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TECHNOLOGY-DRIVEN INTERVENTION: ENHANCING STATISTICS AND PROBABILITY LEARNING THROUGH PROJECT CLI (CLICK, LEARN, AND IMPROVE)

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ABSTRACT

The study was undertaken to assess the achievement in Statistics and Probability of Grade 11 students after using the Project CLI (Click, Learn, and Improve). Forty heterogeneous Grade 11 students at Santa Rosa Science and Technology High School, Santa Rosa City, Laguna were included in the study conducted during the Fourth Quarter of S.Y. 2021-2022. A teacher-made achievement test of forty items was used as the pretest and posttest to assess the students' performance in Statistics and Probability. The results of the mathematics achievement scores revealed that there is a significant increase in the performance of the students after their exposure in Project CLI. The Project CLI is a website created by the researcher that served as a learning tool to the learners. This was composed of the Preliminary activities and Video lessons. Performance of the students were assessed before and after using the said learning tool and its components. The results of the students who completed this project showed that overall, the students performed very well. The result showed that the mean score of learners in posttest which is 34.83 is higher than the mean score in the pretest which is 22.25. The standard deviation in the pretest is 4.25, while in the

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posttest, the standard deviation is 2.89. This difference is significant because the null hypothesis is rejected, p (0.00) < 0.05. In other words, the use of Project CLI in asynchronous classes resulted in an improvement in the mathematical achievement test scores of the learners.

Keywords: *Statistics and probability, mathematics achievement, Project CLI (Click, Learn, and Improve), technology-driven learning, educational intervention, blended learning, digital learning tools, pretest-posttest analysis, student performance assessment, video lessons, heterogeneous students, innovative teaching strategies, website-based learning*

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INTRODUCTION

Rationale

Online learning requires teachers to think creatively and innovatively to attract students. Learning media becomes the main factor in helping teachers make it happen (Anwar, 2021). It is important that a teacher is not just equipped with the knowledge and mastered the subjects in conducting online classes. Being creative and resourceful is one of the major traits that an online facilitator should have. With this, the researcher created a learning tool called as the Project CLI (Click, Learn, and Improve) asynchronous classes of the Grade 11 Statistics and Probability students. The Canva application became the major tool to make it happened.

Going back, during the pandemic, many schools conducted online learning, such as synchronous and asynchronous session. Synchronous sessions required a real-time interaction between the learners and the teacher using platforms like Google Meet and Zoom while in asynchronous sessions, learnings happened in the different time and set-up, depend upon the instruction of the school and the teacher.

The researcher, as part of the school guidelines, conducted synchronous online sessions with the students. Activities and the lesson proper are conducted and administered simultaneously, following the required schedule in their school. But while the researcher facilitating the online sessions synchronously, there are things that were observed. First, students tend to lose or experience problems in their internet connections when the online classes are conducted synchronously, leading to late or non-compliance to the submissions of

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outputs. Second, some students tend to have anxiety in dealing with synchronous sessions because they thought that their teachers might called them even if they do not fully understand the question or the concept of the lessons. Third, since the students are experiencing problems in their internet connections and interactions in the synchronous sessions, they tend to have poor mathematical performance.

In line with this, the researcher's Project CLI for asynchronous classes were created to be accessible by the students anytime and anywhere. The content of the learning resources was based on the learning competencies of Statistics and Probability that the students needed to know and attained for the whole duration of the study. Using these learning tool, the researcher aimed to improve and refine the condition. Why the researcher used Canva instead of using other platforms and applications?

The researcher used Canva as the major platform of the study because it's very easy to use, both on teacher and student's side. Canva also has pre-made size templates make creating size-specific content simple, and hundreds of elements, icons, and graphics to choose from (Anwar, 2021). As an addition, the learners are also familiar in using Canva as shown in the outputs that they have submitted in the different activities in class. Compared to the tutorial videos, like YouTube videos, the Project CLI were more personalized that made the students to have an in-depth understanding of the lessons (Edwards, 2021).

Canva is accessible also in different gadgets that's why the researcher believed that the learning tool created became useful to the learners as 40% of the respondents were

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smartphones users, for the online classes, while 60% used tablets, laptops, and desktops. In addition, Canva is a comprehensive design tool that is simple to use and wonderful for pros and beginners alike. Canva is available in 190 countries and in over 100 languages, and works with all operating systems (Gehred, 2020). The researcher found out in this study that using Project CLI as a technology-driven learning tool helped the students in improving their Statistics and Probability scores. Also, since it was done asynchronously, the students became more comfortable understanding the lesson and answering different questions that made them to have a positive learning experience.

With the stated reasons above, the researcher sought to know the Mathematical Achievement in Statistics and Probability subject of the Grade 11 STEM students at the Santa Rosa Science and Technology High School for the School Year 2021-2022 with the help of the technology-driven intervention tool, Project CLI (Click, Learn, and Improve), that were administered in asynchronous class sessions. The researcher's study became focused also on the topic because there are no previous studies from the DepEd - Division Office of Santa Rosa City about the utilization of Canva in Education, especially in the teaching – learning process and the researcher wants to explore it further for education purposes.

Statement of the Problem

The researcher aimed to determine the mathematical achievement in Statistics and Probability of the Grade 11 STEM Students at the Santa Rosa Science and Technology High School S.Y. 2021-2022 using the technology-driven intervention tool, Project CLI (Click, Learn, and Improve).

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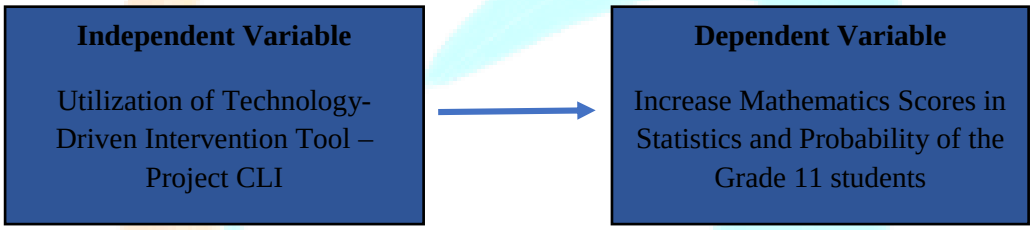
Specifically, it aims to answer the following:

1. What are the students' mathematical achievement before and after using the Project CLI for asynchronous classes?
2. Is there a significant difference in the students' mathematical achievement before and after using the Project CLI for asynchronous classes?

Research Paradigm

Figure 1

Research Paradigm



As can be seen from the research paradigm (Figure 1), the independent variable was the utilization of Technology-Driven Intervention Tool – Project CLI, in four sessions of asynchronous classes where video lessons created were posted to the website that was created by the researcher. The dependent variable was the increased students' mathematical achievement in Statistics and Probability subjects after watching the video lessons.

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Research Hypotheses

The following hypotheses are formulated based on the specific statements of the research problem and was tested at a 0.05 level of significance.

1. There is no significant difference in the pretest and posttest mean scores of the students in the mathematical achievement test before and after their exposure to the video lessons (Project CLI) in an asynchronous class in Statistics and Probability subject.
2. There is a significant difference in the pretest and posttest mean scores of the students in the mathematical achievement test before and after their exposure to the video lessons (Project CLI) in an asynchronous class in Statistics and Probability subject.

Definition of Terms

The following terms are conceptually and operationally defined as used within the context of this study for better understanding and comprehension of the research:

Project CLI (Click, Learn, and Improve). These were the teacher-made video lessons using the Canva for Education features and tools. The content of the lessons was based on the MELCs (Most Essential Learning Competencies) for Statistics and Probability subject that fell on the duration of the actual duration implementation of the study.

Mathematical achievement. This served as the dependent variable in the study.

Asynchronous online class. This was the learning modality used in the study where

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the students watched and learned through the Project CLI for four sessions, equivalent of four synchronous online meetings, and do the activities by following the instructions in the class in their most significant time and place.

Canva for education. This was the main application used to create meaningful video lessons for the asynchronous online class of the students in Statistics and Probability subject.

Preliminary activities. These are the activities that should be done before the actual lesson. In this study, preliminary activities are the things that the students should do before they proceed to the other parts of the learning tool.

Video lessons. These recorded videos where the teacher can be seen. In the study, these are components of the Project CLI where the actual lessons per session were incorporated.

MATERIALS AND METHODS

Research Design

The study used the quasi-experimental research design. The same dependent variable was measured in one group of participants before using pretest and after using post-test implementation of the Project CLI in an asynchronous online class. Changes in the outcome of interest are presumed to be the result of the intervention. The quantitative analysis was applied to determine the effect of the independent variable on the dependent variable. Scores

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for the dependent variable obtained before treatment were called as the pre-test scores, whereas scores obtained after the treatment were called as the post-test scores.

Participants of the Study

The Grade 11 STEM Senior High School students at the Santa Rosa Science and Technology High School SY. 2021 – 2022 were the respondents of this research. Purposive sampling was used by the researcher to know the section and the students who participated in

the researcher so that the respondents became heterogenous in nature. A total of 40 heterogeneous students became the participants of the study for the whole duration of this study. The participants were the students who attended both online classes and limited face-toface so that the validity and authenticity of the test result were preserved.

Research Instruments

The following research tools were utilized in the research according to the different purposes stated below:

Lesson plan. Certified and validated lesson plans were the basis of the contents of the

Project CLI created and uploaded on the website formed by the researcher. The researcher created four lesson plans that were equivalent to the four sessions of the asynchronous classes using the learning tool, Project CLI.

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Project CLI. Certified and validated video resources aligned to the curriculum guide and MELCs were utilized for the stated variables. Furthermore, the content of the video lessons that became part of the actual implementation of the study underwent validations with experts.

Mathematical achievement test. Certified and validated researcher-made Mathematics Examination in Statistics and Probability was used in this study. The 40-item questions and content of the stated examination were based on the DepEd curriculum guide and most essential learning competencies related to Statistics and Probability subject of Grade 11. Then, a table of specifications was also used and became the main basis of the placement of items. In addition, to ensure the validity and reliability of the examination, a dry run was conducted where Grade 12 students for the SY 2021-2022 have answered the test questions. After that, the researcher computed the item analysis of the results to know which questions should be retained, rejected, and revised. KR-20 of the results was also computed to compute the internal reliability of the test questions.

Data Gathering Procedure

The study carried out for two (2) weeks in the second semester of the Academic Year 2021-2022 for the actual implementation. Where in, the first part, the researcher prepared the necessary documents for the approval of the school, division office, and parents' consent of the respondents. Next, the researcher let the students answer the mathematics test in

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Statistics and Probability of the students to know their pretest scores. Then, the researcher conducted the asynchronous class where the validated and certified Project CLI using Canva for Education website was used by the Grade 11 students to watch and learn. After that, the students answered the mathematical achievement test in Statistics and Probability to know their posttest scores that was compared to their first scores (pre – test results). The study followed five stages in gathering the data needed for the research:

Stage I was about developing, adapting, selecting, and validating the research instruments, and preparing necessary documents for the approval to conduct. The researcher created video lessons based on the Lesson Exemplar aligned to the DepEd curriculum guide and MELCs for Statistics and Probability subject of Grade 11 students. In line with that, questions for a math test were created that served as the Mathematical Achievement Test in Statistics and Probability of the Grade 11 students, that was based on the TOS and MELC required. Dry run of the test questions, item analysis and computing KR-20 were also administered.

Stage II was the first administration through face-to-face of the Mathematical Achievement Test in Statistics and Probability subject that served as the pretest of the respondents.

Stage III was the actual implementation and the utilization of the Project CLI in asynchronous classes. This phase was guided using the lesson exemplars where the contents of the video lessons were based and were uploaded in the Canva for Education website that was made by the researcher. The respondents didn't join during the synchronous classes for

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four sessions, and they had their asynchronous classes and used Project CLI Video Resources. The contents of the said learning tool were the same on the lessons that were tackled in the synchronous classes of the other students. The respondents have read and did the activities that were assigned and were uploaded in the Project CLI.

Stage IV of the study was the administration through face-to-face of the posttest, Mathematical Achievement Test in Statistics and Probability.

The final phase, Stage V, involved the analysis of the collected data, interpretation of the collected data, drawing of conclusions, and providing the corresponding recommendations.

Data Analysis

Quantitative method was used in analyzing and interpreting the data in this study. The Mathematical Achievement in Statistics and Probability of the students were measured using their pre-test and post-test scores that were administered face-to-face.

Statistical Treatment of the Data

The following were used to interpret the data gathered:

Item analysis. This was used to check the validity of the test questions before the actual implementation to the respondents.

Kuder and Richardson Formula – 20. This was used to check the reliability and the

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internal consistency of the choices in the created Mathematical Achievement Test for the Grade 11 respondents. The researcher computed KR-20 = 0.85 and can be interpreted that the test questions are good and reliable.

Mean and standard deviation. These were used to compute the mathematical achievement of the students before and after using the Project CLI as a technology-driven intervention tool.

Paired sample t-test. This was used to know the difference in the mathematical achievement of the students before and after using asynchronous class tools, with alpha = 0.05.

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary of Findings

This study ascertained the effects of Project CLI in Mathematics Achievement in Statistics and Probability subject of Grade 11 learners of Santa Rosa Science and Technology High School. The findings of the study are as follows:

1. The computed Posttest Mean Score is higher than the computed Pretest Mean Score in the Achievement Test. The highest score in the pretest is 31, while the lowest pretest score is 15. On the other hand, in the posttest, the highest score is 39, while the lowest score is 28. The mean score in the pretest is 22.25, while on the posttest, 34.83 is the mean score. The result showed that the mean score of learners in the posttest is higher than the mean score in the pretest. The

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standard deviation in the pretest is 4.25, while in the posttest, the standard deviation is equal to 2.89. This shows that the learners' scores in the pretest are more scattered or more spread out around its mean than their scores in the posttest. Both scores in pretest and posttest are homogeneous.

The said result was the same with the result of the research about the Integration of Learning Management System as an Aid in Teaching: An Assessment (Garcia et al., 2021). The researchers used Paired T-Test and found out that the respondents performed poorly in the pretest examination but performed very satisfactorily in the posttest examination.

2. The results from the pretest, with the mean that is equal to 22.25 and standard deviation of 4.25, and posttest, with 34.83 as the mean and 2.89 standard deviation, before and after using the Project CLI for asynchronous classes, shows an increase of scores. This difference is significant because the null hypothesis is rejected, p (0.00) < 0.05. The computed t-test p-value is remarkably less than the 0.05 level of significance. This means that there is a significant difference in the learners' scores in the Mathematics Achievement Test and indicates a remarkable increase in the learners' achievement in Mathematics after exposure to the Project CLI as a technology-driven intervention tool for Statistics and Probability class.

In relation to the study "The Use of Pre-Recorded Video Lessons and Its Impact on Students' Achievement in Mathematics 8" (Perez, 2023), it was

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found out that the mathematics achievement of students who watched pre-recorded video had significant increase compared to those who don't watch. The results of the questionnaire also obtained positive results that students found it helpful to their learning process.

Conclusions

Based on the findings of the study, the following conclusions were formulated:

1. The construction and use of Project CLI tends to improve the learners' achievement in Mathematics. Learners are assumed to have less knowledge of the subject matter during the pretest, explaining the standard deviation computed that signifies that the pretest scores are more scattered compared to the posttest scores. The lower standard deviation in the posttest may be attributed to the same learnings that the learners gained after their exposure to the treatment.
2. The construction and use of Project CLI as a learning tool for Asynchronous Class is effective for learners. In other words, the use of Project CLI for asynchronous classes resulted in an improvement in the mathematical achievement test scores of the learners.

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Recommendations

Based on the findings of the study and the conclusion drawn, the following recommendations are put forward:

1. The learning tool and features explored and used in this study should be utilized to improve learners' achievement in Mathematics.
2. The use of Project CLI further investigated for other topics in Statistics and Probability, as well as in other mathematics subjects of STEM students, such the General Mathematics, Pre-Calculus, and Basic Calculus.
3. Conduct further studies on Project CLI considering other factors such as engagement level and problem-solving ability.
4. Conduct similar studies with a sufficiently bigger sample size to validate the generalizability of the study.

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