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Assessing the Effectiveness of the Learning Modalities during the Covid-19 Pandemic

Allan V. Pinili

Cebu Technological University - Main Campus, Cebu, Philippines

ABSTRACT

The research was conducted at Matab-ang National High School, Matab-ang, Toledo City, Cebu as basis for an instructional support development plan. Quasi-experimental method was used in the research. Respondents were grouped into two, online and modular learning, with 40 respondents in each group. Pre- test and post-test questionnaires were given to 80 respondents as instrument for evaluation. Gathered data were treated using frequency count, paired t – test, and t – test for independent samples. Results showed that there was significant difference between the pre-test and post-test scores for both groups. On the other hand, there was no significant mean gain difference between the pre-test and post-test scores between the two groups. Thus, it is highly recommended that the proposed instructional support development plan to address the needs of the students in strengthening and enhancing mathematical skills and learning be adopted with focus on school and home partnership, instruction and assessment, supplemental activities, and instructional support team approaches.

KEYWORDS: *Teaching Mathematics, online learning, modular learning, Quasi- experimental Design, Toledo City, Cebu, Philippines*

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1. THE PROBLEM AND ITS SCOPE

INTRODUCTION

Rationale of the Study

The outburst of the pandemic has brought an adverse effect on the lives of every people. The business establishments shut down, paving to a massive percentage of people becoming unemployed. The people around the globe struggle and have done all means for one essential purpose – to live and appreciate life to the fullest. With a substantial value of optimism, this pandemic shall undoubtedly end. The occurrence of the pandemic is taken as a whopping challenge. The people fight vigorously for it, continue to exuberate, and are grateful for their solid determination to victory against the fatal disease. To win the deadly battle is gratifying.

The closure of schools and the loss of learning during the COVID-19 pandemic have a long-term negative impact on the current cohort of school children. The global evidence from past health and disaster-related emergencies shows that the impact extends well beyond the period of the pandemic. It is also likely to affect the children's economic potential and productivity in adulthood, thus undermining the country's competitiveness. The policy note analyzes critical issues related to the current schooling and learning situation and proposes policy options to prepare for in-person schooling when this is possible.

The Department of Education is one of the sectors in the country which has been tremendously hit by the pandemic. Teaching must go on – this is a sturdy legacy created despite the terrible life-threatening virus. This is because of the urge to endure the quest for education. The department foresees it yet struggling, considering it is not in a face-to-face setting, learning must never be put to a halt; thus, come varied learning modalities. The schools may implement any of these modalities convenient for the learners. The Department of Education urged teachers and students, as well as parents and school heads, to utilize other learning delivery modalities under the distance learning setup as it seeks to reduce the use of printed learning modules. In place of face-to-face classes, the Department of Education implements distance learning at the basic education level.

Students may choose from multiple learning delivery modalities, including modular (printed or digitized), online learning, radio and television-based instruction, or blended learning. With all the options for learning delivery, the department said that printed modular is the "most preferred choice" of students and parents.

With varied learning modalities implemented, Matab-ang National High School has opted for modular distance learning. The teachers, likewise, must provide instructional support to the students, other than modular classes, like virtual discussion via ZOOM or Google Meet or in any platform the teachers prefer to convey the lessons. The students find modular distance learning modalities onerous. Understanding the topic is strenuous. The students are in dire need of someone to guide them in answering the attached Learning Activity Sheets and Written Assessments and in carrying through the Performance Task. School year 2020-2021 concluded that sizeable figures of the grade were in 75-79 range of grades in mathematics.

The weekly distribution and retrieval of self-learning kits with activity sheets ignored has caused appalling academic performance. Teachers physically witnessed the crowd of students in claiming modules; however, the quantity started waning in the succeeding weeks. Other students decided to halt coming to school and travail for monetary purposes. Claiming the crafted modules with no learning is massive rubbish of time. Students vividly become lazy and demotivated. The scenario continues in the Academic Year 2021 - 2022, thus enormously demands the teachers to catalyze programs that predominantly aim to clinch back the curiosity and appreciation of the students toward the subject.

For two years after the pandemic, students across the country have been deeply impacted, and not all do their modules wholeheartedly. Students tended to copy answers from others without any understanding and say that they never actually learned. Numerous students cannot work on the modules independently and cannot accomplish them on time because mostly the study time had been spared teaching their siblings with their modules and helping their parents in the field. Mastery of the lessons is impossible to attain. One factor that affects the students' performance is the lack of knowledge of the parents to assist their child/children (Sumaoang, 2020). Parents are in crisis to provide for the needs of their children to accomplish the activities and perform the related tasks.

The modules were regarded as formality cause only stemming from below-par academic performance. With the struggles that students endure with modular distance learning, teachers take the drive to provide instructional support to students by engaging in online knowledge. However, the efficacy of this modality still needs to be validated even though teachers conducted online learning. The positive impact has been foreseen by teachers, yet there are still students not able to comply with the activities required.

In this context, the researcher aims to assess the effectiveness of learning modalities for Grade 10 students while learning mathematics at Matab-ang National High School for 2021 – 2022. The study has been conducted to design an instructional support development plan that addresses the students' desiderata to enhance their interest and mathematical skills. One foremost motive of the study, it builds students' strengths and opportunities in mathematics and, at the same time, creates an environment for safe and supportive mathematics teaching and learning. The focus on mathematics may be heftily affected by the current situation; teachers play a crucial function in strengthening the effective knowledge of the students. As a researcher, I am confident that students will be able to re-establish their inclination towards numbers.

Theoretical Background

Two theories have been used as bases for the research. Moore's Theory of Transactional Distance Learning and George Siemens' Connectivism: A Learning Theory for the Digital Age and DepEd Order No. 012, Series 2020, Adoption of the Basic Education Learning Continuity Plan for School Year 2020 – 2021 In Light of

The Covid-19 Public Health Emergency

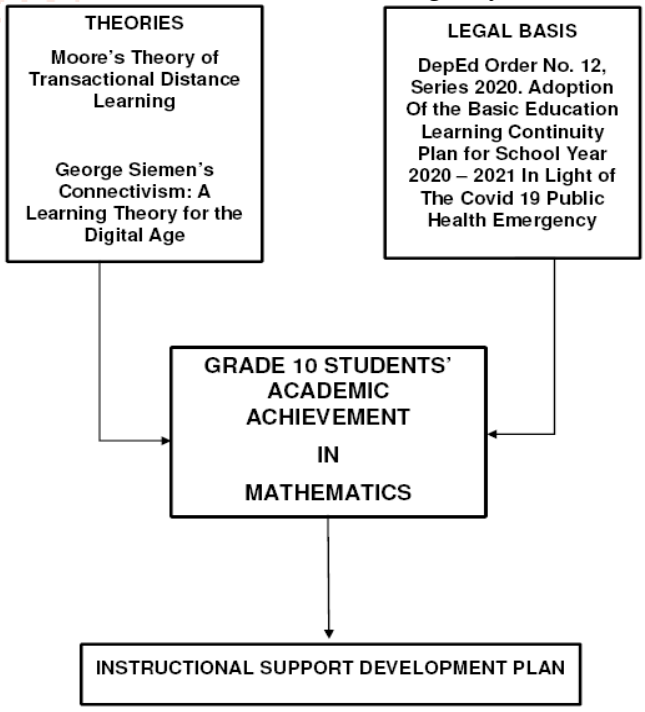

Figure 1 Theoretical Framework of the Study

Moore's Theory of Transactional Distance Learning explains and quantifies the learning relationship between instructor and student in the e-learning situation, and there is a substantial physical or temporal distance between the two. The transactional distance - as distinguished from a physical or temporal distance - refers to the psychological or communicative space that separates the instructor from a learner in the transaction between them. Moore (1997) defined transactional distance as "the psychological and communicative space' between the teacher and learner." Connectivism: A Learning Theory for the Digital Age, on the other hand, emphasizes how technologies can be used and designed to create new learning opportunities and promote effective learning (Siemens, 2004). Underwood, 2019) also added that the idea of connectivism accepts the medium of technology as a part of the student's decision-making process. Learners in today's time are no more passive consumers of information and participate in producing information (Shrivastava, 2018).

Based on DepEd Order No. 012, Series 2020, Adoption of the Basic Education Learning Continuity Plan for School Year 202-2021 In Light of The Covid-19 Public Health Emergency, the public health emergency brought about by COVID – 19 calls for the Department of Education to be innovative and resourceful in delivering quality, accessible, relevant, and liberating education. In response to this emergency, the Basic Education Learning Continuity Plan (BE-LCP) has been developed, a package of education interventions that will respond to primary education challenges brought about by Covid-19 (DepEd Order N0. 12, S. 2020).

Thus, modular distance learning, online learning, and blended learning respond to the need, contexts, circumstances, and diversity of learners.

Modular learning uses learning modules that facilitate student learning by themselves. It is a form of distance learning that uses Self-Learning Modules (SLM) based on the essential learning competencies (MELC). The focal objective of MELC is to compress the curriculum reducing the workloads of learners. The Department of Education leaders always treasure paths to detach the problems and to capacitate the teachers and school heads for them to become more effective in the field of modular distance learning (Bagood, 2020). This kind of instructional modality was followed by public school teachers throughout the country. According to the study conducted by Lapada et al. (2020), teachers were highly aware of the presence and consequences caused by the COVID-19 pandemic. The teachers endure serving by crafting modules as learning guides and become the facilitators in students' growth as members of their community and the society, despite the threats caused by the pandemic. (Martineau et al., 2020). The efforts of the teachers in crafting modules are worth acclaiming; however, it was also observed that there are modules containing some faulty parts, either typographical or content-related, that eventually confuse students.

Online learning is a method of education whereby students learn in an entirely virtual environment. This is an internet-based learning environment that can connect students of diverse backgrounds who boast different perspectives. The students who engage in online learning typically have a greater capacity to monitor class performance. This learning modality benefits the students in terms of efficiency, accessibility of time and place, and improved class attendance.

The study conducted by Ibyatova et al., 2018, Modular Approach to Teaching and Learning English Grammar at Technical Universities, found that the performance of the students has been successfully enhanced by the modular approach to teaching. The study of Satyarthi in his published research on the practical learning strategy for secondary school students-modular approach, discovered that the modular teaching method was better compared to the traditional education. According to Ambayon (2020), students know at their own pace with the modular system. In the said study, modular instruction is more effective in the teaching-learning method when compared to traditional teaching techniques.

The study of Aksan (2021) explained that modular learning modality promotes a student-centered approach to learning. Using a descriptive research design with 178 Grade 11 STEM students, the study conducted also revealed that there is not enough evidence to conclude the significant relationship between the students' perceptions to the academic performance of the students using the new method of teaching modular distance learning approach amid COVID – 19 pandemic. Charles (2014) found out that the modular structure in mathematics learning was verified to be an operative and competent instrument to aid students to absorb mathematics all by themselves. As observed by the researcher, the achievement of students in modular distance learning contradicted the study of Charles (2014). According to Dhawan (2017), the college in New Zealand, which was severely affected by seismic activities became more resilient to online learning after that disastrous event. Technology helped them overcome the barriers in those difficult times.

The study of Adnan & Anwar (2020), concluded that online learning is not as effective as conventional learning. However, it is proven helpful in safeguarding student's and faculty's health amid COVID-19 pandemic.

The research of Mahmood et al. (2021), concluded that considerable number of respondents agreed that online learning is the best solution during the pandemic situations. Furthermore, online learning enhances the time management skills of the students and reduces expenses. A huge number of students agreed that they have become more advanced. However, from most students' perspectives, they prefer to engage in a face-to-face setting rather than modular distance or online learning.

With Moore's Theory of Transactional Distance Learning and George Siemen's Connectivism: A Learning Theory in the Digital Age, the researcher conducted a study on the efficacy of adopting an instructional support development plan in addressing the needs of grade 10 students in Matab-ang National High School in the new normal, at the same time, enhancing mathematics learning.

THE PROBLEM

Statement of the Problem

This research assessed the academic achievement of Grade 10 Students, that engaged in modular and online learning modalities at Matab-ang National High School in Toledo City, Cebu for the school year 2021-2022. The performance of the students in the probability of compound events was used as the basis for an instructional support development plan to enhance mathematics learning.

Specifically, it sought answers to the following sub-problems:

1. What is the level of academic achievement of the groups in the probability of compound events engaged in modular and online learning modalities during the Pre-test?
2. What is the level of academic achievement of the groups in the probability of compound events which engaged in modular and online learning modalities during the Post-test?
3. Is there a significant difference between the Pre-test and Post-test scores of the respondents in the probability of compound events which engaged in modular and online learning?
4. Is there a significant mean gain difference between the Pre-test and Post-test scores of the respondents in the probability of compound events that engaged in modular and online learning modalities?
5. Is there a significant mean gain difference between the Pre-test and Post-test scores of the respondents in the probability of compound events that engaged in modular and online learning modalities?
6. Based on the findings, what instructional support addressing the needs of the students to enhance mathematical learning can be proposed?

Statement of the Null Hypotheses

Based on the objectives of the study, the following null hypotheses were tested at 0.05 level of significance:

Ho1: There is no significant difference between the Pre-test and Post-test scores of the respondents in the probability of compound events that engaged in modular learning.

Ho2: There is no significant difference between the Pre-test and Post-test scores of the respondents in the probability of compound events that engaged in online learning.

Ho3: There is no significant mean gain difference between the Pre-test and Post-test scores of the respondents in the probability of compound events that engaged in modular and online learning modalities.

Significance of the Study

This study was conducted to address the needs of students at Matab-ang National High School during School Year 2021 -2021 in enhancing mathematics learning as the basis for Instructional Support Development Plan.

In this connection, the researcher believed that this study is of eminent merit in the following:

Department of Education Officials. The outcome of this study will aid the government in helping the high school students by offering practical instructional support that caters to the needs to enhance learning further.

School Administrators. The research will guide the administration for an alternate solution to lessen the number of students flocking to school in claiming modules instead provide instructional support.

Teachers. The study will aid the teachers to understand more about the concerns of the students in developing their skills and interest.

Learners. The study will enlighten their mindset that, other than the modular, online learning and additional instructional support can be effective devices that stimulate them and progress an optimistic perspective that learning also takes place in the digital world.

Parents. With the utmost support and cooperation of the parents, learning becomes as easy as ABC and will help them persuade their children to keep going.

Researcher. The findings of the study will be shared to my co-teachers for future use reference.

Future Researchers. The findings of this research serve as a foremost tool for researchers in responding to other problems encountered by students.

RESEARCH METHODOLOGY

Quasi-experiments are studies that aim to evaluate interventions but that do not use randomization. Quasi-experiments aim to demonstrate causality between an intervention and an outcome similar to randomized trials. Revesz and Rogers (2019), Experimental and Quasi-experimental Designs, explained that research designs examine whether there is a causal relationship between independent and dependent variables.

The design also includes a Pre-test and a Post-test, in which both the experimental and control groups participate. The purpose of the Pre-test is to ensure the comparability of the two groups before the treatment, at the same time, the Post-test allows the researchers to determine the immediate effects of the treatment on the outcome variable(s).

Design

In this study, a Quasi-Experimental designed by Donald T. Campbell and Julian C. Stanley were used to determine what was best for the population. According to Campbell (1963), a quasi-experimental design aimed to establish a cause-and-effect relationship between an independent and dependent variable. Pre-test and Post-test were crafted in this research, and a sample was randomly assigned to two or more groups, Modular and Online (one treatment group and one control group). The subject in each group was measured at two time periods: pre-test (before treatment) and post-test (after treatment). Topics in the same group received the same treatment.

Flow of the Study

The synthesis of the whole study was reflected in the research flow, as illustrated in figure 2.

The primary data sources were the scores of the respondents of the Pre-test and Post-test given. These data collected were used to determine the level of academic achievement of the two groups during the Pre-test and Post-test, to identify the significant difference between the Pre-test and Post-test scores. Moreover, the data became the basis to spot significant mean gain difference between the Pre-test and Post-test scores of the respondents.

The process of the study commenced by crafting a transmittal letter addressed to the Teacher-in-Charge of the school. After securing favorable nod from the Teacher-in-Charge, the respondents were then grouped into two and were provided with a letter of consent. After which, set of questionnaires was designed. Data were gathered meticulously. A quasi-experimental design was used to establish a cause-and-effect relationship between the variables in the study. The collected data were validated, treated statistically using simple percentage, frequency count, paired t-test, and t-test for independent samples. Such data were thoroughly analyzed and interpreted. After a thorough process, findings and recommendations were vividly presented.

The data in this study were the bases for the researcher to design an instructional support development plan whose paramount objective is to direct the needs among Grade 10 students in enhancing their mathematical skills in the new normal.

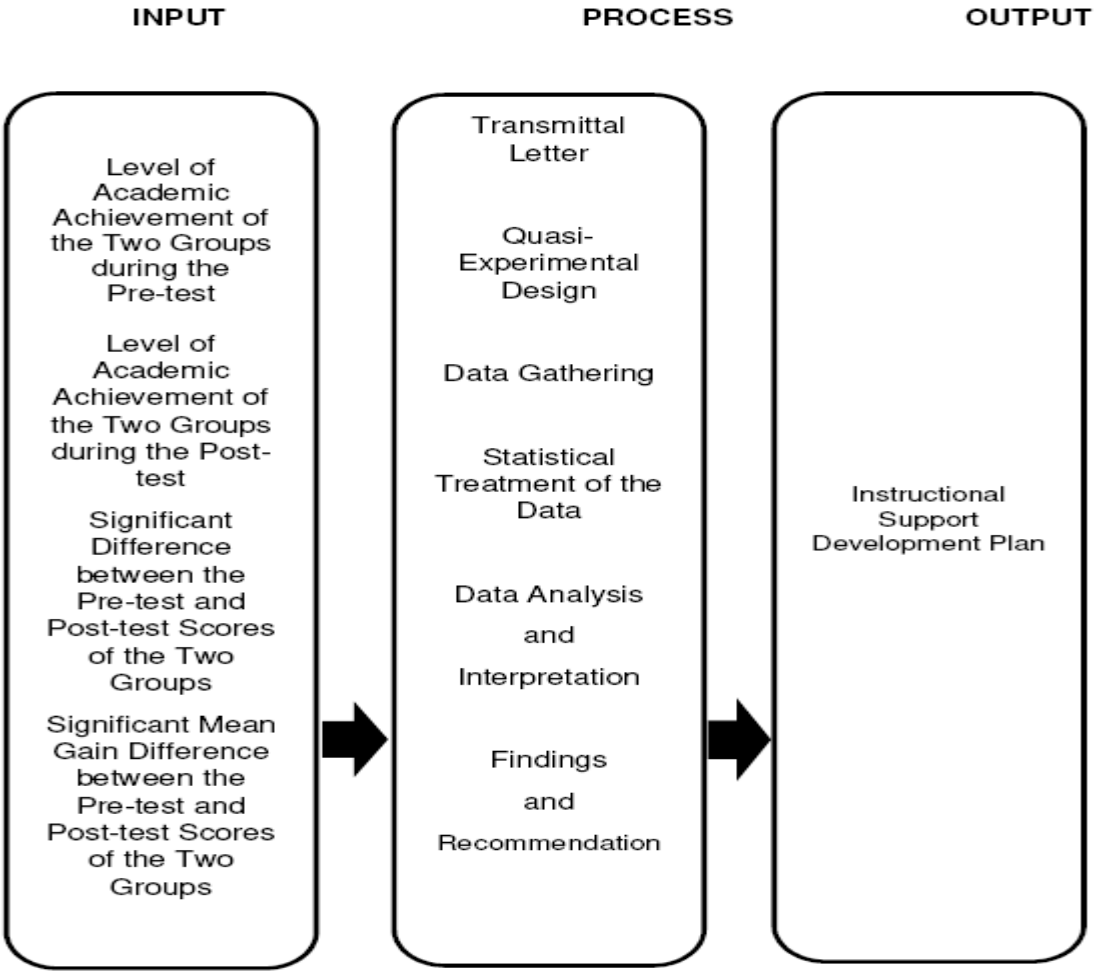

Figure 2 the Flow of the Study

Environment

The study was conducted in Matab-ang National High School at Matab- ang, Toledo City, a Secondary Cluster 1 Technical-Vocational School with a 1,585-student population offering 4-grade levels of Junior High School curriculum and Senior High School (Grades 11 and 12). It is one of the big schools in the Division of Toledo City. This learning institution has 62 faculty members with a School Head and three Assistant School Heads.

Barangay Matab-ang, in the northern part of Toledo City, has a population of 6,706 and a land area of 11.11 square kilometers which have fertile soil. Most people living in this area utilized the land by planting crops as their source of income. Students, likewise, gain knowledge on different agricultural activities. The goal of the school is to produce graduates equipped with knowledge and skills and prepare them for work. In addition to, students were taught when it comes to agricultural activities. There are areas of the school planted with different crops where both the students and teachers benefit from it through harvesting. Since the place is fertile in soil, students can easily plant agricultural crops in their home backyard with the support of their parents.

The place Matab-ang means “not salty”, tracing its history.

Figure 3 Location Map of the Research Environment

Respondents

The researcher chose Grade 10 students of Matab-ang National High School as respondents. The respondents were determined through purposive sampling methods. They were grouped into the Modular Group and the Online Group. Each group was composed of 40 students. The respondents were selected to validate the effectiveness of the study **"Assessing the effectiveness of learning modalities during the COVID-19 pandemic."**

Table 1 Distribution of Respondents

Respondents	Population	Sample Size	Percentage
Modular Group	123	40	50.00
Online Group	87	40	50.00
Total	210	80	100.00

The researcher handled five (5) out of the eight sections in Grade 10 and has 210 total students dealt with. There were 123 students grouped as modular. A sizeable number of the students did not have gadgets. Some students have, but downloading ZOOM or Google Meet was stiff. Another factor was the unstable wi-fi connectivity. The online group had 87 members. However, only 40 of them directly engaged in the virtual discussion. Data used in the study were quickly gathered.

Instrument

The data-gathering instrument for this study was the Pre- test and Post-test scores among the 80 respondents. Set of 40 questions involving the topic probability of compound events were taken from the reference book authored by Callanta et al. (2015). Mathematics Teacher's Guide (First Edition), Department of Education – Instructional Council Secretariat (DepEd – IMCS).

Data Gathering Procedure

As preliminary stage in data gathering, a letter requesting approval to conduct the study to the School Principal was secured. Upon the approval, the respondents of the study were grouped into two – modular and online groups and were provided with a consent letter. The Pre- test and Post-test questionnaires were formulated. The questions were taken from Mathematics Teacher's Guide (Callanta et al. 2015). Questionnaires were distributed to the respondents, and a timeframe was set for the data collection. A detailed discussion of the questionnaires to the respondents was given. After providing sufficient period to answer, the pre-and post-test questionnaires were retrieved and checked. The data gathered were tallied, tables, and subjected to the statistical treatments: simple percentage, frequency count, paired t-test, and t-test for independent samples. The data were analyzed and interpreted. The results were given action.

Statistical Treatment

Below are the statistical formulas used in the conduct of this study.

Simple Percentage. This is to determine the percentage of the respondents in each group. A percentage is calculated by taking the frequency in the category by the total number of participants and multiply by 100%. It is appropriate when it is essential to know the number of participants giving a particular answer.

Frequency Count. The calculation of how many people fit into a particular category or the number of times a characteristic occurs. This is to identify the level of academic achievement of the respondents.

Paired t-test. This is to determine the significant difference between the two variables in the study. It is a method used whether the mean difference between pairs of measurements is zero or not at the same time.

T-test for Independent Samples. This is to test the significant mean gain difference between the scores of the pre-test and post-test of the respondents.

Scoring Procedure

The respondents were provided with the Pre-test and Post-test questionnaires. Scores were grouped using an interval of 8. The questionnaires became the bases for numerical rating, how the scores were descriptively rated, and the corresponding verbal interpretation of the scores. In this procedure, the students were aware of their performance and eventually persuaded to give out their best in future activities and assessments.

Numerical Rating	Descriptive Rating	Verbal Interpretation
33 – 40	Excellent	The score obtained displayed a magnificent performance.
25 – 32	Very Good	The score obtained displayed a highly gratifying performance.
17 – 24	Good	The score obtained displayed an adequate performance.
9 – 16	Fair	The score obtained displayed an unsatisfactory performance.
0 – 10	Poor	Performance needs further guidance and assistance.

DEFINITION OF TERMS

For transparency and a better understanding of this study, the following terms will explain in the context of this investigation:

Asynchronous learning. This type of learning is used to describe forms of education, instructions, and learning that do not occur in the same place or at the same time. Students engage themselves in educational activities, discussions, assignments at their own pace, on their own time.

Cohort. This is any group of people with shared characteristics. A colleague, companion, fellow, comrade.

Connectivism. In connectivism, learning occurs when peers are connected and share opinions, viewpoints, and ideas through a collaborative process. It emphasizes on the process of identifying, learning and contributing knowledge.

Conventional learning. By going to school and being present physically in class, learning takes place. Interaction and communication between students and teachers are evident. Teachers as the main source of knowledge guide the students in the learning process.

Extrinsic motivation. A type of motivation when students are granted tangible rewards for the highly gratifying performance in class.

Intrinsic motivation. A type of motivation when learners do something because it is interesting, enjoyable, and fun. Learners perform the activity because they find it challenging and engaging and eventually elicits feeling of satisfaction and pleasure. This is doing of an activity for its inherent satisfactions rather than for some separable consequence.

Learning delivery modalities. This is the mode, method or paradigm in which something is done. It is when learning takes between the teachers and students who are remote from each other during instruction.

Lifelong learning. Basically, this is the practice of continuing to learn, the process of gaining knowledge and learning new skills throughout one's life. This is going beyond formal education.

Pre-requisite knowledge. This anything that students need to know before learning and understanding new concepts. Students are geared up for something new and of higher level but still on related course.

Synchronous learning. This type of learning which students learn from a distance, attending virtual classes with the teacher and classmates. In synchronous learning, students may ask questions and receive on-the-spot answers, more engaged on learning, and feel connected to their peers.

Transactional learning. This happens by way of interactions with people, particularly, students and teachers. This is a communicative activity that involves two parties (like students and teachers) or things that influence each other.

2. PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter systematically presents the analyses and interpretations of the gathered data to verify and substantiate the problems being studied. This study also assesses the respondents' academic performance during the pre-test and post-test covering the topic, Probability of Compound Events, in terms of illustrating event, and union and intersection of events, illustrating the probability of a union and intersection two events, and illustrating and finding the probability of mutually exclusive events. Furthermore, determining the level of achievement, the significant difference and significant mean difference in the pre-test and post-test between the modular group and the online group were also considered.

The types of statistics used to analyze the data were frequency count, paired t – test, and t – test for independent samples. Frequency count is used to determine the number of respondents fit into a certain category or the number of times a characteristic occurs. This is to identify the level of academic achievement of the respondents. Paired t – test is used to determine the significant difference between the two variables in the study. It is a method used whether the mean difference between pairs of measurements is zero or not, at the same time, and T – test for Independent Samples is used to test the significant mean gain difference between the scores of the pre-test and post-test of the respondents.

LEVEL OF ACADEMIC ACHIEVEMENT OF THE TWO GROUPS IN PROBABILITY OF COMPOUND EVENTS DURING PRETEST

The respondents who were grouped into Online and Modular were given multiple choice test before taking up Probability of Compound Events. This determined their readiness toward the topic as the main focus of the study.

In addition to, the table below displays the difference in terms of the average obtained and the standard deviation garnered between the two groups in relation to the range of scores.

Table 2 Level of Academic Achievement of the Two Groups in Probability of Compound Events during Pretest

Level	Ranges of Scores	Online		Modular	
		F	%	f	%
Excellent	33-40	0	0.00	0	0.00
Very Good	25-32	10	25.00	3	7.50
Good	17-24	9	22.50	11	27.50
Fair	9-16	19	47.50	25	62.50
Poor	0-8	2	5.00	1	2.50
Total		**40**	**100**	**40**	**100**
Average		17.23		15.48	
Standard Deviation		7.44		4.62	

Table 2 reveals the range of scores of both online learning and modular learning groups having no score obtained displaying a magnificent performance. The online learning group displayed a highly gratifying performance. The modular group also exhibited a higher percentage of scores obtained displaying an adequate performance. However, the online group showed scores of insufficient performances lower than the modular group. The online group had higher number of respondents needing further guidance and assistance.

It is vividly found in the table that a huge percentage of students both in online and modular groups displayed an adequate performance based on the scores obtained. One primary reason is that pre-test questionnaires were provided a week before the distribution of modules of the covered competencies of the topic Probability of Compound Events. Basic concept regarding Probability was tackled in Grade 8, however, poor attention span is considered as one deterring factor affecting the scores. The study of Cicekci & Sadik (2019), defined that attention is the state of mental awareness and focus. According to Halcom (2018), attention span is shorter than that of a goldfish. When it comes to learning, students lose focus, distracted, and are wandering away to things being taught. Necessary learning is lost. Furthermore, students' academic performance is affected by several factors which include students' learning skills, parental background, peer influence, teachers' quality, learning infrastructure among others (Oyediranet. al, 2018).

LEVEL OF ACADEMIC ACHIEVEMENT OF THE TWO GROUPS IN PROBABILITY OF COMPOUND EVENTS DURING POSTTEST

Post-test was given after two weeks of undertaking up Probability of Compound Events. The respondents were allotted time to answer independently the test. The paramount purpose of the post-test is to find out the level of achievement of the respondents.

Table 3 Level of Academic Achievement of the Two Groups in Probability of Compound Events during Posttest

Level	Ranges of Scores	Online		Modular	
		f	%	f	%
Excellent	33 - 40	3	7.50	0	0.00
Very Good	25 - 32	8	20.00	1	2.50
Good	17 - 24	15	37.50	25	62.50
Fair	9 - 16	14	35.00	14	35.00
Poor	0 - 8	0	0.00	0	0.00
Total		**40**	**100**	**40**	**100**
Average		20.98		18.25	
Standard Deviation		7.11		4.78	

The table shows the academic achievement of the two during post-test. The online group of respondents have scores obtained displaying a magnificent performance. The modular group displayed a highly gratifying performance very much lower than the online learning group.

Meanwhile, the modular group exhibits higher percentage with scores obtained displaying an adequate performance. Both modular and online groups show an insufficient performance. Likewise, no respondents need further guidance and assistance either online learning or modular group as both groups present same performance.

As gaudily seen in the table, there are reasonable factors affecting the performance of the respondents. The topic Probability of Compound Events with three (3) learning competencies were tackled in two weeks thus respondents of the modular group have ample time to scribble down salient points including illustrative examples as guides while the online group had two virtual classes of the said learning competencies. Getting acquainted to the topic other than the sufficient time allotted were deemed factors that eventually helped the respondents improved their performance. More so, time management is correspondingly a noteworthy reason. It allows students to get more focused and time is not emaciated on distractions. Effective time management is associated with greater academic performance and lower levels of anxiety in students; however, many students find it hard to find a balance between their studies and their day-to-day lives (Adams & Blair, 2019).

TEST OF SIGNIFICANT DIFFERENCE BETWEEN THE PRETEST AND POSTTEST SCORES OF THE RESPONDENTS WHO ARE ENGAGED IN MODULAR LEARNING

The table exhibits the existence of the significant difference between the pre-test and post-test scores as the sources of difference of the modular learning group. Likewise, the table shows either to reject or accept the hypothesis and its corresponding result as significant or not.

Table 4 Test of Significant Difference between the Pretest and Posttest Scores of the Respondents who are engaged in Modular Learning

Source of Difference	Mean	Standard Deviation	Mean Difference	Computed t- value	p-value	Decision	Result
Pretest	15.48	4.62	2.77	5.901**	0.000	Reject Ho	Significant
Posttest	18.25	4.78					
**significant at p < 0.01 (two-tailed); df=39							

As revealed in table 4, the results on the significant difference between the pre-test and post-test scores of the respondents engaged in the modular learning display a better performance in the post-test. Respondents' post-test scores show a higher standard deviation which implies that data are widely spread out as compared to the pre-test scores. A computed t – value indicates very strong evidence of learning. The p – value, furthermore, implies that the null hypothesis, "there is significant difference between the pre-test and post-test scores of the respondents engaged in the modular learning" is rejected. Thus, the findings showed significant difference on the academic performance of the respondents. Exposing the respondents with abundant time to the world of probability carried them through to a good performance. Using modules for learning leads to better self-study or learning skills among students. The concepts presented in the modules engross students in learning. The tasks provided develop a sense of responsibility among students (Betlen, 2021).

TEST OF SIGNIFICANT DIFFERENCE BETWEEN THE PRETEST AND POSTTEST SCORES OF THE RESPONDENTS WHO ARE ENGAGED IN ONLINE LEARNING

Pre-test and post-test scores of the online learning group were correspondingly tested if there exists a significant difference between the scores. It is either to reject or accept the hypothesis, and at the same token, determine the result as significant or not.

Table 5 Test of Significant Difference between the Pretest and Posttest Scores of the Respondents who are engaged in Modular Learning

Source of Difference	Mean	Standard Deviation	Mean Difference	Computed t- value	p-value	Decision	Result
Pretest	17.23	7.44	3.75	4.694**	0.000	Reject Ho	Significant
Posttest	20.98	7.11					
**significant at p < 0.01 (two-tailed); df=39							

Table 5 showcases the results on the significant difference between the pre-test and post-test scores of the respondents engaged in online learning. Post-test scores disclosed an improved performance as compared to the pre-test scores. Correspondingly, respondents' pre-test scores demonstrated higher standard deviation. This implies that data are widely spread out than the post-test scores. The computed t – value still specifies very strong evidence of learning. The p–value indicates that the null hypothesis, "there is significant difference between the pre-test and post-test scores of the respondents engaged in online learning" is rejected. The findings disclosed significant difference on the academic performance of the respondents.

The period allotted for virtual discussion, the engagement to varied meaningful activities involving probability, the freewill to raise levelheaded questions, instructor quality, the initiative of the teacher in creating a fun and

interactive discussion directed the respondents to someway easily grasp the concept thus producing a better outcome. Furthermore, prompt feed backing of the performance and students' expectation are two looked-for factors to ponder. Factors like the quality of instructor, course design, prompt feedback, and expectation of students positively impact students' satisfaction and further student's satisfaction positively impacts students' performance (Aggarwal et al., 2021).

TEST OF SIGNIFICANT MEAN GAIN DIFFERENCE BETWEEN THE PRETEST AND POSTTEST SCORES OF THE TWO GROUPS

The table demonstrates the significant mean gain difference prevailing between the two groups of the respondents. Furthermore, the decision is visibly presented as to accept the hypothesis and describing the result as insignificant.

Table 6 Test of Significant Mean Gain Difference between the Pretest and Posttest Scores of the Two Groups

Source of Difference	Mean Gain	Standard Deviation	Mean Gain Difference	Computed t- value	p-value	Decision	Result
Online Learning	3.75	5.05	0.97	1.052	0.297	Do not reject Ho	Not Significant
Modular Learning	2.77	2.97					
*significant at $p < 0.05$ (two-tailed)							

It is found in the table the significant mean gain difference between the pre-test and post-test scores of both the online and modular learning groups. The online group displays a higher mean than the modular group. This means that respondents of the online group performed better than those in the modular group.

Online group has a higher standard deviation compared to the modular group. A small computed t-value tells that the two groups are similar. The p-value explains that the null hypothesis, "there is no significant mean difference between the pre-test and post-test scores between the two groups" is accepted.

Moreover, the table shows online learning platform provided beneficial effects to respondents. It is in this learning modality that learning instructional materials, learning activities, and practice can be accessed. Students were comfortable communicating and interacting with classmates and lecturers electronically. Besides, they might also be able to manage their study time and self-disciplined (Oktaviani, 2021).

3. SUMMARY, FINDINGS, CONCLUSION, AND RECOMMENDATIONS

SUMMARY

This research aimed to assess the effectiveness of learning modalities during the COVID-19 pandemic toward the academic achievement of the students in mathematics at Matab-ang National High School in Toledo City, Cebu as basis for instructional support development plan. The respondents were grouped into two – modular and online learning. Pre- test and post-test questions were provided to the respondents to answer. Pre- test and Post-test Scores were used to interpret the results of the study. The gathered data were treated statistically using frequency count, paired t-test, and T-test for Independent Samples.

FINDINGS

Based on the results of the data that were gathered and treated statistically, the following findings were arrived. Respondents participating in the online discussion of the topic Probability of Compound Events displayed a better performance both in the pre-test and post-test. The modular group demonstrated an adequate to highly gratifying level of achievement.

Furthermore, the test of significant mean gain difference based on the pre-test and post-test score showed that there is no significant difference regarding the level of academic achievement of the respondents of both online and modular groups.

CONCLUSION

Based on the findings of the study, it can be concluded the learning modality the school adopted has contributed a huge impact toward the level of academic achievement of the students in mathematics. Additionally, several factors are to be pondered as to why numerous respondents perform appallingly in mathematics, viz, the learning skills, parental background, peer influence, teacher's quality, learning infrastructure, among others. On the other side, implementing an expedient learning modality can be a good route in transpiring knowledge to the learners.

RECOMMENDATION

In light of the findings of the study, it is highly recommended that the instructional support development plan to address the needs of the respondents in strengthening and enhancing mathematical skills and learning be implemented.

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