concluded that gender did not affect the test scores achieved in both the pre-test and post-test in this particular study.

Research Question 4

“ What are the problems / difficulties encountered by students in the learning and understanding of Trigonometry?”

Summary for Research Question 4

From the analysis of the test items, results showed that students did find solving trigonometric equations and proving trigonometric identities very difficult. In addition to that, it was even more surprising that almost all the students in the sample group had difficulties in relating angles in degrees to

angles in radians hence making an impact on their ability to evaluate trigonometric ratios in the 4 quadrants.

Evidence from the interviews showed that using ICT to teach Trigonometry did yield mixed feelings from one of the students who commented that although the ICT activities were a new experience, but unsure if the ICT activities did enhance his understanding of the topic. Majority of the students interviewed did agree that the activities did enhance their understanding of Trigonometry and made the learning environment fun and engaging especially for students who have been accustomed to rote learning.

From the research findings, the researcher believed that the best approach in enhancing students' understanding of Trigonometry would come from a combination of both teaching methods namely the traditional " chalk-and-talk" with that of implementing ICT based activities.

This could be further supported with the evidential extract from an interview session with a student in the sample that the use of ICT related activities would be most helpful in the students' learning of Trigonometric Graphs whereas the use of the step-by-step explanation method would help in the teaching of solving Trigonometric Equations.

The National Mathematics Advisory Panel (2008) reported that instruction that is entirely " student centered" or " teacher directed" should be avoided in any research.

5. 3 Researcher's Reflection of the Research

This section will present the researcher's reflection from the study. The implementation of ICT into the teaching has definitely brought a new teaching experience not only to the students but also to the researcher. Switching from the traditional teaching to implementing ICT into the teaching definitely took some time getting used to.

The researcher felt anxious and lack of confidence in implementing ICT into the lessons in the initial process of the study, but after getting used to the software application, the researcher has gained the confidence to be able to conduct the lessons with minimal problems. During the course of the intervention process, the researcher felt that the students did enjoy the new learning experience using the software despite some technical problems that were unavoidable.

The researcher observed that the students were enthusiastic when working on the worksheets using Autograph. The researcher felt that implementing ICT into the teaching would bring benefits not only to the students but also the teacher. This would allow the teacher to give freedom to the students to explore and discover the concepts on their own, and hence allow the teacher to have more time to provide assistance to students who needed it.

The researcher would definitely try to incorporate ICT into his teaching wherever appropriate in the future, and hopefully with careful planning of the lessons, the students will gain the necessary knowledge to help them progress in their future undertakings.

5. 4 Recommendations and Suggestions for Future Research

The main objective of this research was to implement ICT into the teaching of Trigonometry in the Advanced Level and use the results to investigate the effectiveness of such activities in enhancing students' learning and understanding. One of the major limitations faced during the research was the time factor. Students being unfamiliar with the software used did take up some of the time that was allocated for the activities. It would be recommended that more time should be spent on introducing the software to the students and hopefully the research in the future would yield a more significant result.

A highly recommended study that could be looked at in the future would be the extent of the use of ICT in the teaching at Advanced Level Mathematics amongst the teachers in Brunei. Gathering information regarding the ICT-based lessons incorporated by teachers in their teachings, how the resources were obtained, software used and frequency of using ICT in their lessons would be helpful to the Mathematics educators and officers from the Ministry of Education.

A future study on the gender issue would be highly recommended with a bigger sample size. Having a smaller sample size in this study did not provide much information if gender issue did pose a significant impact on the students' performance. It would also be recommended that the sample size should have equal numbers of male and female students.

A deeper research into the correlation between students with and without Additional Mathematics and their achievements in the Advanced Level

Examinations would be an issue of interest. Future research on this issue could be done by looking into past examination results and analyze the data collected for correlation. Results may be used to provide information to the Ministry of Education on the requirements for Advanced Level Mathematics.

Findings from this particular study have shown promising evidence that using technology-based instructions and activities do offer a worthwhile alternative teaching approach in the students' learning of Trigonometry. More time and efforts in planning and designing the lesson activities with the implementation of ICT hopefully will ensure better students' learning in the future.

5. 5 Conclusion

From the findings, it could be seen that there were improvements in the students' achievements between the pre-tests and post-tests scores however it could not be concluded if the improvements were enhanced by the ICT-based activities or the students putting in more effort in the learning of Trigonometry. It was concluded that time possibly had an effect on the outcomes of the achievements.

It could also be concluded that students who have not done Additional Mathematics at O-Levels seemed to gain more from the lessons compared to those who did do Additional Mathematics. From the findings, it was found that there was no significant relationship between the students' gender and the achievement scores. However, more research could be done to further support the findings.

Interview sessions with the randomly selected students have provided evidence that learning Trigonometry using ICT was fun and engaging but only applicable to certain areas in the topic. It was suggested that the teacher should apply a mixed method of teaching as it would help in strengthening the students' understanding of the topic.

The researcher hopes that this research study may reveal information that could be useful to the Mathematics educators in Brunei Darussalam regardless if they are from the Curriculum Department of the Ministry of Education or teachers in schools in implementing ICT into the teaching and learning of not only Trigonometry but any topics in the Mathematics syllabus in the Advanced Level.