Upgrading Mathematics Learning: Investigating the Result of Localized Worktext on Student Achievement

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ABSTRACT

This study investigated the upshots of a localized worktext to the academic achievement of students in applied statistics. This was conducted at Saint Theresa College school during the academic year 2023-2024. The researcher used the quasi-experimental pre-test-post-test control group design method to determine the effectiveness of localized worktext strategy in teaching applied statistics on the academic achievement of students. In this design, two groups of students were involved: the experimental group and the control group. Two intact classes were utilized in the study. Thirty students were taught lessons in applied statistics using a Localized Worktext for the experimental group and another thirty students were taught using a traditional method for the controlled group. Pre-test and post-test were given to both groups, but the treatment (x) was only introduced to the experimental group which was the integration of localize worktext context. The study further examined how students who received instruction via a lecture approach and those who received instruction via a localized worktext fared in applied statistics. Students' performance in applied statistics was also compared when they were divided into groups based on their mathematical proficiency levels and taught utilizing the two different teaching philosophies. It also looks at how the two methods interact to affect students' performance when they are exposed to them and when they are categorized based on their mathematical proficiency. The posttest results analyzed the students' achievement in select topic in applied statistics. The conduct of the study started by having the experimental and control group took the pre-test to find out the skills and concepts that they had learned as well as to establish the similarity of the groups in terms of Mathematics grades. The answers of the students were checked and recorded for a comparison of their scores in the post-test by the researcher the two- and One-Way analysis of Covariance (ANCOVA), means and standard deviation were the statistical tools used to analyze the data. Lecture method can be an effective teaching approach and enhances students' capabilities in understanding lesson in applied statistics. Lecture method and the use of localized worktext as a teaching approach are effective for the different mathematical level of ability. The above and average students of both experimental and control groups perform better in applied statistics than those low achieving students in both experimental and control group. The p-value for the pre-test and post-test mean acquired scores in both processes was 0.000, which is less than the 0.05 level of significance. As a result, the null hypothesis was disproved by both methods. Results from the pre-test did not differ significantly between the two groups, but the results from the post-test did.

Keywords: Advancing Mathematics Learning, Localized Worktext, Students Achievement

INTRODUCTION

Second language instruction is not that simple. It continues to be one of the most difficult responsibilities for math teachers in spite of the numerous approaches, methods, tactics, and strategies that have been proposed. This situation has also necessitated the design and use of practical workbooks that might reinforce the mathematical knowledge that students have acquired from the textbooks. Since instructional localized worktexts improve students' knowledge, critical thinking, and problem-solving skills while also incorporating new advancements in disciplinary content, teachers believe that it could be one effective way to handle the challenge (Nicoll, 2018). Worktext approach plays a crucial rule in the learning of mathematics in general. Localized worktext according to Kilpatrick (2017) as cited in the study of Madzorera (2020) is one of the most central aspects of Mathematics. These researchers argued that localized worktext helps learners to make sense

of how Statistics can be of use in daily situations. Boutlet (2017) asserted that the ability of a mathematical message is often embedded in the context of a three-way relationship involving statistical words, symbols and numerals. Part and parcel of problem solving is to translate word problems into a certain mathematical equation. However, students have difficulties in analyzing and interpreting statistical problems. This study was designed in order to find out whether students are able decode statistical problems especially on Applied Statistics.

The International Commission on Mathematical Instruction (ICMI,2004) emphasized the use of the investigations to develop students' mathematical creativity. Localized worktext can serve to attract students who come to school with less motivation, and such students learn from challenging instructional materials more than they can learn from the mastery of routine methods. The issue of lower than expected mathematics achievement is a persistent worry to education leaders and policy makers at all levels in Philippine Education System. In Saint Theresa College of Tandag, the researcher found out that the students are experiencing difficulty in statistics subject, particularly in applied statistics, as usually reflected in their scores obtained in their major examinations. Hence, in their first semester, the mean percentage score of students are less than 75 percent.The results of this study were cascaded to the school administrators and curriculum developers as well as math teachers evidences which they can make use of in planning appropriate actions in order to help the students increase their abilities to solve statistical problems. Thus, this study became an avenue to better improve both the curriculum and the classroom experience of the students given the various strategies such as integrating localized Worktext that was offered by the teachers to improve their problem-solving skill. For analysis of the data, the mean standard deviation and one-way and two-way analysis of covariance (ANCOVA) were used.

THEORETICAL/CONCEPTUAL FRAMEWORK

Phyllis (2018) asserts that instructional materials have certain intrinsic benefits that set them apart from other teaching resources. For starters, because they inspire students to want to study more and more, they give teachers engaging and captivating platforms to communicate knowledge. The best possible development of the person is the aim of democratic education. The requirement for individual instruction stems from the necessity of paying more attention to each learner's needs in order to achieve this goal. The idea that each child is unique supports individualized training. Individuals develop at varying rates. Development occurs gradually and is comparatively orderly (Woolfolk,2018). Using modularized training, which takes into consideration each student's unique learning capacities, is one way to personalize instruction. Critical thinking is developed through individualized training. Pupils are encouraged to challenge, critique, and defend their opinions. Additionally, it helps one develop their self-concept by acknowledging the value of individual variations. This method is predicated on the idea that each student is an individual with distinct needs, interests, potentials, and abilities. As a result, no two pupils can acquire the same ideas in the same way or at the same pace.

Knowing that students have difficulties with problem solving due to learning barriers, educators will need to take several steps to address their needs. One of those steps could be helping students use reading strategies in a mathematical classroom using worktext or workbook. Educators cannot help students to transfer knowledge just lecturing alone. At risk students must take an active role in their own learning. To accomplish this, educators in the field of mathematics need to use lessons that incorporate word problems, in which students would have the opportunity to explore, question, discuss and discover (Chamot&O"Malley, 2015). Mathematics and reading teachers will need to look at teaching strategies that mat assist at-risk students in their learning process.

This study was based on Ausubel's theory wherein the activities which are incorporated in the localized worktext are in the form of graphic organizers at every end of each lesson to develop the higher order thinking skills of the students. Scaffold Learning Theory of Lev Vygotsky. He postulates that one's acquiring of knowledge may be more successful when a scaffold assists it (Hang, et.al.,2018). He says that once a student masters a given task with the help of a scaffolding, he will then be able to complete the task again once the scaffolding has been removed. Based on this underlying theory, it is believed that the instructional material will provide as scaffold to support for the teaching and learning process (Berk & Winsler, 2013). Constructivist approach by John Dewey encompasses the theories mentioned as a guide in this study because

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according to Gupta (2017), this approach implies direct experience with mathematics as a process of acquiring knowledge in which prior concepts are explained and changed on the basis of fresh meaning from peers and teachers. They say that constructivist approach is based on the idea that the learner forms his or her own knowledge through experiences. From a constructivist's perspective, knowledge cannot be transferred, being intact, from one individual to the other in ready-made fashion, but instead, the child is seen as an active participant in the acquisition of new knowledge. The child is responsible for the construction of his knowledge through the interaction of new ideas with his prior knowledge. A cognitive schema therefore functions as an intellectual tool during the process of learning where a child can retrieve and apply it at appropriate times during the learning process.

RESEARCH METHODOLOGY

This study used the pretest – posttest non comparable quasi experimental design to determine the effectiveness of the two methods of teaching applied statistics in Saint Theresa College. This design is the same as the classic controlled experimental design except that the subject cannot be randomly assigned to either experimental or control group, or the researcher cannot control which group will get the treatment. In other words, participants do not have the same chance of being in the controlled or experimental group, or of receiving or not receiving the treatment. Since the research questionnaire was made by the researcher, validation was deemed necessary. To forego with the validation process, the researcher requested a panel of validators who were experts in the field of Mathematics/Statistics to validate and look into the said instruments as to their content and face validity. Five content validators and five face validators joined the panel. Respondents to conventional method of teaching were the control group while the experimental group underwent the localized worktext of applied statistics. Before the treatment, the two groups were given pre-test and the same test was administered after the treatment as post-test.

The researcher's applied statistics achievement test was employed in the study. In the pre-final to final grading period, it consists of fifty items that cover themes to applied statistics in BSED Mathematics Majors. The Teacher-Made Test was used to determine the respondents' achievement scores. To make sure that the quantity of things was spread evenly, a table of specifications was also employed. A weight of one (1) point was assigned to each item. This test was created by the researcher to gauge how well students performed when using a localized worktext to solve statistical problems. Students had to use the teaching materials to solve the various issues. Professors of Applied Statistics verified the evaluation's face and content.

After the Midterm period, the researcher was administering to both experimental and controlled groups the Applied Statistics Achievement Test as pre-test. The students were oriented on how the class is to be conducted so that they can be responsive on whatever activities that may transpire inside the classroom. In the Localized Worktext method, the students will be given a worktext. Each student will be provided with instructional worktext that direct them on how to do the given activities to be able to learn. The instructional worksheets contain detail explanation on how to undergo the given task. They will be also given problem exercises included in the instructional worktext to measure how far they have learned out from the activity they performed. They are allowed to ask questions to the researcher if ever they wanted to be clarified on something. In the Conventional Method, the researcher will be employed lecture method or simply "chalk-talk" instruction. Every meeting, the lessons will be started with terminologies, concepts; formula will be given to them followed by an example. Quizzes are given to both experimental and control groups as formative test but this will not be included in the analysis. After the post-test was conducted, data was tallied and was subjected to statistical analysis. After which, inferences will be made, it was followed by the recommendations of the researcher to better improve the performance of the students in solving measures of central location, variances and standard deviation in applied statistics.

RESULTS AND DISCUSSIONS

Achievement of students in the pretest and posttest are presented in table 1. Table shows that the experimental group obtained slightly higher mean than that of the control group in the pretest. This result indicates that both groups have acquired the pre-requisite skills of the lesson before the conduct of the study. Furthermore, show

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that the experimental group gained high scores in the posttest with a mean value of 16.89 compared to the experimental group having a mean value of only 14.48

Table 1. Mean scores and standard deviation values of the pretest and posttest

Type of Group	Pretest			Posttest		
	N	Mean	s.d.	N	Mean	s.d
Experimental Group	30	8.84	3.12	30	16.89	3.16
Control Group	30	8.63	3.52	30	14.48	2.39

Students that were taught using the localized worktext demonstrated a favorable attitude after receiving it, as they were thrilled to be taught using a worktext, according to the study's findings. Additionally, the experimental group's pupils were able to significantly raise their mean score by frequently studying the lessons in the worktext. In contrast, the teacher directly contributes to the discussion of the applied statistics lecture with the students in the control group. Because of the teacher-researcher's in-depth discussion, the group's mean score significantly increased, indicating that the pupils understood the concepts she had taught them.

The experimental group's larger standard deviation indicates that, in comparison to the control group's scores, the experimental group's scores were dispersed and near the mean. This suggests that some students who received instruction utilizing a modular worktext had a solid understanding of the material. Their high posttest results were the consequence of this. The standard deviation of the control group is modest. It clarifies why, in contrast to the experimental group, the test results of the pupils in this group are not closed. It also concluded that the majority of pupils did not comprehend the chosen lesson in mathematics 8, which was thoroughly discussed by the teacher-researcher. .

Table 2. Summary of One –Way ANCOVA on the Achievement of Students in applied statistics when taught using localized worktext and taught using without localized worktext.

Source of Variances	p-value	Conclusion	Decision
Achievement of Students in mathematics 8 when taught using work text and taught using without work text	0.000	Sig.	Reject H_0

It can be shown on the table 2 that the p- value is 0.000, which is less than the set level of significance at $\alpha = 0.05$. Thus, the null hypothesis is rejected. This implies that there is a significant difference on the achievement of students in applied statistics when taught using the two strategies. The finding of this study is parallel to the study of Espinar & Ballado (2017) entitled Content Validity and Acceptability of a Developed Worktext in Basic Mathematics 2. The difference in the post-test between the experimental and the control groups was significant. The said study concluded that the localized worktext is effective to be used in teaching Mathematics 2.

Aureada, J 2017., supported this finding that integrating worktext was a legitimate teaching tool that improves students' Logic performance. Additionally, students taught with the work text outperform those taught using the traditional technique. Additionally, in the Salavaria research, F. (2014) found the Statistics modular

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Worktext to be highly satisfactory to the respondents. Students are happier with the statistics work text than teachers are, and teachers were most pleased with the work text's usefulness.

Table 3. Summary Table of Two-Way ANCOVA on the Achievement of Students in Mathematics 8when Taught Using Modular Worktext and Taught Without modular Worktext

Source of Variances	p-value	Conclusion	Decision
Covariate	0.000	Sig.	Reject H_0
Factor A (Mathematical Ability)	0.002	Sig	Reject H_0
Factor B (Teaching Strategy)	0.000	Sig.	Reject H_0
AxB	0.041	Sig	Reject H_0

As shown in Table 3, the *p-value* = 0.000 is lesser than the significant level at 0.05. Thus, the null hypothesis is rejected, which states that, there is a significant interaction effect in the achievement of the students when they are exposed using two teaching approaches and when grouped according to their mathematical level. This implies that Mathematical Ability and the teaching approaches interact if taken at the same time. This finding further implies that the teaching approaches and mathematical ability has a significant interaction effect on the achievement test scores of the students. The result further implies that the teaching approaches have interaction on the ability level of the result. Hence, whatever teaching approach is applied by the subject teacher the average students could still get a better result on the achievement test than the low average student. Parallel result in the control group shows that average students performed better than the low average student. This result is not related with the findings of Lumaya (2015) which indicated no significant exist interaction in the students' achievement when they are grouped according to their mathematical ability and the teaching strategies used.

CONCLUSION

Based on the following findings it can be asserted that: Lecture method can be an effective teaching approach and enhances students' capabilities in understanding lesson in applied statistics. Lecture method and the use of work text as a teaching approach are effective for the different mathematical level of ability. The above and average students of both experimental and control groups perform better in applied statistics than those low achieving students in both experimental and control group. Based on their mathematical prowess, students are classified into groups; as a result, academic achievement significantly influences one another. The two teaching methods had no discernible interaction effect on the students' academic performance. When the two instructional strategies are combined, there is no discernible interaction effect on students' academic achievement when groups of students were created based on their mathematical prowess.

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