

## Utilization of Differentiated Learning Modules with Blended and Scaffold-based Instruction in Mathematics Education

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### Abstract

This study aimed to evaluate the developed intervention-learning materials (Phase 1) that support distance teaching and learning in the Philippines. Specifically, the study focused on the utilization (Phase 2) of the developed Differentiated Math Learning Materials (DMLMs) to enhance academic performance and achievements in Mathematics 8: Linear Inequalities in Two Variables. The study employed a mixed-method approach and utilized the DMLMs on grade-8 students of a far-flung secondary school in the Department of Education in the Philippines. The results indicate a significant positive impact on the academic performance and achievements of students in the least mastered contents of Mathematics 8. The intervention learning materials designed for slow-paced and average-paced learners were found to be effective during the implementation of blended and remote learning education. The study's contribution to the field of distance learning education highlights the importance of developing and utilizing tailored intervention-learning materials to address the challenges of distance education.

**Keywords:** innovative learning materials; utilization math LMS; code-switch video lessons; mathematics education; linear inequalities

### INTRODUCTION

Every citizen of the Philippines is entitled to receive education as a right as it forms the foundation for acquiring knowledge and skills for a successful life. The government of the Philippines acknowledges this right by providing education to all its citizens, which plays a crucial role, in building a brighter future, for the nation. One of the objectives of the government is to ensure that everyone has opportunities to access high quality basic education and numerous measures have been implemented towards achieving this goal. These measures include distributing textbooks and school supplies offering tuition fee subsidies and investing in infrastructure development for schools nationwide. Republic Acts 9155 and 6655 also known as the Free Secondary Education Act highlight these initiatives [1]. Moreover, Republic Act 10931 addresses education [2]. These laws are aimed at guaranteeing that every Filipino child can avail themselves of quality education without any barriers based on their socio status or geographical location.

Despite the fact that every Filipino citizen has the fundamental right to an education, there are still a number of problems, particularly in the domain of mathematics. Concerns about children' poor math performance extend beyond the Philippines to the rest of Asia. This problem requires immediate attention. The Philippines placed last among the 79 participating nations in the PISA, a global assessment of educational systems carried out by the OECD, in reading and second last in mathematics and science,

according to recent research by the FEU Public Policy Center [3]. The PISA test measures the academic performance of 15-year-old students in mathematics, science, and reading. The study revealed that 81% of 15-year-olds were reading below level, with 24% reading one level lower and 57% reading two or more levels below. The average score for science literacy was 357, and for mathematics literacy, it was 353, both significantly lower than the OECD averages of 489. The inadequate education system and lack of resources available to students and teachers contribute to this problem [3].

The issues in education in the Philippines, especially in mathematics, have been further exacerbated by the COVID-19 pandemic. The sudden shift from traditional classroom teaching to blended and distance learning has brought to light the challenges of learning from home, particularly for students with limited access to resources and technology. Online learning platforms are not suitable for underdeveloped countries like the Philippines due to poor internet connectivity, especially in remote areas [4]. In fact, the country has the slowest average internet speed in the world, with only 4.5 Mbps [5]. To address this, the Department of Education has introduced modular and blended learning approaches for distance and remote learning education. Modular distance learning involves individualized instruction and self-learning modules, which can be in printed or electronic format, while blended learning combines two or more learning modalities [6]. According to a learner enrollment survey conducted by the Department of Education, nearly 8.8 million parents chose modular learning materials, while 3.9 million parents opted for blended learning for their children [7]. However, during the implementation of these strategies and approaches, some teachers found that certain learning modules were designed for advanced or average learners, raising concerns among parents and educators.

The way mathematics education is being delivered in the Philippines has significantly changed with the introduction of blended and distance learning approaches. However, several issues are impacting the quality of mathematics education in the country, including lack of resources, inadequate teacher training, poor student engagement, and limited technology access. These challenges have made it difficult for teachers and parents to provide quality education, resulting in many students falling behind in mathematics due to lack of access to resources. Additionally, the pandemic has caused a decrease in teacher motivation and lower student engagement in remote teaching. These challenges require urgent attention and solutions to ensure that Filipino students receive quality education during the pandemic. Schools have implemented various methods, such as online learning platforms, distance and remote learning, and synchronous and asynchronous teaching, to address these issues [6], [8], [9]

Furthermore, studies have shown that the integration of Information Communication Technology (ICT) and other online and web-based learning platforms has had positive impacts on education [11], [12], [13]. However, these strategies may not be suitable for students who lack electronic gadgets and internet access due to financial constraints. Moreover, collaborative and cooperative activities, peer tutoring, and other face-to-face interactions have been restricted due to the implementation of health protocols amidst the pandemic. Additionally, the learning modules issued by the Department of Education in the Philippines have been reported to be too difficult for young students, making them unsuitable for slower-paced or struggling learners [14].

To address these issues, the researcher developed three differentiated learning modules entitled "Easy Exploratory Individualized Instructional Tool: 21st Century Learning Modules in Linear Inequalities" that are suitable for students at different levels or paces of learning (i.e., slow-paced, average-paced, and advanced-paced learners) and for remote learning education. This development phase (Phase 1) of the study focused on creating the materials. These modules were highly accepted by a panel of experts but have not yet been utilized by the target users. Therefore, Phase 2 of the study aims to focus on the utilization phase, where these materials will be implemented with the aim of introducing blended and scaffold-based instruction as unique features of the learning modules and assessing their effectiveness and significance to the target users. Additionally, this study aims to contribute to the academic field by providing alternative, innovative, and flexible learning materials for teaching Mathematics, considering the diverse education

needs in the new normal. The results of the study will also contribute to future extension programs and activities conducted by the institution (Development and Acceptability of Three Differentiated Learning Modules with Blended and Scaffold-based Instruction in Mathematics 8).

Overall, the introduction provides a comprehensive overview of the education landscape in the Philippines, highlighting the challenges faced in mathematics education, especially during the COVID-19 pandemic. It also sets the context for the study and outlines the objectives and contributions of the research.

## OBJECTIVES

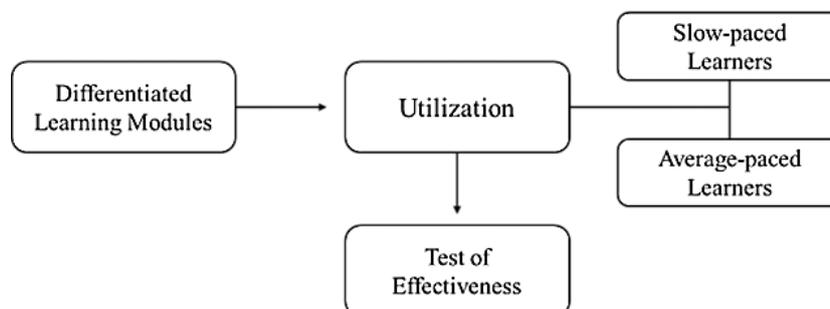
This study aims to determine the effectiveness of the three differentiated learning modules developed for Mathematics 8 at Sta. Cruz National High School in Sta. Cruz, Jose Panganiban, Camarines Norte, Philippines, during the School Year 2021.

Specifically, the study seeks to address the following objectives:

1. Determine the preferred learning modalities of Grade-8 students at Sta. Cruz National High School in Sta. Cruz, Jose Panganiban, Camarines Norte, Philippines.
2. Assess the effectiveness of the proposed three (3) differentiated learning modules titled "Easy Exploratory Individualized Instructional Tool: 21st Century Learning Modules" among Grade-8 students at Sta. Cruz National High School in Sta. Cruz, Jose Panganiban, Camarines Norte, Philippines.
3. Explore the testimonies, issues, and concerns encountered by the student and teacher respondents during the utilization of the three differentiated learning modules titled "Easy Exploratory Individualized Instructional Tool: 21st Century Learning Modules."

## FRAMEWORK

The purpose of the study was to identify the learning styles that students prefer assess how well the differentiated learning modules worked and investigate any challenges faced by both students and teachers when using these modules. In order to achieve these goals a thorough conceptual framework is necessary. The framework consists of the following components: (1) learning modalities, (2) differentiated learning modules, (3) effectiveness, and (4) testimonies, issues, and concerns. Figure 1 illustrates the framework of the present study.



**Figure 1.** Paradigm of the Study

The first component of the framework focuses on learning modalities, which refer to the preferred ways of learning among the target participants. The identified four learning modalities: visual, auditory, kinesthetic, and tactile [17]. Visual learners prefer learning through images and diagrams, auditory learners prefer learning through listening, kinesthetic learners prefer learning through movement and hands-on activities, and tactile learners prefer learning through touch and feel. The researcher can determine the preferred learning modalities of the target participants by employing a learning style inventory survey.

The second component of the framework encompasses the differentiated learning modules titled "Easy Exploratory Individualized Instructional Tool: 21st Century Learning Modules." Differentiated instruction, as defined by Tomlinson, is a teaching approach that addresses the diverse learning needs of students by providing multiple pathways for learning [18]. The researcher can develop the modules based on the principles of differentiated instruction, such as content, process, and product.

The third component of the framework pertains to effectiveness, which refers to the impact of the differentiated learning modules on the target participants. The researcher can evaluate the effectiveness of the modules by measuring pre-test and post-test scores and gathering feedback from students and teachers. The effect size is a measure of the intervention's impact on student learning [19]. The researcher can calculate the effect size to determine the effectiveness of the differentiated learning modules.

## **MATERIALS AND METHODS**

A mixed-methods approach was employed in this study, incorporating quantitative and qualitative methods. To determine the preferred learning modalities of selected Grade-8 students, descriptive-quantitative methods were used, including the analysis of the index of mastery, mean proficiency level, and academic performance. Additionally, a request was made to obtain a copy of the accomplished and consolidated Learners' Enrollment and Survey Form (LESF) of Sta. Cruz National High School as secondary data for the study.

The mixed-methods approach provides a comprehensive understanding of the effectiveness of the developed differentiated learning modules in Mathematics 8. It allows for insights into the preferred learning modalities of Grade-8 students and the issues and concerns encountered by both students and teachers during module implementation. The findings of this study can be valuable in guiding the development and implementation of future differentiated learning modules in Mathematics education.

Data collection involved the use of a survey questionnaire to determine the preferred learning modalities of Grade-8 students. The questionnaire was validated by experts in the field of education and demonstrated good reliability with a Cronbach's alpha value of 0.71. Onsite observation and document analysis were also employed to gather data on the implementation of the differentiated learning modules.

The effectiveness of the proposed learning modules was evaluated by comparing pre-test and post-test scores. The tests were developed based on the mathematics 8 learning competencies and underwent validation by experts, achieving good internal consistency with a KR20 value of 0.84. Feedback from students and teachers was collected through open-ended questions to explore their testimonies, issues, and concerns during the utilization of the differentiated learning modules.

Descriptive statistics, such as frequency counts and percentages, were utilized to analyze the data collected from the survey questionnaire and the teacher-made test. Mean and percentage techniques were

used to determine the indexed mastery and mean proficiency level (MPL) of the selected learners per learning competency in the learning modules for two experimental groups: slow-paced learners (green module) and average-paced learners (orange module). These techniques were also employed to compare the previous MPL percentage to the MPL results during the post-evaluation phase, with the NAT rating scale (MPS) descriptor used to interpret the descriptive analysis results.

Moreover, mean and standard deviation were employed to compare the mean scores of the two experimental groups across the learning competencies in the proposed learning modules. The t-test for independent two-sample groups was used to determine if there is a significant difference between the mean scores of the two experimental groups in the Linear Inequalities in Two Variables learning competency.

Item analysis per assessment (test) in the learning activities of the modules was conducted to gather data, with a teacher assigned to perform the analysis for each learning competency. The number of items and sessions per component (learning competency) is presented in Table 1.

**Table 1.** Assessments and Test Materials

Learning Competencies	Week Number	Assessment	Number of Item
Before implementation		Pre-test	20 items
<i>Illustrate linear inequalities in two variables</i>	Q3-Week 1	Test 1 & 2	10 items
<i>Differentiate linear inequalities in two variables from linear equations in two variables</i>	Q3-Week 2	Test 1 – 4	36 items
<i>Graphs linear inequalities in two variables</i>	Q3-Week 3	Test 1	12 items
After implementation		Post test	20 items

Qualitative methods were employed to supplement the data by exploring the testimonies of teachers and students during and after module utilization. An analytic rubric (rating scale instrument) and unstructured survey questions were used to collect data during and after the pilot testing, administered via Google Form with hard copies provided and attached to the learning materials. The teacher-in-charge of the subject handled the evaluation, providing comments and suggestions on the materials.

During the pre-utilization process, the study initially planned to utilize three differentiated learning modules. However, based on the advice of mathematics teachers and considering the absence of students fitting into the "LM for advance-paced students" category and the current pandemic situation, the researcher decided to use only two learning modules for two categories: LMs for average-paced learners and for slow-paced learners. Additionally, to facilitate monitoring and adhere to IATF protocols, the number of participants was limited to twenty (20). Purposive sampling was employed to select the respondents, specifically students with access to at least a smartphone. The 20 heterogeneous Grade-8 students were randomly selected and categorized into slow-paced learners (10) and average-paced learners (10) based on assessments by the respective class advisers using previous academic performance and final grades in Mathematics.

For the implementation process (see Figure 2) of the learning materials, five learning facilitators/teachers delivered the teaching and learning process on-site. These teachers were properly oriented in the teaching-learning process, following the execution procedures stipulated in the teacher's manual of the learning modules. Regular visits and monitoring of the students were conducted on a weekly basis, in accordance with the school's weekly monitoring schedule.



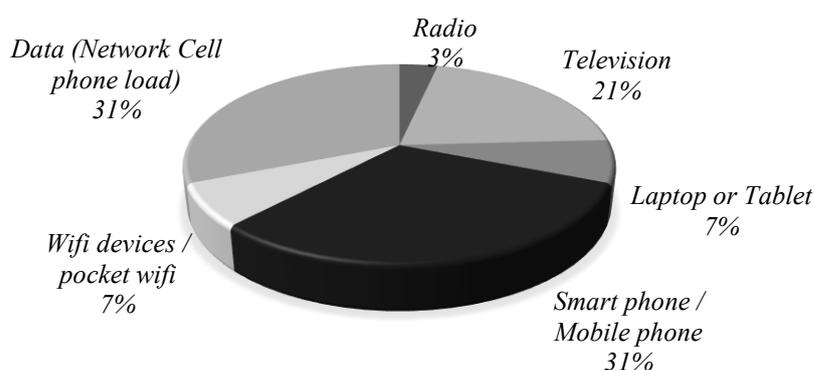
**Figure 2.** Face-to-face Teaching-Learning Process and Monitoring

Finally, this study focuses on the pilot testing of the developed learning modules, and Sta. Cruz National High School located in Brgy. Sta. Cruz, Jose Panganiban, Camarines Norte was purposively selected as the target school since the modules were created in this school during the previous phase of the study. This school is classified as a remote public secondary school under the Department of Education, Division of Camarines Norte.

## RESULTS AND DISCUSSION

### Learning Modalities of Grade-8 students: Common Learning Assisted Gadgets Available at Home

According to the survey conducted by the study, the researcher acquired a list of common learning-assisted gadgets available at home, which likely helped students during the implementation of blended and modular learning education. These gadgets were considered learning support materials for independent learning, especially in Mathematics subjects. Figure 3 below shows the percentage distribution of common gadgets used as assisted learning materials by 110 Grade-8 students at Sta. Cruz National High School.



**Figure 3.** Learning Assisted Gadgets Available at Home

The largest percentage (31%) of students reported having their own smartphones or mobile phones, along with data for internet connections or cellular phone load for network connections. This allowed them to search for additional online learning resources as supplementary information, such as DepEd video lessons, tutorial videos on platforms like YouTube/Facebook, and other electronic learning materials. However, approximately 7% of the respondents mentioned having their own laptops and Wi-Fi connections. It should be noted that the internet connection or network signal is "unstable" due to the geographic location of the area (approximately 17.0 km or almost

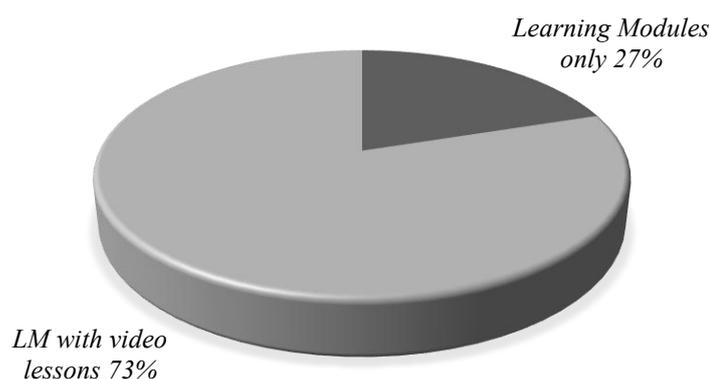
37 minutes of travel to Centro of Jose Panganiban Camarines Norte). Consequently, the majority of students cannot fully access the online tutorials prepared by the Department of Education.

On the other hand, the second highest percentage (21%) of students stated that they have their own televisions, which assisted them in the learning process. The Department of Education uses this platform for blended learning education. However, the use of television can be complicated as it does not align with the rhythm or flow of teachers' planned classes. The activities requested by the program may not coincide with what the teachers have planned, as cited by the Institute for the Future of Education [15]. Nevertheless, television remains an effective supplement for blended and remote learning education. Finally, only 3% of the students reported using radio as an assisted learning gadget in the blended and modular learning setup. However, radio-based instruction for teaching Mathematics is viewed as more complicated, as it lacks the ability to visually present illustrations and patterns, which are essential for understanding and learning specific concepts.

Overall, the discussion highlights the different learning-assisted gadgets used by Grade-8 students at home. It emphasizes the prevalence of smartphones and the challenges associated with internet connectivity in the area. The role of television as a supplement for blended learning is also discussed, along with the limitations of radio-based instruction for Mathematics education.

#### **Learning Modalities of Grade-8 students: Learners' Preferred Mode of Learning in Mathematics 8**

The learners' preferred mode of learning during the implementation of blended and remote learning approaches always depends on the available learning resources and learning assisted gadgets that the students have at home. Figure 4 below illustrates the percentage distribution of the students' preferred learning modalities in Mathematics subject.



**Figure 4.** Learners' Learning Modalities in Mathematics

In the actual implementation of blended and remote learning education, 100% of the students choose the modular-based learning. However, based on the conducted survey of the study, the study found out that 73% of the respondents preferred learning modules with offline video tutorials (by chance) if tablets or learning gadgets are provided by the school, while only 27% of students preferred learning modules only.

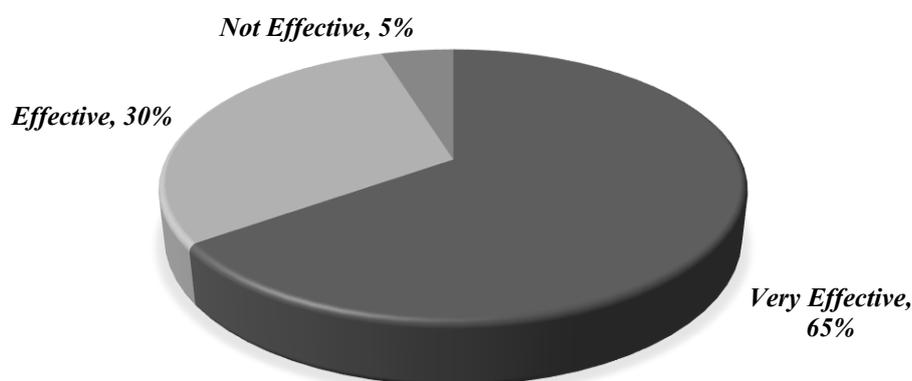
Thus, the study provided learning modules with offline (downloaded) video lessons as a guide for answering and learning the selected least learned content in Mathematics 8. For students who prefer only learning modules, the said material was designed for self-paced learning since the instructions and activities in the LM are simplified and scaffolded.

### **Effect of the Developed Learning Modules to the Academic Performance of Grade-8 Students**

The learning contents (competencies) in the learning modules were based on the least mastered learning competencies in Mathematics 8, as determined in Study 1: the developmental phase of the LMs [20]. The learning competencies of the developed LMs include illustrating Linear Inequalities in two variables, differentiating linear inequalities in two variables from linear equations in two variables, and graphing Linear Inequalities in two variables. This study aimed to determine the effect of the developed LMs during the implementation of blended and remote learning in one of the secondary schools of the Department of Education in the province of Camarines Norte.

### **Descriptive Analysis: Utilization and Pilot Testing of LMs “Easy Exploratory Individualized Instructional Tool: 21st Century Learning Modules**

The regular on-site schedules of visitation and monitoring, wherein face-to-face teaching-learning and micro-teaching were applied to the selected learners, resulted in a remarkable positive outcome during the implementation procedure of the LMs. See Figure 5.



**Figure 5.** On-site (Face-to-face) Supplement Teaching-Learning Process During the Implementation of LMs with Offline Video Lessons of the Study.

Majority of the respondents (65% or 13 out of 20 students) said that the on-site teaching-learning schedule during the utilization of LMs was 'Very Effective,' while 30% or 6 out of 20 learners said the intervention was 'Effective.' The conventional learning set-up, face-to-face teaching of mathematics subjects, is considered the best teaching-learning approach. Learners are more comfortable interacting with their peers and teachers in the face-to-face learning mode compared to online learning because, as Stanford researchers found out, 'in-person communications make our brains happier.'

In a classroom setting, teachers can manage their topics more effectively as there is no need to adjust their lessons to fit the modules. Attending class with a real teacher is more engaging for

learners compared to reading a pile of modules [16]. However, 5% or 1 out of 20 respondents responded 'Not Effective' regarding the on-site teaching-learning intervention of the study. This is due to the limited time allotted to discuss the lessons in the learning module. Thus, the researcher will consider this as a recommendation to enhance the intervention of the study. The researcher will plan for appropriate time allocation for each lesson in the LMs per week.

In terms of students' achievements and performance evaluation of the learning competencies in the LMs, the study employed descriptive statistical analysis, specifically mean and percentage techniques, to determine the index of mastery and the mean proficiency levels per learning competency for the two categories of respondents (experimental groups i.e., slow-paced learners and average-paced learners). Please refer to Tables 2 and 3, respectively.

**Table 2.** Mastery Level of Slow-paced Learners in Linear Inequalities in Two Variables

<b>Learning Competency</b>	<b>Specific Objectives</b>	<b>Previous %</b>	<b>I</b>	<b>Portion of Students Who Got Correct Answer</b>	<b>I</b>
1. Illustrate Linear Inequalities in two variables	1. Determine Linear Inequalities in two variables	31%	Low	66%	<b>Moving towards Mastery</b>
	2. Transform General or Standard form to slope-Intercept form of Linear inequalities				
2. Differentiate linear Inequalities in two variables from linear equations in two variables.	1. Differentiates linear inequalities in two variables from linear equations in two variables.	29%	Low	82%	<b>Closely Approximately Mastery</b>
	2. Illustrates linear inequalities in two variables.				
3. Graphs Linear Inequalities in two variables	Solve and graph Linear Inequalities in two variables	17%	Low	48%	<b>Average</b>

**LEGEND:** (96% - 100%) Mastered; (86% - 95%) Closely Approximately Mastery; (66% - 85%) Moving Towards Mastery; (35% - 65%) Average; (16% - 34%) Low; (5% - 15%) Very Low; (0% - 4) Absolutely No Mastery

After the utilization phase of the developed learning materials designed for the slow-paced learners, the result of the descriptive analysis shows a positive effect. The index of mastery and the mean proficiency level of the learning competencies increased by more than 50%. For learning competency 1, which is to illustrate Linear Inequalities in two variables, the mean proficiency level (MPL) increased from 31% (Low) to 66% (Moving Towards Mastery). Similarly, for learning competency 2, which is to differentiate linear Inequalities in two variables from linear equations in two variables, the MPL increased from 29% (Low) to

82% (Closely Approaching Mastery). Additionally, for learning competency 3, which is to graph Linear Inequalities in two variables, the MPL increased from 17% (Low) to 48% (Average). Therefore, the developed learning materials designed for slow-paced learners were effective during the implementation of blended and remote learning education.

Meanwhile, using the same procedure, the learning materials designed for average-paced learners were also descriptively analyzed. The results also exhibited a positive impact, with the index of mastery and the MPL of all learning competencies increasing by more than 49%. Please refer to Table 3.

**Table 3.** Mastery Level of Average-paced Learners in Linear Inequalities in Two Variables

<b>Learning Competency</b>	<b>Specific Objectives</b>	<b>Previous %</b>	<b>I</b>	<b>Portion of Students Who Got Correct Answer</b>	<b>I</b>
1. Illustrate Linear Inequalities in two variables	1. Determine Linear Inequalities in two variables 2. Transform General or Standard form to slope-Intercept form of Linear inequalities	31%	Low	<b>60%</b>	<b>Average</b>
2. Differentiate linear Inequalities in two variables from linear equations in two variables.	1. Differentiates linear inequalities in two variables from linear equations in two variables. 2. Illustrates linear inequalities in two variables.	29%	Low	<b>94%</b>	<b>Closely Approximately Mastery</b>
3. Graphs Linear Inequalities in two variables	Solve and graph Linear Inequalities in two variables	17%	Low	<b>50%</b>	<b>Average</b>

**LEGEND:** (96% - 100%) Mastered; (86% - 95%) Closely Approximately Mastery; (66% - 85%) Moving Towards Mastery; 35% - 65%) Average; (16% - 34%) Low; (5% - 15%) Very Low; (0% - 4) Absolutely No Mastery

The mean proficiency level (MPL) for learning competency 1, which is to illustrate Linear Inequalities in two variables, increased from 31% (Low) to 60% (Average). Similarly, for learning competency 2, which is to differentiate linear Inequalities in two variables from linear equations in two variables, the MPL increased from 29% (Low) to 94% (Closely Approaching Mastery). Additionally, for learning competency 3, which is to graph Linear Inequalities in two variables, the MPL increased from 17% (Low) to 50% (Average). Thus, the developed learning materials designed for average-paced learners are effective during the implementation of blended and remote learning education. Therefore, using this intervention for these learning competencies is considered effective even during blended and remote learning education, and more effective if this intervention is utilized during face-to-face classroom teaching in Mathematics subjects. This could help achieve the mean percentage score (MPS) of 75% set by the Department of Education in the Philippines.

### Inferential Analysis and Interpretation of the Mean Scores of the Two (2) Experimental Groups i.e., Slow-paced Learners and Average-paced Learners

The overall descriptive interpretation of the mean scores for the slow-paced learners (Mean=0.68, SD=0.19) is 'Moving Towards Mastery,' while for the average-paced learners (Mean=0.64, SD=0.34), it is 'Average,' based on the NAT rating scale interpretation. These results indicate that the developed learning materials were effective for both categories and experimental groups in the study. To further analyze and interpret the quantitative data, inferential statistics were employed, specifically the independent t-test for two samples. The summary of the inferential results is presented in Table 4.

**Table 4.** Significant Difference of the Mean Scores of Slow-paced Learners and Average-paced Learners using the LMs

<b>Summary Result of t-test for Independent Samples</b>				
<i>Item</i>	<i>Slow-paced Learners</i>	<i>Average-paced Learners</i>	<i>t-test</i>	<i>Critical Value</i>
Total	4.76	4.5	0.25	2.179
Mean	0.68	0.64	at 5% Alpha (Two tailed test)	
Standard Deviation	0.19	0.34		
<b>Overall Interpretation</b>	<b>Descriptive</b> Moving Towards Mastery	Average		

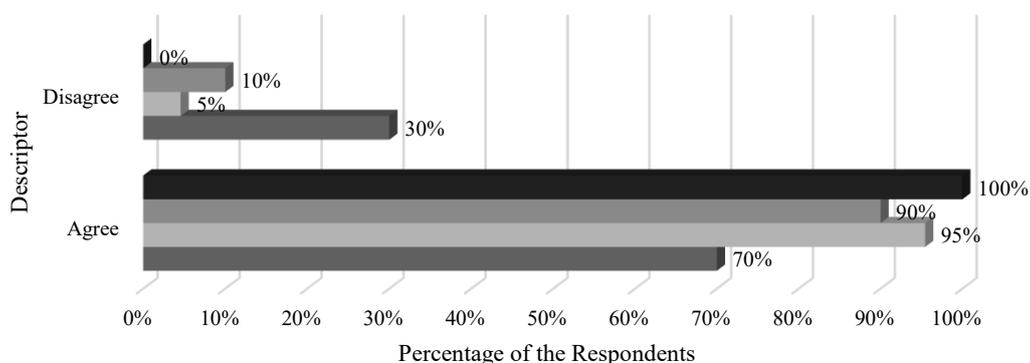
**LEGEND:** (96% - 100%) Mastered; (86% - 95%) Closely Approximately Mastery; (66% - 85%) Moving Towards Mastery; (35% - 65%) Average; (16% - 34%) Low; (5% - 15%) Very Low; (0% - 4) Absolutely No Mastery

The computed t-test, at a 95% confidence level, is 0.25, which is less than the critical value of 2.179. Therefore, the null hypothesis fails to be rejected, suggesting that there is no significant difference in the mean scores of the two groups per learning competency in the learning modules. This finding indicates that the developed learning modules were effective for both the slow-paced learners and average-paced learners. It suggests that the designs and difficulty levels of the learning activities in the developed modules were suitable for the respective levels of the students. The inferential analysis confirms that the developed learning materials had a positive impact on the academic performance of both slow-paced learners and average-paced learners. These findings support the effectiveness of the learning modules in enhancing the learning outcomes in Mathematics 8 during the implementation of blended and remote learning education."

### Some testimonies, Issues Encountered During Implementation of Intervention of the study and Its Recommendations: Post-Evaluation of Respondents During the Implementation of the Learning Materials

As part of the post-implementation phase of the study, a survey interview was conducted with the students and parent-respondents to evaluate the content of the learning modules. This survey served as a supplement to the descriptive-quantitative analysis and provided valuable insights for enhancing the learning modules. The results of the survey are presented in Figure 6.

### RESPONDENTS' POST-EVALUATION IN THE IMPLEMENTATION OF LMs OF THE STUDY



- The "tagalog" used as mode of instructional deliver in the video lessons are helpful to understand all the lessons in the LMs
- The designs and physical appearance of the LMs are very helpful to answer motivatively the learning activities in the LMs
- The clues and patterns illustrated in the LMs are helpful to understand lessons/solve problem-solving in the LMs
- The instructions and examples in the LMs are helpful and easy to understand.

**Figure 6.** Respondents' Post-Evaluation Result

The majority of the respondents 'agreed' with the indicators considered in this study. Specifically, 100% of the respondents 'agreed' that 'Tagalog' should be used as the mode of instructional delivery in Mathematics, using a code-switching approach. Based on the survey results, the researcher will incorporate more clues and patterns as examples in the learning modules, as 95% of the respondents 'agreed' with this indicator. While 90% of the respondents appreciated the physical appearance of the learning modules, the researcher will make enhancements to the size to make them more portable and convenient to use. Finally, considering that 30% of the respondents 'disagreed' with this indicator, the researcher will provide more simplified examples in the learning modules.

In addition to the quantitative findings, qualitative data in the form of testimonies from the respondents further support the effectiveness of the instructions and examples in the learning modules. However, the majority of the respondents suggested adding more simplified examples and patterns for each topic in the modules (refer to Appendix 1). Furthermore, parent-respondents recommended flexible schedules for peer-teaching and micro-teaching in the school (limited face-to-face) or frequent home visitation activities to assist the learners in their studies (refer to Appendix 2).

During the implementation of blended and remote learning education by the Department of Education, self-paced and independent learning setups have become prevalent in the education system. This poses a challenge for learners and parents in adapting to remote learning, particularly in modular learning. As a result, some respondents suggested providing native Filipino language 'Tagalog' translations in the instructions and explanations of the learning modules (refer to Appendix 3). These statements and testimonies not only serve as qualitative findings to support the

quantitative results of the study but also provide a basis for enhancing and improving the content of the learning materials and interventions.

Overall, the testimonies and issues raised by the respondents highlight the importance of incorporating simplified examples, flexible schedules, and language considerations in the learning modules to further enhance the effectiveness of the intervention during blended and remote learning education.

## **CONCLUSION**

Grade 8 students prefer learning Mathematics in a classroom setting but find supplemental materials, such as offline video lessons, helpful for independent learning in a modular setup. Parents support this approach, considering many students have smartphones for learning at home, and offline lessons are accessible without the internet. For those without smartphones, alternative on-site flexible schedules, including tutorials or limited face-to-face sessions, are suggested. This highlights the challenges of learning Mathematics independently. Despite not using the advanced-paced learning module due to unforeseen circumstances, the implemented modules positively impacted academic achievement in Linear Inequalities in Two Variables, benefiting both slow-paced and average-paced learners in blended and remote learning settings.

## **RECOMMENDATION**

To assess their effectiveness, it is recommended to utilize the unutilized advanced-paced learning modules. This will provide a comprehensive understanding of their impact on student achievement. Continuous enhancement and improvement of learning modules are advised, based on quantitative and qualitative data. This includes incorporating simplified examples and patterns for each topic, ensuring flexible schedules, and including Tagalog translations in instructions and explanations. These enhancements will optimize the effectiveness of learning materials and interventions in blended and remote learning environments.

## **DECLARATION OF INTEREST**

There is no conflict of interest with this study.

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