ASSESSMENT IN BASIC STATISTICS USING TECHNOLOGY INTEGRATION IN SENIOR HIGH SCHOOL

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ABSTRACT

The efficacy of an intervention program designed to enhance the fundamental statistics skills of Grade 11 Senior High School students was examined in this research study. The primary goals were to improve students' comprehension of basic statistical concepts and to enhance their ability to employ statistical methods in real-world scenarios. Data was collected to assess the program's influence on the intended pupil demographic through the implementation of a quasi-experimental research design. The intervention was found to be an effective instrument for enhancing the statistical skills of Grade 11 students, as evidenced by the findings of this study. The program's ability to cultivate a more profound comprehension of fundamental statistics was evidenced by the observed improvement in performance between pre-test and post-test assessments. The implementation of innovative teaching strategies, which involved the adaptation of a diverse range of learning materials and activities to the students' requirements, may have contributed to this positive outcome. The study emphasizes the progressive enhancement of statistical competencies among Grade 11 students as a consequence of these encouraging findings. It is firmly advised that the intervention program be maintained and further developed, as it has the potential to make a substantial contribution to the ongoing development of students' statistics abilities. This research provides valuable insights into the optimization and advancement of instructional strategies for teaching fundamental statistics, thereby facilitating students' academic success.

Keywords: *basic statistics, statistical skills, data interpretation, probability, descriptive statistics, quasi-experimental research design, Senior High School, academic performance, and mathematics education.*

1. INTRODUCTION

Statistics plays an important role in many disciplines the world's modern life is fueled by information and technology, and a large portion of this knowledge is derived mathematically by Statistics. Statistics is a branch of science that deals with collection, organization and analysis of data from the sample to the whole population (Sirsisilla, 2023) [1]. Statistics plays an important role in many disciplines including mathematics, economics, social sciences, natural sciences, business, medicine, and engineering. Understanding statistics is helpful for gathering data in the right ways, doing accurate analysis, and effectively communicating the findings. The practice of using statistics is essential to scientific discovery, data-driven decision-making, and prediction (Frost, 2024) [2].

The University of Wollongong in Dubai, Difficulty in understanding Statistic became a major concern to all educators. This has driven them to a question on how to improve the academic performance of the students and motivate them in understanding the concepts with the use of a new method to simplifying the operations of statistics. To address these issues, we attempted to integrate the new technology as a new tool in teaching statistics that will not only remain but will improve the curriculum and without sacrificing the content of the subject. Though we expect challenges ahead with this innovation and perceive that through the use of this new technology it will further facilitate students to learn statistical concepts with greater understanding and ease Fortes (2011) [3].

In the Philippines University of the Philippines Los Baños (UPLB). Institute of Statistics, College of Arts and Science, UPLB offers Elementary Statistics (STAT 1) In asserted that a substantial number of students entering college have a

knowledge base that covers only fundamental concepts or the basic concept of statistics which in turn makes them under-prepared. Meanwhile, Rocky Marcelino (2018) emphasized that most students who fail in class have experienced difficulties early on during the senior high School [4]. Deals with basic concepts in statistics, including methods of data collection and presentation, numerical descriptive measures, general probability, probability distributions, sampling, estimation, and tests of hypothesis technology as a modernize tool in teaching Statistics. Technology has been an important instrument for learning statistics; hence teachers must also develop an overarching conception of their subject matter in teaching with technology Samar (2015) [5].

The success of this study is rooted in the importance of the student's performance in improving basic mathematics a fundamental statistics opportunity in various fields. By assessing true assessment basic concept of statistics and technology integration how these elements contribute to the student's confidence and success in mathematics. This study provides evidence that positive toward performance and the effective use of technology integration can boost confidence and math proficiency. In return, the parents will be more aware of the level of their involvement in the learning of their students and will be challenged to exert more effort when needed. Ultimately this research informs educational practices by identifying actionable predictors to improve basic math in statistics.

2. Methodology

This chapter deals with the discussion of the methods procedures used in the study. It includes research design, research locale, and subjects of the research, research instruments, and validation of instruments, research procedures, and statistical treatment of data.

2.1. Research Design.

The design used in this study was quasi experimental design by using pre-test and post-test nonequivalent group design where two or more groups are compared typically one receiving the intervention experimental group and the other not control group with measurements taken before pretest and posttest the treatment. Experimental research is one of the most powerful research methodologies that can be used by the researcher. It is the only type of research that directly attempts to influence a particular variable, and it is the only type that can really test hypothesis about cause-and-effect relationship (Fraenkel 2012).

2.2. Research Locale

This study was conducted at Atty. Orlando S. Rimando National High School, situated in Maco, Davao de Oro, as the site of the investigation. The investigation concentrated on students in the eleventh grade of the Senior High School during the academic year 2023-2024. Serves as one of my respondents, the large school in the Municipality of Maco.

Maco is a municipality in Davao de Oro that is renowned for its natural beauty and tourism attractions, making it a popular destination for both residents and visitors. In the north, it is bordered by the municipality of Mabini, in the west by Pantukan, and in the east by the boundaries of Tagum City. Atty. Orlando S. Rimando National High School is one of the principal populations of learners in Maco, which is home to several public and private institutions.

Atty. Orlando S. Rimando National High School caters to a diverse population of students from the surrounding barangays, including Lumatab, Dumlan, Anislagan, Hijo, and Binuangan. Steadily increased its enrollment over the years and has established itself as a public school committed to providing quality education in any aspects.

2.3. Research Subject

The subjects of the study were the 40 Grade 11 students as the experimental group identified under frustration level in the subjects of Statistics and Probability with the integration of technology conducted at the beginning of second semester with the strand of General Academic Strand at Atty. Orlando National High School Year 2024- 2025.There was only 1 section of the above mentioned year level, and it was grade 11 Dove. The participant selected thru cluster sampling randomly in statistical population. The participants is voluntary, and participants will be informed that they can withdraw at any time without any consequences, should they feel uncomfortable or wish to discontinue their involvement.

For the purpose of this study, the respondents were grade 11 students enrolled in school year 2024-2025 a particular subject is Statistics. The study seeks to understand the performance of the basic statistics with technology integration.

2.4. Research Instrument

The instrument used in gathering the data is the 40-item statistical question for the pre-test and post-test. The questions were formulated to assess students' understanding of fundamental statistics, with a focus on technology-enhanced learning methods. The pre-test and posttest instruments were validated by experts, tried out through a pilot testing before using it in the study. The instructional process aimed to engage students in meaningful learning experiences through technology-assisted methods to help them better understand, analyze, and apply statistical concepts, thereby improving their ability to answer the comprehension questions correctly.

A Table of Specifications (TOS) was also prepared so that the items of the test can be distributed to the grade 11 students. The questionnaire was a multiple-choice type of test with four choices for each item and consisting of 40 items with 35% literal questions, 30% inferential questions, and 35% critical questions. This test served as the pretests and posttests of the research study.

2.5. Validation of Instrument

Panels of external and internal validators were assigned to check the instrument before it was administered to the respondents. To test the validity of the instrument, 20 students pilot testing who were not involved in the study were asked to answer the instrument to determine if the questions would really ask what was intended to measure. Should any problems arise, the researcher would look into it and made some revisions on the instrument.

The pretest-posttest was presented with Table of Specification (TOS) to ensure proper distribution of the test items. The item analysis, reliability test and validity test were also checked using the appropriate statistical formula. The 20 students in the pilot testing were selected and divided into upper and lower groups of score that were analyzed for the indices of difficulty, discrimination, and options. The results of the analysis were then submitted for revision and finalization to her peers, advisers and other authorities for refinement

2.6. Research Procedure

The following were the data procedures that were employed in this study.

Ethics Review Committee. The researcher before the conduct of the study, sought the approval to ensure that all ethical standards in research were strictly observed. The research procedures, which encompassed the treatment of participants, the use of informed consent, and the measures for maintaining confidentiality and data security, were reviewed by the committee. The study's compliance with ethical principles, which ensured the rights and welfare of all participants involved in the research process, was confirmed by the committee's approval.

Test Material. The researcher taught basic statistics concepts using a technology-supported instructional approach. Anchored in this approach were the teacher's lesson plans, which served as a guide for delivering structured lessons in each session. The pre-test and post-test instruments used were adapted from standard materials on statistical fundamentals, tailored to assess students' interpretation and application of basic statistical concepts with the integration of technology.

Seeking Permission to Conduct the Study. The researcher wrote a letter of request and permission to the Office of the Schools Division Superintendent of Davao de Oro to allow her to conduct the study. After the approval, the researcher submitted the approved letter as well as the permission letter to the school principal. In a manner, the researcher informed the research subjects who were chosen for the quasi-experimental study. Furthermore, the researcher observed proper ethical standards on the conduct of the study and the names of the subjects were not indicated and any important matters were kept with utmost confidentiality. Then, I proceeded to conduct the study

Administration of the Instrument. Since the pre-test, the researcher gathered the students' performance in basic statistics in terms of their integrating technology, instructional and independent level. Then, the researcher made

statistical lesson plans were employed during the conduct of intervention phase of the experimental group. After the administration of lesson to 10 sessions, post-test was conducted with the same instrument used in the pre-test.

2.7. Statistical Treatment of Data

To provide readable conclusions, the data were organized and collated. The following statistical tests were employed to make an accurate analysis and interpretation of the different data gathered in this research. The researcher uses SPSS Other than that, to have the results easily, the researcher will use SPSS software to determine and compare the T- test results between pre-test and post-test of experimental and control group the study.

T-test-is a statistical test that is used to compare the means of two groups. It is often used in hypothesis testing to determine whether a process or treatment actually has an effect on the population of interest, or whether two groups are different from one another.

Mean. This was used to determine the competency level of the two groups according to their pretest and posttest result and sought to answer problems 1 and 2.

2.8. Ethical Considerations

As part of the technicalities of the research, all participants were asked to consent and informed of the aims of this study and that no participant shall be harmed in the study. All data gathered were utilized only for the study.

Social Value. This research will be conducted to address the existing challenges in understanding and applying basic statistics among senior high school students in Barangay Binuangan. The study aims to enhance statistical literacy, which can contribute to better academic performance and informed decision-making. The results will be shared with the community through the Local Government Unit (LGU) and published in an online journal, providing a valuable reference for future research and initiatives in improving statistical education.

Informed Consent. The researcher will distribute Informed Consent Forms (ICF) to the Senior High School identified participants. The forms will explain the purpose of the study, which is to assess senior high school students' understanding of basic statistics, and outline the procedures that will be followed during the research. Participation is voluntary, and participants will be informed that they can withdraw at any time without any consequences, should they feel uncomfortable or wish to discontinue their involvement.

Vulnerability of the Research Participants. The researcher will explain the entire process of the pretest and posttest that will be conducted, ensuring participants fully understand the procedures. It will also be emphasized that participants have the freedom to withdraw from the test at any point if they experience any discomfort, and their decision to do so will not negatively impact them in any way.

Risks, Benefits, and Safety. The researcher will explain the benefits of the participants' involvement in the study, particularly in enhancing their understanding of basic statistics. The pretest and posttest will be scheduled at a time and place most convenient for the participants to ensure their comfort. Any expenses incurred by the participants related to their involvement in the study will be reimbursed by the researcher.

Privacy and Confidentiality of Information. The researcher is committed to safeguarding the participants' personal information, identity, and any data collected, ensuring strict compliance with the Data Privacy Act of 2012. All data gathered during the study will be securely recorded, transferred to a password-protected Google Drive, and accessible only to the researcher to prevent unauthorized access.

Justice. The research participants will be selected based on the inclusion criteria: they must be Grade 11 students enrolled at Atty. Orlando S. Rimando National High School who are taking statistics as a subject in the second semester. In the event that participants incur any expenses during the pretest or posttest, the researcher will reimburse them to ensure no financial burden.

Transparency. The researcher will uphold transparency by clearly disclosing their affiliations, the purpose of the study, and the specific objectives to ensure participants fully understand the research intent. Participants will be

provided with a detailed explanation of the data collection process and will receive a summary of their responses for review and validation.

3. RESULTS

This chapter discusses the presentation, analysis and interpretation of data in accordance with the sequence of the statement of the problem.

Competence level of the students' pre-test scores
This section presents the results to the first statement of the problem that examines the competence level of the students' pre-test scores in Basic Statistics.

Table 1: Pre-test Performance of the Grade 11 Students

SKILLS	No. of Students	Mean	Class Proficiency	Competency Level
Assessment in Basic Statistics	40	20.5	51.25 %	Low Mastery

As shown in the table above, the pre-test performance of the Grade 11 students in Basic Statistics reveals a mean score of 20.5 with a class proficiency level of 35.8%. Based on the standard competency benchmarks, this falls under the level of Low Mastery Expectation**.**

Competence level of the students' post-test score
The results of this section pertain to the second statement of the problem, which evaluates the students' proficiency in Basic Statistics by analyzing their post-test scores. The post-test performance of the Grade 11 students is summarized in Table

Table 2: Post-test Performance of Grade 11 Students

SKILLS	No. of Students	Mean	Class Proficiency	Competency Level
Assessment in Basic Statistics	40	33.9	84.75%	Low Mastery

As shown in Table 3, the Basic Statistics skills of the Grade 11 students in the post-test had a mean score of 33.9, which corresponds to a class proficiency level of 84.75%. Based on the standard criteria, the competency level of the students in the post-test is considered Full Mastery.

Difference between Pretest and Posttest

Table 3: **Test of Difference of means in Pre-test and Post-test of Assessment in Basic statistics using technology integration in Senior High School**

	Mean	t-value	p-value	Remarks
Pre-Test	20.5	-7.124	0.000	Significa
Post-Test	33.9			

Table 3 illustrates the test of difference of means between the pre-test and post-test of the students' performance in the Basic Statistics assessment. The mean performance of the student in the pre-test was 20.5, while the post-test produced a mean of 33.9. The null hypothesis was refuted, as evidenced by the p-value of 0.000 and the t-value of -7.124.

4. DISCUSSION AND CONCLUSION

4.1. Discussion

Competence level of the students' pre-test scores.
This implies that students encounter difficulties in the acquisition of fundamental statistical skills, such as the ability to identify different categories of data, comprehend measures of central tendency, and interpret graphs. These challenges may impede their capacity to effectively analyze and interpret data, underscoring the necessity of targeted instructional strategies to enhance their understanding of fundamental statistical concept

In Addition study assessed that the mathematical skills of grade 11 students using the questionnaire. The finding revealed that the students had low proficiency in both verbal and non-verbal mathematical components, indicating challenges in fundamental mathematical skills essential for understanding basic statistics that integrate technology by Mayon & Son (2025).

Competence level of the students' post-test scores.
This implies that the increase in performance in Basic Statistics during the post-test is substantial. The results further indicate that the use significantly support the development of statistical skills among students by providing interactive, learner-centered resources that enhance understanding and engagement.

According to Navaro & Reyes (2024) application of game –based learning in improving statistical mastery was introduce through interactive software and quizzes. Students in the experimental group showed post-test score averaging with full mastery in probability and data interpretation.

Furthermore, Baustista (2021) mastery based grading approach in Senior High School Statistics a school wide reform using mastery based grading led of students showing complete proficiency in key statistical areas as measured in post assessment.

Difference between the pre-test scores and the post-test scores of the despondence. Student's performance in assessment of basic statistics for senior high school the pre-test had a mean of as a mean for the post-test. The results gave a value and t-value which means that the null hypothesis was rejected and accept the alternate hypothesis that there was a significant difference between the pre-test scores and post-test scores of the respondents. This suggests that the students' performance improved in a statistically significant manner following the intervention or instructional period. The significant increase in scores indicates that the learning activities and teaching strategies implemented were successful. Consequently, the findings suggest that the educational approach employed in the instruction of Basic Statistics had a beneficial effect on the comprehension and performance of the students.

This study the effectiveness of contextualized teaching in Senior High School Statistics evaluated the used contextualized modules in teaching basic statistics. Result showed that the learners' post-test scores improved significantly compared to their pre-test scores. The computed t-value and p-value led to the rejection of the null hypothesis by Lopez & Enriquez (2022).

According to Reyes & Magno (2023). A flipped learning in enhancing Senior High School Students performance in Basic Statistics using the flipped classroom approach students receive recorded lectures before the class allowing more time for problem solving. The post-test scores significantly higher rejecting the null hypothesis.

Furthermore, Jimenez & De Vera (2022). Effectiveness of Inquiry based learning in teaching basic statistics among the senior high school students study explored inquiry based learning as an approach to enhance the understanding of basic statistical measures. The pre-test mean and post-test mean Result showed a significant difference in performance, with a p-value of thus rejecting the null hypothesis.

4.2. CONCLUSION

The researcher concluded that the respondents have a satisfactory competency level in the assessment of Basic Statistics in light of the aforementioned findings. The students have enhanced their comprehension and application of Basic Statistics concepts, as evidenced by the substantial disparity between their pre-test and post-test scores.

The traditional methods and approaches used to teach statistical concepts to Senior High School students at Atty. Orlando S. Rimando National High School were enhanced by the performance level of the respondents in the pre-test

and post-test when the intervention strategies were implemented. The positive indicators of the development of statistical literacy among students are the satisfactory competency level observed and the improvement between pre-test and post-test results. The students have demonstrated substantial improvement their understanding of Basic Statistics that integrate technology by supplemental materials, such as statistical activities and interventions.

4.3. RECOMMENDATION

The researcher provides the following recommendations to enhance the teaching and learning of Basic Statistics among Senior High School pupils through comprehension-oriented strategies, following a thorough examination of the findings and conclusions:

Initially, it is advised that educational leaders coordinate pedagogical and content training programs to encourage integrative learning approaches. Teachers should be equipped with a comprehensive collection of comprehension-oriented strategies, such as sample lesson plans and specific classroom activities, to facilitate their effective implementation during these seminars.

Second, it is crucial for parents and guardians to actively encourage students' learning by cultivating reading habits at home. Parents can reinforce accountability in their children's academic journey by modeling positive study behaviors, underscoring the value of education, regardless of their educational heritage.

Third, the researcher urges students to consistently apply and implement the recommended strategy to use the technology integration for resolving statistical issues. Your experiences can provide valuable insights for future research and serve as a foundation for the ongoing enhancement of mathematics education practices.

Lastly, it is recommended that future researchers expand upon the results of this study by investigating supplementary variables and methodologies that may further improve the understanding and mastery of Basic Statistics among Senior High School students.

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BIOGRAPHY

Dianne Grace P. Rubin 	**Dianne Grace P. Balala** is a graduating Master of Education in Teaching Mathematics student at Assumption College of Nabunturan. With a strong interest in Senior High School student's basic statistical assessment, she conducted this research to better understand using technology integration in Senior High School. This study is part of her graduate thesis requirement. Beyond academics, she is a public mathematics teacher