Hybrid Instructional Model in Mathematics

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Abstract — The main goal of this study is to develop a hybrid instructional model in mathematics. This study employed a sequential explanatory mixed method research design which is composed of two stages. The first stage followed the quasi-experimental research design in determining the effect of hybrid instructional modality on students' mathematics achievement using a standardized mathematics achievement test. The second stage is designed following the principles of phenomenology to investigate the experiences and challenges of the students exposed to hybrid instruction and modular instruction in mathematics using a validated interview schedule. The study was participated by two groups of Grade 7 students, following the regular K to 12 curricula. The groups were randomly assigned as experimental and control groups during the quantitative stage while a purposive sampling technique was employed in the qualitative stage of the study. The result of the study revealed that, the students exhibited level 1-beginner level of mathematics achievement during the early stage of the study. However, after the experiment, the students who were exposed to hybrid instruction demonstrated level 2-developing proficiency while the modular group showed no improvement, indicating that, hybrid instruction was better than modular instruction in improving students' mathematics achievement. The qualitative data revealed that students who receive hybrid instruction in mathematics have distinctive learning experiences. Real-time communication and engagement between students and teachers during hybrid instruction helped the students better understand mathematical concepts. Additionally, the hybrid learners had access to motivate and engage audio-visual elements that fostered critical thinking and enhanced the understanding of mathematical topics. These elements worked together and influenced students' math achievement. Additionally, noisy locations, under powered technology, and intermittent connectivity made it difficult to deliver hybrid learning, which decreased its beneficial effects on math learning. Nevertheless, the students described these difficulties and sought quiet setting and concentrated on class conversations..

Keywords — Hybrid Instructional, Modular, Mathematics, K to 12 Curricula

I.   Introduction

Today, the delivery of instruction in Philippine basic education focuses on the use of flexible approaches such as modular instruction and a hybrid form of instruction which encompasses the utilization of synchronous and asynchronous online sessions. It has been observed that, these forms of instructions are implemented by teachers across disciplines including mathematics. In the context of Zamboanga del Norte Division, Philippines, public secondary schools have adopted a blended learning approach to continuously deliver

mathematics education to all students in the secondary level. In this instructional approach, modules are provided to the learners in which they have to work according to their own pace of learning Silkwood, (2000). In addition, teachers also conduct synchronous and asynchronous instructions to students who have the technology and internet connectivity to attend online classes.

The implementation of hybrid instruction is viewed as an efficient system of teaching and learning to fulfill the instructional needs of students and teachers at distant locations during pandemics and beyond. Although there have been reports and studies about the effectiveness of synchronous and asynchronous online instructions to improve student's learning achievement, the way mathematics teachers articulate the process of doing hybrid instruction remains theoretically ambiguous which signifies a threat to the delivery of quality mathematics instruction.

With the aforementioned gaps and issues, there is a need to develop an instructional model that will serve as a guide among teachers and educational leaders to provide meaningful and effective delivery of hybrid instruction in mathematics. Hence, this study will embark on experimenting the effect of hybrid instruction in mathematics to students' mathematics performance. The study also aimed at comparing the mathematics performance of students who were exposed to hybrid instruction and modular instruction, including their experiences and challenges to serve as bases for developing the hybrid instructional model in mathematics.

Statements of the Problem

This study aimed to determine the effects of hybrid instruction and modular instruction to students' mathematics achievement in Bacungan National High School and Manukan National High School School Year, 2021-2022. Specifically, this study sought to answer the following questions:

1. What is the mathematics achievement pre-test result of the control and experimental group?

2. What is the mathematics achievement post-test result of the control and experimental group?

3. Is there a significant difference in the mathematics achievement pre-test results of the control and experimental group?

4. Is there a significant difference in the mathematics achievement post-test results of the control and experimental group?

5. Is there a significant difference in the mathematics achievement pre-test and post-test results of the control and experimental groups?

6. What are the experiences encountered by the students exposed to modular and hybrid instruction?

7. What are the challenges encountered by the students exposed to modular and hybrid instruction?

8. On the basis of the findings, what hybrid instructional model in mathematics can be designed?

Hypotheses.

There is no significant difference in the mathematics achievement pre-test and post-test results of the control and experimental groups.

Significance of the Study

The study is to support policy formulation and possible intervention that focuses on the use of a hybrid instructional model in teaching mathematics in the regular K to 12 program and can use the findings of the study in the formulation of flexible teaching and learning curriculum in mathematics in the regular K to 12 program, aligned with the learning continuity plan of the department with emphasis on the effective utilization of the online platforms to support the ideal implementation of synchronous and asynchronous in mathematics in the regular K to 12 program and to developed hybrid instructional model to provide technical assistance to schools and teachers on the effective implementation of hybrid instruction in mathematics during the time of pandemic and beyond. Further, the SPS may benchmark on the developed instructional materials developed in the study to improve the provision and availability of quality teaching and learning materials in mathematics for students and instructional support materials for teachers to effectively and efficiently implement hybrid instruction in mathematics and to introduce new and effective modes of instruction to achieve higher learning outcomes in mathematics. The study's findings can also provide evidence-based information to the schools' heads, which can be utilized to guide staff development. The study can provide information on the effect that hybrid instruction has on students' achievement in mathematics, which can be used as an intervention strategy to eliminate the potential threat of pure modular instruction to students' achievement in mathematics.

Conceptual Framework

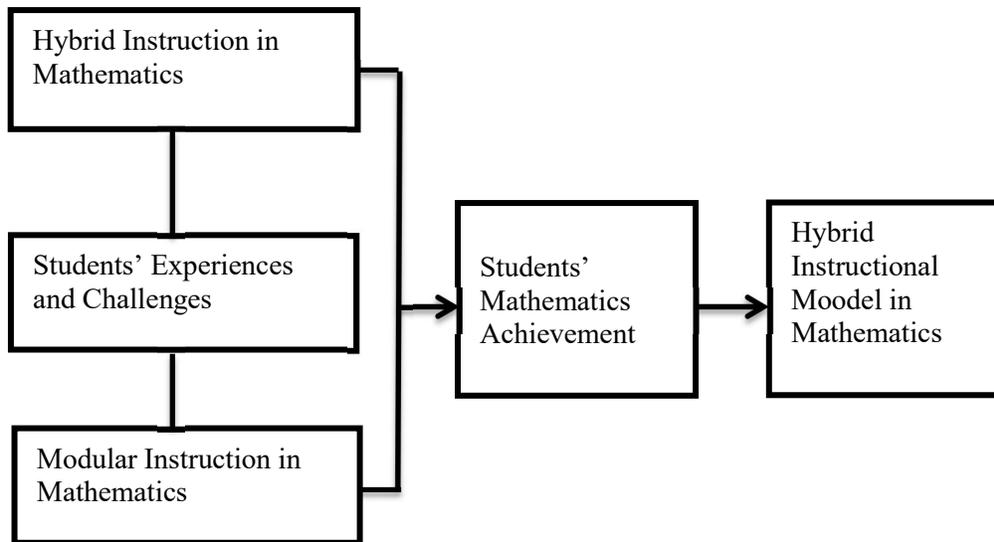The Conceptual Framework shows the Hybrid Instructional Model in Mathematics.

Figure 1. Conceptual Framework of the Study

II. Methodology

Research Design

The mixed-methods sequential explanatory design was used in this study which consisted of two phases. This entails gathering and analyzing quantitative data, followed by gathering and analyzing qualitative data.

Figure 2 shows the visual model of the research design procedures that was used in the study.
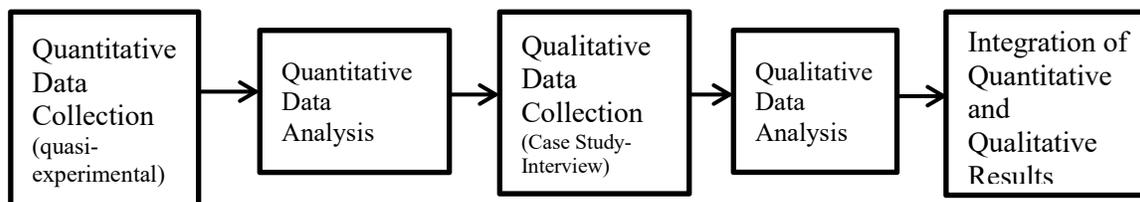
Figure 2. The Research Design Process

This design involved two equivalent groups of students who were assigned to compose the experimental and control groups. The experimental group was exposed to hybrid instruction while the control group was exposed to modular instruction. Both groups were given a pre-test before the intervention and a post-test after the intervention in the light of finding answers to the

specific questions that guided the study. The quantitative data were analyzed using descriptive and inferential statistics.

After the quantitative data was analyzed, the qualitative phase commenced which followed a case study approach. An interview method was used to gather in-depth information and provided clarification on the statistical results. The interview questions were based on the results of the experiment and the experiences of the students as a result of exposure to hybrid instruction and purely modular instruction in mathematics. Finally, the qualitative results were integrated into the interpretation of quantitative findings to provide in-depth and valid research findings and conclusions..

Research Locale

The study was conducted in the two identified Junior High Schools (JHS) in the schools division of Zamboanga del Norte, one is in the Municipality of Manukan, while the other one is in the Municipality of Bacungan. The schools offer the regular K to 12 education program and Science Technology, Engineering, and Mathematics (STEM)..

Population and Respondents of the Study

The respondents of the study is composed of two groups of Grade 7 students who are enrolled in the regular K to 12 program..

Table 1. Demographic Profile of Respondents

Group	Gender		
	Male	Female	Total
Experimental (Hybrid)	10 (25.00%)	30 (75.00%)	40 (100%)
Control (Modular)	15 (37.50%)	25 (62.50%)	40 (100%)

Sampling Design

The researcher utilized two-stage sampling method. Since the quantitative stage of the study employed a quasi-experimental research design where a random selection of the individual respondents is not possible, the researcher randomly assigned two intact groups of Grade 7 students to compose the experimental and control group. The distribution of the respondents in each group is presented in the table below Specifically, the researcher employed a purposive sampling technique to select the students who participated in the interview.

The criteria for selecting the interview participants are the following; (1) the student should have mathematics achievement post-test scores that fall in the bottom 20% of the class for both hybrid and modular instruction; (2) the student volunteered to participate as an interview participant with the approval of his/her parents or legal guardian; and (3) the student should have a stable internet connection or network signal to facilitate the conduct of the virtual interview.

Research Instrument of the Study

The Mathematics Achievement Test (MAT) is a paper and pencil test that is intended to measure students' scientific knowledge and skills on the specific topics that were covered in the experiment that includes the following: (1) Introduction to statistics; (2) Gathering Statistical Data; (3) Organizing Data in a Frequency Distribution; (4) Data Representation; (5) Appropriate Graphs to Represent Organized Data; (6) Measures of Central Tendency; (7) Measures of Variability ; (8) Application of Statistics.

The test was developed by the Department of Education-Region IX. The items in the MAT were presented in a multiple choice format with four options for each item. The test items were constructed following bloom's taxonomy to ensure content validity and balance distribution of the items in terms of the level of difficulty. The MAT is composed of seventy-one (71) items which were prepared by the mathematics teachers and validated by mathematics experts in the Zamboanga Peninsula. Hence, the MAT was deemed valid and reliable.

On the other hand, the Interview Guide on Students' Mathematics Achievement in Hybrid and Modular Instruction (IGSMAHMI) was a tool that was composed of semi-structured test questions which were intended to obtain information about the lived experiences and challenges of the students exposed to hybrid instruction and modular instruction in mathematics. This instrument has two parts. The first part was composed of two major questions with follow-up questions which were focused on asking questions regarding students' experiences and challenges after being exposed to hybrid instruction in mathematics. Further, the second part of the tool was composed of two major questions with follow-up questions which were designed to collect information on students' experiences and challenges in learning mathematics through a modular approach.

Validity and Reliability of the Research Instrument

The instrument was adopted entoto with no modification. However, to verify the validity of the items, the instrument was checked by three master teachers in mathematics to ensure its usability in the study. On the other hand, the Interview Guide on Students' Mathematics Achievement in Hybrid and Modular Instruction (IGSMAHMI) was validated by three research experts to ensure its appropriateness in the current study.

Data Gathering Procedure

Prior to the implementation of the experiment, the researcher developed semi-detailed learning plans and instructional materials that were used to implement hybrid instruction in mathematics. The lesson plans were aligned with the content of the modules and followed the 4 A's instructional template. The topics that were covered include the following: (1) Introduction to statistics; (2) Gathering Statistical Data; (3) Organizing Data in a Frequency Distribution; (4) Data Representation; (5) Appropriate Graphs to Represent Organized Data; (6) Measures of Central Tendency; (7) Measures of Variability ; (8) Application of Statistics.

Statistical Tool

Mean Percentage Score (MPS) was used to describe the mathematics achievement pre-test and post-test results of the students exposed to hybrid instruction and modular instruction and Independent t-Test was used to determine if significant differences exist in the mathematics achievement pre-test of the students who were exposed to hybrid and modular instruction in mathematics. Paired t-Test was used to determine if there is a significant increase in the mathematics achievement pre-test and post-test of students who were exposed to hybrid instruction in mathematics. The same statistical tool was used to test of significant differences exist in the mathematics achievement pre-test and post-test scores of the students exposed to modular instruction in mathematics. Cohen's D was used to determine the effect size and assess how effective is hybrid instruction and modular instruction in mathematics in terms of improving students' mathematics performance. Thematic analysis was carried out by analyzing qualitative data obtained from the interview.

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

Table 2. Mean Percentage Score (MPS) of the Pre-test Results of the Experimental (Hybrid Instruction) and Control (Modular Instruction) Groups

Topics Covered	Experimental (Hybrid)		Control (Modular)	
	Mean Score	Interpretation	Mean Score	Interpretation
Introduction to Statistics	42.60	Beginner	32.60	Beginner
Gathering Statistical Data	29.67	Beginner	18.83	Beginner
Organizing Data in a Frequency Distribution	25.50	Beginner	26.00	Beginner
Data Representation	30.00	Beginner	27.00	Beginner
Appropriate Graphs to Represent Organized Data	23.00	Beginner	23.70	Beginner
Measures of Central Tendency	20.80	Beginner	23.20	Beginner
Measures of Variability	22.50	Beginner	20.50	Beginner
Application of Statistics	25.50	Beginner	23.50	Beginner
Overall Mean	**27.65**	**Beginner**	**26.97**	**Beginner**

Legend: *≤ 50% (Beginner), 51-60% (Developing Proficiency), 61-75% (Proficient), ≥ 76% (Advanced Proficiency)*

The experimental group has an over all mean score 27.65 interpreted as beginner. This means that the students have little background on the topics that were presented before the experiment. This implies that students have limited lessons and experiences on the topics presented. While, the control group has an over all mean score 26.97 interpreted as beginner.

This means that, the students have little background on the topics that was presented before the experiment. This implies that, students have limited prior knowledge and experiences on the topics presented. The results indicated that students have prior knowledge of the different mathematics topics included in the MAT which resulted to achieve certain scores even before the contents were taught to them. However, the knowledge of the students on the covered mathematics topics were not enough to demonstrate a higher level of mathematics achievement. This means that an instructional intervention was necessary for students to gain a higher level of mastery of mathematics concepts. This implies that at the start of the experiment, both the experimental and control groups have equal prior knowledge about the lessons given to them.

Table 3. Mean Score in Post-test of the Experimental (Hybrid Instruction) and Control (Modular Instruction) Groups

Topics	Experimental (Hybrid)		Control (Modular)	
	Mean Score	Interpretation	Mean Score	Interpretation
Introduction to Statistics	81.60	Advanced Proficiency	44.60	Beginner
Gathering Statistical Data	53.00	Developing Proficiency	24.16	Beginner
Organizing Data in a Frequency Distribution	51.00	Developing Proficiency	30.80	Beginner
Data Representation	56.50	Developing Proficiency	35.30	Beginner
Appropriate Graphs to Represent Organized Data	32.70	Beginner	32.80	Beginner
Measures of Central Tendency	45.50	Beginner	29.30	Beginner
Measures of Variability	62.30	Proficient	29.00	Beginner
Application of Statistics	52.50	Developing Proficiency	37.80	Beginner
Overall Mean	**54.39**	**Developing Proficiency**	**32.97**	**Beginner**

Legend: *≤ 50% (Beginner), 51-60% (Developing Proficiency), 61-75% (Proficient), ≥ 76% (Advanced Proficiency)*

The experimental group has an over all mean score, 54.97 interpreted as Developing Proficiency. This means that the students are working on the skills required and needs some help to be successful. This implies that, students pass lessons and experiences on the topics presented and used them to acquire the necessary skills needed to understand and learn the topics presented. While, the control group has an over all mean score 32.97 interpreted as beginner. This means that, the students were not able to acquire skills on how to master on gathering statistical data and organizing data using the frequency distribution. This implies that, students cannot understand the concepts on Gathering Statistical Data using the modular technique without the help or further explanation from the teachers.

Further, the students in the experimental and control groups differed in the over all mean. The overall mean of the   experimental group   indicated that, the students improved their

achievement when exposed to hybrid instruction in mathematics while the overall mean of the control group remains the same as beginner which indicated no change in terms of mathematics achievement. These results shows that, students have better understanding of concepts and gained a higher level of mastery when exposed to hybrid instruction in mathematics. This is because students were given the chance to interact with their teachers and classmates and clarified ideas during synchronous sessions.

Table 4. Independent t-Test Analysis Result of the Pretest Scores of the Experimental and Control Groups

Groups	Mean	Df	t- value	p-value	Interpretation
Experimental	19.63				
		78	0.393	0.6925	Not Significant
Control	19.15				

α = 0.05

The pre-test mean score of the experimental group (19.63) was higher than the pre-test mean score of the control group (19.15). However, when the mean difference was tested, the result revealed that, the computed p-value (0.6925) is higher than the 0.05 level of confidence. This means there was no significant difference in the mathematics achievement of the pre-test results of the control and experimental groups.The hypothesis which states that, there is no significant difference in the pre-test mean scores of the control and experimental groups was accepted. This implies that, the mathematics performance of the experimental and control groups were just the same prior to the experimentation, and indicated that the experimental and control groups have similar achievement in mathematics achievement.

Table 5. Independent t-Test Analysis Result of the Post-test Scores of the Experimental (Hybrid Instruction) and Control (Modular Instruction) Groups

Groups	Mean	Df	t-value	p-value	Effect Size	Interpretation
Experimental	37.20					
		78	6.702	<0.001	1.50	Significant
Control	23.15					

α = 0.05

The post-test mean score of the experimental group (37.30) was higher than the post-test mean score of the control group (23.15). Further, when the mean difference was tested, the result revealed that, the computed p-value (<0.001) was lower than 0.05 level of confidence. This means there was a significant difference in the mathematics achievement of the post-test results of the control and experimental groups.The hypothesis which states that, there is no significant difference in the post-test mean scores of the control and experimental groups was rejected. Further, the calculated effect size (d=1.50) was interpreted as a "large effect"

indicating that the mean of the experimental group was at the 93rd percentile of the control group. This means that, the students exposed to hybrid instruction performed significantly better in mathematics than the students who were exposed to purely modular instruction. This implies that, hybrid instruction significantly improved students' mathematics achievement than modular instruction. This is because hybrid instruction offered an opportunity for active interaction between and among the players in the instructional process and students were also given the chance to enhance their learning through the use of varied and interactive instructional materials which were not available in modular instruction.

Table 6. Paired t-Test Analysis Result of the Pretest and Post-test Mean Scores of the Experimental Group (Hybrid Instruction)

Paired Tests	Mean	t-value	Df	p-value	Effect Size	Interpretation
Pretest	19.63					
Posttest	37.20	9.645	39	<0.001	1.93	Significant

$\alpha = 0.05$

The overall post-test mean score ($\mu=37.20$) of the experimental group was higher than the pretest mean score ($\mu=19.63$). When a paired t-Test was carried out to test the mean difference at 0.05 level of confidence, result revealed that the difference in the mean was significant (p= <0.001). This indicated that there was a significant difference in the Pretest and Post-test Mean Scores of the Experimental Group (Hybrid Instruction). The hypothesis, which states that there is no significant difference in the Pretest and Post-test Mean Scores of the Experimental (Hybrid Instruction) Group was rejected.

Further, the calculated effect size (d=1.93) is interpreted as a "large effect" indicating that the post-test mean score is at the 97th percentile of the pretest score. Therefore, there was a significant difference in the mathematics achievement pre-test and post-test results of the experimental group. The result further indicated that, hybrid instruction has a significant and large effect on students' mathematics achievement. The result implies that exposure to hybrid instruction significantly improved students' mathematics achievement. This could be explained by the fact that hybrid instruction provided students with an opportunity to interact with their teacher which facilitated a better understanding of mathematical concepts. Furthermore, hybrid instruction is a combination of synchronous and asynchronous instructions that gives differentiated instruction to at least give opportunity to students to understand better the mathematical concept.

Table 7. Correlational t-Test Analysis Result of the Pretest and Post-test Mean Scores of the Control (Modular Instruction) Group

Paired Tests	Mean	t-value	df	p-value	Effect Size	Interpretation
Pretest	19.15					
Posttest	23.15	6.571	39	<0.001	0.681	Significant

α = 0.05

The post-test mean score (μ=23.15) of the control group was higher than the pretest mean score (μ=19.15). When the mean difference was tested using a paired t-Test, the result shows that, the p-value (<0.001) is lower than the alpha level of 0.05. This indicated that there was a significant difference in the Pretest and Post-test Mean Scores of the control Group (modular Instruction). The hypothesis, which states that there is no significant difference in the Pretest and Post-test Mean Scores of the control Group (modular Instruction) is rejected. This means that modular instruction significantly improved the mathematics achievement of students.

The calculated effect size (d=0.68) indicated that the mean of the post-test was at the 76th percentile of the pretest. This means that, modular instruction in mathematics generally has a "medium effect" on the mathematics achievement of the students. This implies that modular instruction significantly improved students' mathematics achievement. However, hybrid instruction was far better than modular instruction in terms of improving students' mathematics achievement as supported by the large effect of hybrid instruction to students' mathematics achievement. This was because students can have a good interaction with their classmates and their teacher. They can ask clarification or more explanation on topics that they do not understand. This is because, hybrid instruction gives opportunity to the learners to improve mathematical achievement through collaborative, interactive activities among learners. It also allows students to ask for further clarification if the subject taught was not understood.

Experiences of the Students Exposed to Hybrid Instruction in Mathematics:

Communication and Interaction: The results revealed that respondents experienced real-time discussions in mathematics through hybrid instruction. The results indicated that, the use of hybrid instruction in mathematics allowed students to interact with their classmates and teachers in real-time which improved their overall learning experiences in mathematics. The data implied that, when students were exposed to hybrid instruction in mathematics, they got the opportunity to interact and communicate with their classmates and peers which contributed to the improvement of students' mathematics achievement.

Pedagogical Practices: The result shows that, students mentioned experienced

collaborative learning and most of them also stated that, they experienced being exposed to engaging audio-visual materials in mathematics when they were exposed to hybrid instruction. This indicated that, the students who were exposed to hybrid instruction were exposed to collaborative learning opportunities in mathematics and their mathematics learning was supported with the use of effective and engaging audio-visual materials. This account implied that students' mathematics achievement improved when students were exposed to online collaborative activities and engaged in audio-visual materials in mathematics.

Mathematical Concepts Understanding: The students stated that, they experienced understanding of lesson content and experienced an understanding of assessment instructions when they were exposed to hybrid learning modalities in mathematics. The data indicated that, the students understand the lesson in mathematics and they can easily understand assessment instructions that contributed to the understanding of mathematical concepts. This account implies that when students were exposed to hybrid instruction, they gain a better understanding of mathematical concepts that contribute to the enhancement of their mathematics achievement.

Experiences of the Students Exposed to Modular Instruction in Mathematics:

Opportunities for Involvement and Communication. The result of the interview revealed that, students' experienced opportunities for involvement and communication as a result of exposure to modular instruction in mathematics. Appendix O shows the sub-themes and responses of the students under mathematical concepts understanding which included (1) parent involvement, (2) student-student communication and (3) student,t-teacher communication were presented and discussed. The data shows that, the students experienced communicating with their parents in modular learning. The results indicated that, students experienced interacting with their parents, teachers, and fellow students through the use of an online platform. This implies that when students were exposed to modular learning in mathematics, it was important to enhance the mode of communication for the improvement of students' learning in mathematics .

Guided Independent Learning: The result of the interview showed that, the students also went through the guided independent learning as they were exposed in modular instruction in mathematics. Three sub-themes included (1) self- study, (2) student-student communication, and (3) student-teacher communication are presented and discussed. This indicated that, students exposed to modular instruction in mathematics experienced self-study and communicated with their classmates and teachers to gain some understanding of mathematics concepts. This implies that, students who were exposed to modular mode of learning improve their mathematics achievement and level of communication and network of support that helped them understand mathematical concepts.

Challenges Encountered by Students Exposed to Hybrid Instruction:

Disturbing Learning Environment: Based on the interview data, one of the major themes that emerged in the study, reflecting the challenges that the students have encountered a result of exposure to hybrid instruction have a disturbed learning environment that affected their mathematics learning using hybrid learning. The result revealed that, the students said that one of the challenges encountered in hybrid learning was having a noisy learning environment. This indicates that in hybrid learning, students get disturbed in focusing on online instruction when their environment was very noisy. This implies that for hybrid learning to become effective, students should be provided with a conducive learning environment that is free from noise and disturbances. Otherwise, having a disturbing noisy environment may have a serious negative effect on students' mathematics learning and achievement.

Technological Limitations: The data also revealed that, students who were exposed to hybrid instruction experienced challenges in terms of technological limitations. There were three sub-themes under technological limitations which included unstable connection, defective gadgets, and power interruptions. These sub-themes, with the corresponding responses of the students are presented. The students said that, they experienced unstable internet connections which contributed to the challenges they experienced in hybrid mathematics learning. The results indicated that, the lacked of stable internet connection and the availability of functional gadgets were factors to consider in hybrid learning in mathematics. This implied that having a poor internet connection and unstable internet connection affected the quality of learning experiences and consequently affected the quality of mathematics learning and achievement of the students.

Articulation to Address Challenges in Hybrid Learning: The result of the interview showed that, students also addressed the challenges they encountered in hybrid learning. The two sub-themes that emerged were included as paying attention and a noise-free environment. The responses of the students under each sub-theme are presented followed by the discussion and interpretation. The students said they really paid attention to the online discussion to gain a sound understanding of mathematical concepts discussed during the hybrid teaching sessions.

Challenges Encountered by Students Exposed to Modular Instruction:

Complexity of Module Content: The result of the interview revealed that, the students were challenged in modular learning because of the complexity of modular content. The thematic analysis also revealed that, three sub-themes such as, explaining the challenges in terms of the complexity of module contents. The sub-themes include difficulty understanding, voluminous activities and complexity of language. The result revealed that, the students said they found it difficult to understand mathematics content using the modules. The result indicated that the complexity of language used in the modules and including too many activities in the modules resulted in task overloading which overwhelmed students and contributed to the negative impact of modular instruction on their learning in mathematics. The results implied

that, teachers need to reassess the number of activities provided in the modules, including the language used as these may have a significant impact on students learning and achievement in mathematics.

Independent Learning: The interview data revealed that engaging in individual learning was also one of the challenges that, students experienced as they were exposed to modular instruction in mathematics. Three sub-themes emerged based on the thematic analysis result which included internet access, self-learning, and lacked of student-teacher interaction. The responses of the students on each theme is presented and discussed. The students experienced challenges in terms of securing a stable internet access. The data indicated that when students do not have sufficient access to the internet, they found it difficult to search for information they need to answer the difficult parts of the module. Also, the students' inability to communicate with their teachers made it difficult for them to clarify instructions and salient components of the modules. Collectively, the lack of internet and communication affects students' ability to perform effective self-study which has a negative effect on their mathematics achievement and learning.

Articulation to Address Challenges in Modular Learning: The students also applied strategies to articulate the challenges they encountered in learning mathematics through the use of modules. The sub-themes under articulation of challenges is presented and subsequently discussed. The students said they sought help from their parents and family members to address the challenges they encountered in learning mathematics through the use of the modules. The result indicates that parental involvement and support of the family was important for successful self-learning in mathematics to happen. This means that, when the family members are involved in modular learning, students got the chance to address the learning challenges they experienced and this benefit their academic achievement.

Hybrid instructional model in mathematics can be developed based on the findings

The implementation of hybrid and modular instruction is based on the fundamental principles of instructional flexibility that aim to provide for the educational needs of the students under the distance education scheme. From the findings that were generated based on the analysis of data, this study seeks to present an instructional model that will fit the type and characteristics of learners at the basic education level, specifically the students in the state-owned lower secondary academic institutions in Zamboanga del Norte, Philippines.

The data that were used to support the development of the hybrid instructional model in mathematics (HIMM) which is shown in Figure 3. The model was developed based on the data derived from the two groups of Grade 7 students under the K to 12 education curriculum, regular program. To strengthen the point of view of the developed HIMM, the findings of the study together with the cited theories and relevant instructional models were utilized. The model proposes a flexible way of hybrid online learning modality in mathematics that addresses the need of the teachers and learners during the time of emergencies and beyond. The model also

shows an ideal situation that will contribute to the sustainability of hybrid online instruction in mathematics to provide a positive contribution to students' mathematics achievement.
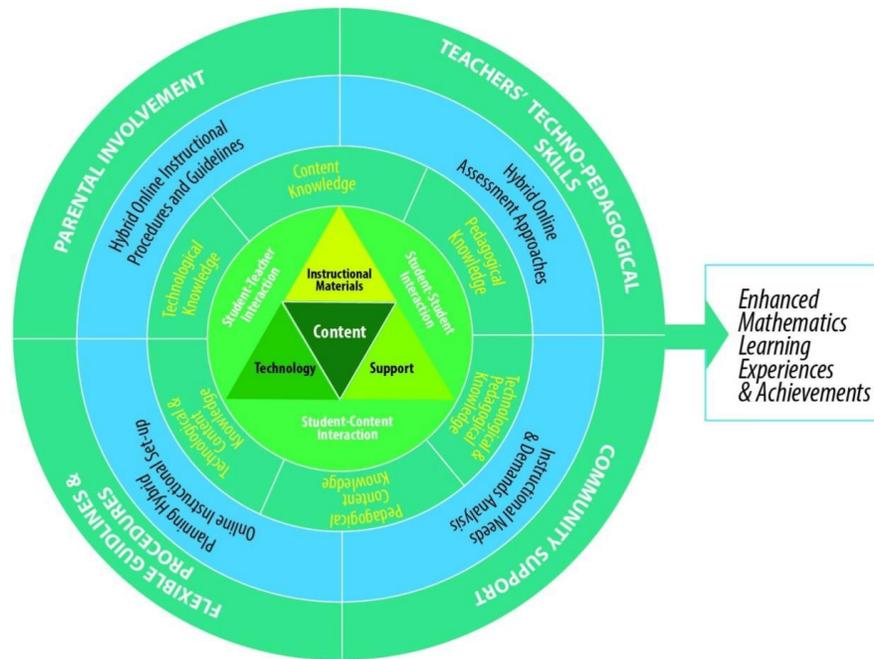

Figure 3. The Hybrid Instructional Model in Mathematics

The aforementioned instructional elements are important components to ensure the feasibility of implementing hybrid instruction in mathematics. These instructional elements are the building blocks in the delivery and implementation of hybrid instruction in mathematics. The mathematics content is placed at the core or midpoint of the analysis because it is considered the most essential element of instruction which should be mastered by the students. Technology is also identified as a vital component in hybrid online instruction as this is needed for the transfer and delivery of content. This is in line with the Theory of Distance Education (TDE), which emphasizes the development and application of technology to support rapid growth in distance education and the inclusion of distance education into the curriculum (Garrison, 1990). This is also supported by education experts who claimed that technology may be utilized to improve the delivery of education (Yapici and Hevedanli, 2012; Ortiz, et.al, 2010).

In addition, the support that, the students get from placed an impact on students' learning motivation when they are exposed to hybrid online instruction. It is necessary, that aside from the instructional support, students should have sufficient financial and emotional support to succeed in hybrid online learning in mathematics. This is in line with the findings of the study which revealed that when students are exposed to hybrid instruction where sufficient instructional materials, technology, and support are well-provided, they tend to exhibit significant improvement in their mathematics learning and achievement.

III. Results and Discussion

The mathematics achievement pre-test result of the experimental group has an over all mean score of 27.65 interpreted as beginner while the control group has an over all mean score of 26.97 interpreted as beginner. The mathematics achievement post-test result of the experimental group has an over all mean score of 54.39 interpreted as developing proficiency while the control group has an over all mean score of 32.97 interpreted as beginner. There is no significant difference in the mathematics achievement on the pre-test results of the control and experimental groups. There was a significant difference in the mathematics achievement post-test results of the control and experimental group. There is a significant difference in the mathematics achievement pre-test and post-test results of the control and experimental groups. The experiences encountered by the students exposed to the hybrid instruction were: enhancing communication and interaction, engaging in online pedagogical practices and contributing to mathematical concepts understanding. The experiences encountered by the students exposed to the modular instruction were: opportunities for involvement and communication and guided independent learning. The challenges encountered by the students exposed to hybrid instruction were: disturbing learning environment, technological limitations and articulation to address challenges in hybrid learning while, students exposed to modular instruction were: difficulty in understanding, voluminous activities and complexity of language.

IV. Conclusion

The experimental and the control groups are both beginners before the conduct of the study. The mathematics achievement post-test result of the experimental group is higher than the control group. The control and experimental groups are at the same level in terms of mathematics achievement prior to experimentation. The students who are expose to hybrid instruction or the experimental group have a higher mathematics achievement than the control group who were exposed to modular instruction. The students' mathematics achievement significantly increases when exposed to hybrid instruction. The students' mathematics achievement slightly increases when exposed to modular instruction. Students expose to the hybrid instruction experience enhancing communication and interaction, engaging in online pedagogical practices and contributing to mathematical concepts understanding. Students expose to the modular instruction experience opportunities for involvement and communication and guided independent learning while students expose to hybrid instruction are challenged with disturbing learning environment, technological limitations and articulation to address challenges in hybrid learning. The students expose to modular instruction are challenged with difficulty in understanding, voluminous activities and complexity of language.

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