

ENHANCING MATHEMATICAL SKILLS OF THE STUDENTS THROUGH DIGI-TECH APPS

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Abstract

The study aimed to determine the effect of using Digi-tech apps on the mathematical skills of selected Grade 8 students of Lumban National High School, Lumban, Laguna, School Year 2021-2022. It determined the level of the attributes of Digi-tech apps, student's mathematical skills, the significant difference on the level of students' mathematical skills before and after the utilization of Digi-tech apps, and the significant effect on the mathematical skills of the students.

The level of the attributes of Digi-tech apps used in the study is Very High.

The student's mathematical skills used in this study the scores revealed that the post-test scores of the students are higher than the pre-test scores.

The test of difference between the scores of the students on the assessment tool for the mathematical skills before and after the utilization of the Digi-tech apps of the respondents resulted in rejecting the null hypothesis. This implies that there is a significant difference on the mathematical skills of students. Moreover, it shows how the Digi-tech apps significantly affect the mathematical skills of students in terms of their analytical skills, computational skills, graphing skills, and problem-solving skills. It will motivate the students to create an interest and attitude towards mathematics to learn at their own pace.

It is highly recommended the continuous utilization of Digi-tech Apps used in this study as additional learning tools of the students especially those who are under the modular distance learning modality. The utilization of Digi-tech apps as a tool may help the students to learn and improve their Mathematical skills. The continuous advancement of technology leading to new learning tools must be applied to the learning setting to ensure the provision of quality education. Further studies may be conducted in line with the new normal education that may improve the teaching-learning process.

Keywords: Mathematical Skills, Applications, Enhancement

1. Main Text

Introduction

COVID – 19 Pandemic has an impact on education that is bringing up new policies for learning from home. Teachers and students are regulated to conduct the teaching and learning processes from traditional face-to-face approaches to remotely digital platforms or into different learning modalities. New normal education was beneficial for students because they had high interaction to reach learning materials regardless of time and place as well as high opportunity to experience digital learning programs. Moreover, the high interaction also occurred in the forms of virtual communication among teachers to students, and students to students which resulted in a vast capacity for sharing information and experience.

Mathematics makes life in order and it prevents chaos. Certain qualities that are nurtured by mathematics such as the power of reasoning, creativity, abstract or spatial thinking, critical thinking, problem-solving ability, and even effective communication skills. Also, mathematics is the most challenging subject for students who meet several problems today due to the pandemic. In mathematics students required lots of attention and focus. Unlike reading, math is almost always formally learned at school, it requires a long explanation for students to understand the subject. Consequently, to enhance the teaching and learning process of Mathematics, the Department of Education under DepEd Order No. 032, s. 2020 issued the guidelines on the engagement of Services of Learning support Aides to Reinforce the Implementation of the Basic Education Learning Continuity

Plan in time of the COVID-19 pandemic. DepEd shall employ multiple learning modalities (LDMs) to ensure the continued provision of learning opportunities to its learners, while protecting the health and safety of both teachers and learners. This can be done through blended learning, distance learning, and homeschooling. 798

This DepEd Order no.032, s 2020 motivated teachers to look at how students could respond to the new normal education. This will also help students to engage with the strategies they employed especially the use of technology. Today, teenagers usually check their phones more than times per day and they are highly comfortable with technology, learning on their own, seeking quick and succinct answers to address an immediate problem, and answering questions with a few clicks on a mobile device.

It can be more challenging for teachers to engage in effective math instructional practices via a remote platform such as Modular Distance Learning and also for students who cannot access the online learning platform. Therefore, teachers need to help the students and provide them with ways to help them learn at their home despite the presence of their teachers and online platforms.

Williams (2020) mentioned in his study “The Use of Digital Applications and Website in Completing Math Assignments”, that there is a large assortment of digital applications and websites available for students to use in completing their math assignments. The problem is how and why they are using these applications. Teachers must know how to utilize the available applications as they can help students especially those who do not have enough means to access the internet. Likewise, Nichols & LeBlanc (2020) also stated that in “Beyond apps: Digital literacies in a platform society”, young students must become proficient in the new literacies of 21st-century technologies to be considered literate. With the continuous integration of technology in the field of education, students with the teachers must also go with the flow of the emerging change in the educational system.

Delivering learning experiences online has become the norm. Teachers

must make sure its effectiveness whether it is asynchronous or synchronous. Digital learning is any type of learning that is accompanied by technology or by instructional practice that makes its utilization effective. It encompasses the application of a wide spectrum of practices, including blended and virtual learning. There are many Digi-tech apps that can be used offline that may lessen the burden of parents in assisting their children in studying.

This research was intended to determine the effectiveness of Digi-tech apps on the enhancement of mathematical skills of students that were under modular distance learning.

Background of the Study

This pandemic opens a challenge to the Department of Education to continuously provide quality education despite the restrictions of limiting face-to-face interactions and limited movements. The answer of the Department of Education is to provide schools with different learning Modalities that they can adopt such as the Online Distance Learning Modality and Modular Distance Modality. But these distance learning modalities became a huge challenge for both the teachers, parents, and the students. Access to technology is beneficial for students but due to the location of the school and student families' livelihood, not all the students can access online applications and videos.

Igcasama (2021) cited that the K – 12 program will greatly help us develop and upgrade the educational system in the Philippines, so teachers may be able to compete globally together with the students who are fully equipped with 21st-century skills. This program provides additional training for the students in preparing for college. It enriches mathematics and other subjects in this new curriculum. This will adequately prepare the students for college and improve their skills. Hence, this study found out that the Spiral curriculum had greatly influenced the curriculum, particularly the content and transitions of subjects, the secondary schools, the learners, and especially the teachers. Based on the findings, teachers were still adapting to the new curriculum. They needed more time and training to master all the fields and learn new teaching strategies because it is challenging to teach something that does not have the necessary mastery. They can teach other branches of their significant subjects without an in-depth discussion because it is not their specialization. For instance, Linear Equations and Linear Inequalities have been discussed in different grade levels and teachers should master their skills in solving algebra which applies to different branches of mathematics.

The school looks different during the COVID-19 pandemic, for some students are thriving with this way of learning through online classes, and many students are striving to cope with this distance learning. Making sure that materials are accessible can be a major challenge, whether students are going online or picking up paper packets. Not all students have someone with them to guide them to study at home. Not all of them have the means to access the internet for additional learning materials. With the absence of teachers to guide the students in learning the lessons, and without an internet connection to access additional learning materials, the other ways must be implemented to help the students continuously receive the education that they deserve.

There are Digi-tech apps that can be downloaded to mobile phones and installed that may be beneficial in understanding lessons in mathematics. Like Photo math as one of the Digi-tech apps, will help interpret problems with comprehensive math content from arithmetic to calculus to drive learning and understanding of fundamental math concepts. Photo math reads and solves mathematical problems instantly by using the camera of a mobile device. There is an effect of the Photo math mobile application on the achievement and attitude of learning algebraic equations for lower secondary school students in Malaysia (Pairan et.al ,2020). Photo math is a free mobile application, for both IOS and Android platforms, which uses computer vision and

image understanding technology to scan math equations using the mobile camera to subsequently provide worked solutions. The application recognizes equations both printed and handwritten and provides step-by-step calculations and graphical solutions. They found that the application of Photo math significantly enhances the learning of algebraic equations among Form Two students.

Thus, this study wanted to determine the effectiveness of using Digi-tech apps such as Desmos, Photomath, Mathway, and Geogebra as supplemental material for students who are under the modular distance learning modality, these learning applications are downloadable to mobile phones and can be used even without internet connection. The researcher emphasized its effectiveness in enhancing the mathematical skills of the students in linear equations and inequalities in terms of analytical, computational, graphing, and problem-solving.

Theoretical Framework

This study was inclined with Bruner's Discovery learning, it is an inquiry-based, constructivist learning theory that takes place in problem-solving situations where the learner draws on his or her own experience and existing knowledge to discover facts and relationships and new truths to be learned. Students interact with the world by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments.

Based on Constructivist Learning Theory of Benozze (2005), learners need first-hand experiences. Sharing ideas, and skills, with learners by telling or showing often is insufficient for them to learn. Learners need to use and test ideas, skills, etc. through relevant activities, often this involves concrete experiences combined with abstract ideas that have just been presented to learners.

This study was also supported by the Experiential theory of David Kolb which describes experiential learning involves learning from experience. The theory was proposed by psychologist David Kolb who was influenced by the work of other theorists including John Dewey, Kurt Lewin, and Jean Piaget. This type of learning can be defined as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combinations of grasping and transforming the experience."

Multimodal Learning theory specifically Visual Learning is another basis of the study. Multimodal learning theory provides four different types of learning—visual, auditory, reading and writing, and kinesthetic. Multimodal learning refers to an embodied learning situation that engages multiple sensory systems and action systems of the learner. This type of learning is traditionally emphasized for children with learning challenges and can include a variety of visual inputs in addition to content. Together, they form what is known as the VARK framework of learning, first developed by Neil Fleming. This type of learning is all about stimulating the eyes through the use of several vision-related techniques. All kinds of graphs, illustrations, infographics, illustrations, diagrams, and flowcharts come under visual learning, making the material compelling and constructive. The color-coding of information, be it through the use of multiple fonts, styles and stickers, is also included under visual learning. This theory supported the purpose of this study which was to determine the effectiveness of using Digi-tech apps such as Desmos, Photomath, Mathway, and Geogebra as supplemental material in enhancing the mathematical skills of grade 8 students.

Statement of the Problem

The goal of this study is to determine the effectiveness of using Digi-tech Apps in enhancing the Mathematical Skills of Grade 8 students in Linear Equations and Linear Inequalities.

Specifically, it sought to answer the following:

1. What is the level of the use of Digi-tech apps in terms of;
 - 1.1. accessibility
 - 1.2. appropriateness
 - 1.3. clarity of the content
 - 1.4. usability?
2. What is the level of student's mathematical skills in terms of;
 - 2.1. analytical skills
 - 2.2. computational skills
 - 2.3. graphing skills
 - 2.4. problem-solving skills?
3. Is there a significant difference on the level of Students' Mathematical Skills before and after the use of Digi-tech apps?
4. Does the Digi-tech Apps significantly affect the mathematical skills of the students?

2. Research Methodology

This chapter presents the methods and procedures which was used in the study. This includes the research design, respondents of the study, sampling techniques, research procedures, research instruments and statistical treatment of data.

Research Design

This research design used in this study was experimental research to collect the required data for the variables which are the enhancing mathematical skills of the students through Digi-tech apps. This is used to determine the effectiveness of Digi-tech apps on enhancing the mathematical skills of the students in Linear Equations and Linear Inequalities. The term “experimental research design” is centrally concerned with constructing research that was high in causal (or internal) validity. Causal validity concerns the accuracy of statements regarding cause-and-effect relationships.

Narenderan et al. (2019) pointed out that Experimental designs is the process of carrying out research in an objective and controlled fashion so that precision is maximized, and specific conclusions can be drawn regarding a hypothesis statement. Also, it is originated to be the most effective method in classify and enhancing the significant factors to achieve a competent result due to its advantages such as providing accurate information with a minimum number of experimental runs, identifying the factor interactions, and allowing multiple response optimizations.

The researcher used this kind of research to determine if there is a significant difference between the before and after scores of the students on the assessment tool that measure the mathematical skill of the students. Also, this aims to know if the Digi-tech apps can significantly affect the enhancing of the mathematical skills of the students on the lesson’s Linear equations and Linear Inequalities.

Population and Sampling Technique

The respondents of this study were the selected Grade 8 students under the Modular Distance Learning from Lumban National High School School Year 2021-202 from Division of Laguna. The respondents were selected based on the student’s sections who got low scores on their summative test on the selected topic. These respondents’ participation was to test the effectiveness of using Digi-tech apps in enhancing mathematical skills of the students in Linear Equations and Linear Inequalities with use of Pre-test and Post-test Design.

Research Procedure

This research aims to determine the effect of determine effect of Digi-tech apps to the mathematical skills of grade eight (8) students of Lumban National High School S.Y. 2021-2022. Specifically, to know the relationship of the level of the attributes of Digi-tech apps used in this study on the mathematical skills of the students which are measured using the assessment tool made by the researcher. Data were collected following standard operating procedures.

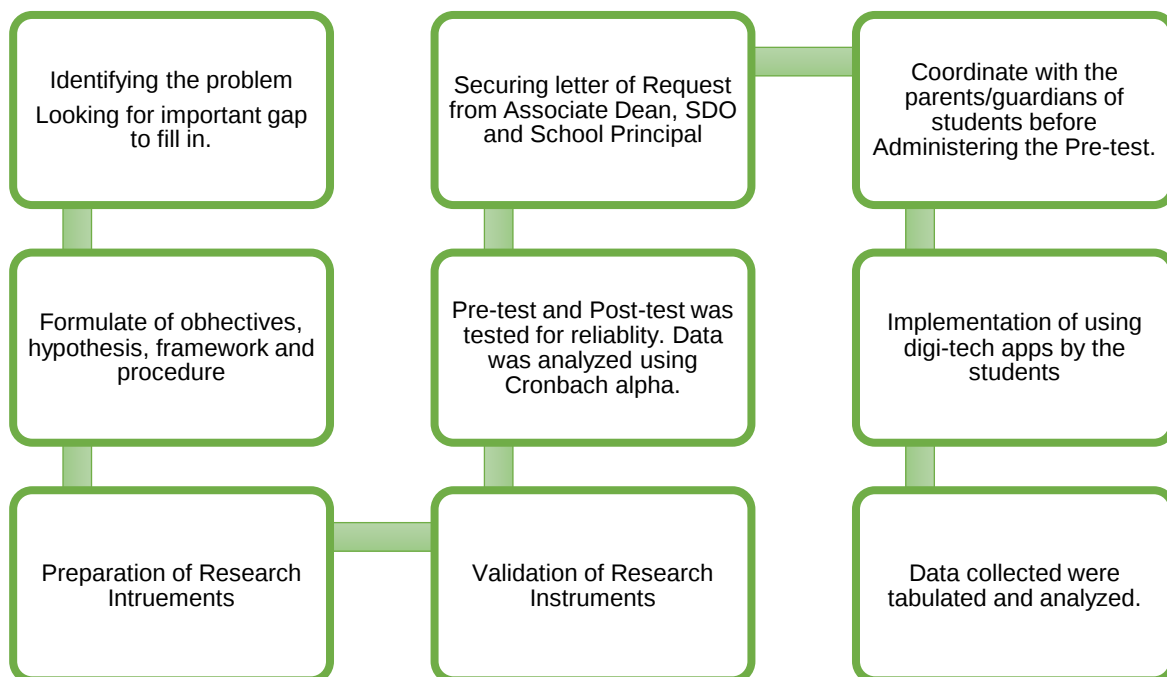


Figure 2. Research Procedure of the Study.

Research Instrument

In gathering of data needed for this study, the researcher made an assessment tool that was divided into four parts 801 corresponding to the skills needed to be measured in this study which are analytical skills, computational skills, graphing skills and problem-solving skills. Each part of the assessment tool was consisted of 10 questions in multiple choice type of test. The researcher – made test was validated by subject expert from other school. The validated assessment tool was distributed to other set of students for testing of reliability. Results were gathered and assessed using the cronbach alpha test to ensure the reliability of the assessment tool.

This research study also used a self-made questionnaire regarding the attributes of the Digi-tech apps used in the study. The questionnaire in the form of a checklist was validated by the thesis adviser. The checklist was composed of five-item statement that describes the attributes of the Digi-tech apps which are accessibility, appropriateness, clarity of the content, and usability.

The researcher used scale to evaluate the factors in the checklist. The rating used to evaluate the indicators of the attributes of the utilized Digi-tech apps in the study using the checklist were as follows: level of student's perception on the attributes of the Digi-tech apps in terms of its usability, clarity of the content and accessibility and appropriateness. The rating scale below was used to determine the frequency and relative frequency of the scores of the respondents in the terms of attributes of Digi-tech apps and Mathematical skills.

Rating	Scale	Level of the Attributes of Digi-tech apps	Interpretation	Scale	Mathematical Skill Interpretation
5	4.20-5.00	Strongly Agree	Strongly agree	9-10	Very Good
4	3.40-4.19	Agree	Evident	7-8	Good
3	2.60-3.39	Neutral	Moderately Evident	5-6	Average
2	1.80-2.59	Disagree	Less Evident	3-4	Below Average
1	1.00-1.79	Strongly Disagree	Not Evident	0-2	Poor

Statistical Treatment of Data

This section of the study discussed about the different statistical treatments used in order to determine effect of Digi-tech apps to the mathematical skills of grade eight (8) students of Lumban National High School S.Y. 2021-2022.

The following statistical tools were used to treat and interpret the data gathered in this study.

The mean and standard deviation were used to determine the level of the attributes of Digi-tech apps. These were also utilized to determine the level of the students' scores on the assessment tool that measures their mathematical skills

The Paired t-test was used, to determine statistically the difference in the students' scores before and after using the Digi-tech apps. This was used to test the significant effect of the Digi-tech apps to enhance the students' mathematical skills.

3. Results and Discussion

This chapter deals with the presentation, analysis and interpretation of the data gathered to answer the sub problem relative to the main problem of this study. This part discusses the findings of the study based on the research questions.

In this study, Digi-tech apps such as Desmos, Geogebra, Mathway, and Photomath were used as tools to enhance the Mathematical skills of the students in terms of their Analytical skills, Computational skills, Graphing skills, and Problem-Solving Skills.

Level of the Attributes of Digi-tech apps

The level of Digi-tech apps was measured in terms of accessibility, appropriateness, clarity of the content, and usability. The mean, standard deviation and verbal interpretation were used.

Table 1. Level of the Attributes of Digi-tech apps in Terms of Accessibility

Digi-tech Apps...	Mean	Standard Deviation	Remarks
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...can be used without an internet connection	4.78	0.42	Strongly Agree
...can be installed on any gadget such as an android phone, tablet, or computer	4.33	0.73	Strongly Agree
...have commands that are the same in a scientific calculator, so it is easy to use	4.55	0.75	Strongly Agree
...have instructions that are easy to follow and understand	4.58	0.68	Strongly Agree
...can be used independently by learners	4.48	0.68	Strongly Agree

Overall Mean= 4.54

Standard Deviation= 0.33

Verbal Interpretation=VH

The Digi-tech apps used in the study was evaluated in terms of its accessibility. The applications can be used without an internet connection (M=4.78, SD=0.42) with an interpretation of *strongly agree*. The applications can be installed on any gadget such as an android phone, tablet, or computer (M=4.33, SD=0.73) with an interpretation of *strongly agree*. The applications have commands that are the same in a scientific calculator, so it is easy to use (M=4.55, SD=0.75) with an interpretation of *strongly agree*. The applications have instructions that are easy to follow and understand, with an interpretation of *strongly agree* (M=4.58, SD=0.68). Finally, *strongly agree* on the application can be used independently by learners (M=4.48, SD=0.68).

The (OM=4.54, SD= 0.33) indicates that the level of the attributes of Digi-tech apps in terms of accessibility was *Very High*. This indicates further the applications used in this study can be used by the students whenever they needed even without internet connection.

This result was also supported by the study of Tortosa et. al. (2021) as he mentioned that accessibility and usability are closely related concepts that share the goals for a satisfactory user experience. Accessibility and usability refer to designing results in a way will be effective, efficient, and user-friendly. It also focuses on making an item easier to use. Nowadays, mobile devices have grown exponentially, giving way to new ways of relating, managing, and working. The existing literature establishes a direct relation between accessibility and usability, and reports that there are problems with both in learning platforms, and more generally with most websites.

Table 2. Level of the Attributes of Digi-tech apps in Terms of Appropriateness

Digi-tech Apps...	Mean	Standard Deviation	Remarks
...use language that is fit for the level of understanding of the users	4.63	0.59	Strongly Agree
...serve for the purpose of helping the users by giving them complete and step-by-step solutions to problems	4.75	0.49	Strongly Agree
...give correct and concise solutions	4.50	0.55	Strongly Agree
...include relevant information about the topics/lessons	4.30	0.61	Strongly Agree
...are a suitable guide in studying the lesson	4.48	0.60	Strongly Agree

Overall Mean= 4.53

Standard Deviation= 0.26

Verbal Interpretation=VH

The application use language that is fit for the level of understanding of the users (M=4.63, SD=0.59) with an interpretation of *Strongly Agree*. The applications serve for the purpose of helping the users by giving them complete and step-by-step solutions to problems (M=0.75, SD=0.49) with an interpretation of *Strongly Agree*. The applications give correct and concise solutions (M=4.50, SD=0.55) with an interpretation of *Strongly Agree*. The applications include relevant information about the topics/lessons (M=4.48, SD=0.60) with an interpretation of *strongly agree*. Finally, a *Strongly Agree* interpretation in the last indicator, the applications are a suitable guide in studying the lesson (M=4.48, SD=0.68).

The (OM=4.53, SD= 0.26) indicates that the level of the attributes of Digi-tech apps in terms of appropriateness was *Very High*. This indicates further the applications used in this study can be used by the students whenever they needed even without internet connection.

This result was also supported by the study of Kusrini & Rizkianto (2018) where the objective of the research resulted in acceptability of ViPhyLab application which was flexible and interactive, with high levels of appropriateness and quality, and able to improve students' independence in learning and their conceptual comprehension of rotational dynamics materials. The application is also equipped with material presentation, virtual practicum, exercise items, and media with interesting and interactive appearance. The results showed that the app is quite appropriate and quite good to use as learning media, corresponding to experts' and users' evaluation. According to field testing results, the application could improve students' learning independence and conceptual understanding.

Table 3. Level of the Attributes of Digi-tech apps in Terms of Clarity of the Content

Digi-tech Apps...	Mean	Standard Deviation	Remarks
...have a well-explained content that is useful in understanding the lesson	4.38	0.63	Strongly Agree
...give solutions that have explanations	4.60	0.59	Strongly Agree
...show clear graphs and complete information regarding it	4.55	0.50	Strongly Agree
...have contents that are error-free	4.58	0.68	Strongly Agree
...include solutions that can be understood by the students	4.55	0.64	Strongly Agree

Overall Mean= 4.53

Standard Deviation= 0.39

Verbal Interpretation=VH

The Digi-tech apps used in the study was evaluated in terms of clarity of the content. It was found that applications have a well-explained content that is useful in understanding the lesson (M=4.38, SD=0.63) with an interpretation of *Strongly agree*. The applications give solutions that have explanations (M=4.60, SD=0.59) with an interpretation of *Strongly agree*. The applications show clear graphs and complete information regarding it (M=4.55, SD=0.50) with an interpretation of *Strongly agree*. The applications have contents that are error-free (M=4.58, SD=0.68) with an interpretation of *Strongly agree*. Finally, a *strongly agree* interpretation on the applications include solutions that can be understood by the students (M=4.55, SD=0.64).

The (OM=4.53, SD= 0.39) indicates that the level of the attributes of Digi-tech Apps in terms of clarity of the content was *Very High*. This indicates further the applications used in this study has content that is easy to be understood by the user. The content of the applications shows clearness and error-free information.

This result was also supported by the study of Leobrera (2016) identified behaviors that contribute to instructional clarity: (a) using relevant equations; (b) teaching in a step-by-step manner; (c) lesson at pace appropriate to students; (d) informing students of lesson objectives or what they were expected to be able to do on completion of instruction; and (e) presenting the application in a logical manner.

Table 4. Level of the Attributes of Digi-tech apps in Terms of Usability

Digi-tech Apps...	Mean	StandardDeviation	Remarks
...make it easier to study the lesson	4.73	0.64	Strongly Agree
...helps the user to complete the task at ease	4.73	0.51	Strongly Agree

...contain commands that are easy to learn	4.63	0.54	Strongly Agree	804
...include functions that are easy to understand	4.70	0.52	Strongly Agree	
...have features that are easy to navigate	4.63	0.49	Strongly Agree	

Overall Mean= 4.68

Standard Deviation= 0.27

Verbal Interpretation=VH

The applications make it easier to study the lesson (M=4.73, SD=0.64) with an interpretation of *Strongly Agree*. The applications help the users to complete the task at ease (M=4.73, SD=0.51) with an interpretation of *Strongly Agree*. The applications contain commands that are easy to learn (M=4.63, SD=0.54) with an interpretation of *strongly agree*. The applications include functions that are easy to understand (M=4.70, SD=0.52) with an interpretation of *strongly agree*. Finally, a *strongly agree* interpretation on the applications have features that are easy to navigate (M=4.63, SD=0.49).

The (OM=4.68, SD= 0.27) indicates that the level of the attributes of Digi-tech apps in terms of usability was *Very High*. This indicates further the applications used in this study is helping the students to study at ease since it is easy to learn on how to manipulate it.

This result was supported by the study of Rahman and Hassan (2018) that identified numerous studies on usability for mobile learning applications for children. They indicated the result that showed the top four usability quality attributes which are efficiency, effectiveness, learnability and user satisfaction. The study reviewed presented that usability evaluations were conducted during implementation phase only, and evaluation is often built as a description of the case study. This study Hassan et. al. (2018) explored the current literatures on the subject matter and stimulates further studies that will lead to improved usability and design of mobile learning applications for children.

Level of Student's Mathematical Skills

The student's mathematical skills were measured using a self-made assessment tool and in terms of the students' analytical skills, computational skills, graphing skills, and problem-solving skills. The mean, standard deviation and verbal interpretation was used.

Table 5. Level of the Students' Mathematical Skills in Terms of Analytical Skills

Pre-test			Post-Test	
Score	Frequency	Percent	Frequency	Percent
9-10	0	0.00%	0	0.00%
7-8	0	0.00%	7	17.50%
5-6	10	25.00%	27	67.50%
3-4	27	67.50%	6	15.00%
0-2	3	7.50%	0	0.00%
Mean	3.70		5.62	
SD	1.04		1.05	
V.I.	Below Average		Average	

Legend:

8.01 – 10.00 Very Good (VG)

6.01 – 8.00 Good (G)

4.01 – 6.00 Average (A)

2.01 – 4.00 Below Average (BA)

0.00 – 2.00 Poor (P)

The table shows the level of the student's mathematical skills in terms of analytical skills, the results show the pre-test (M=3.70, SD=1.04) of the students gained an interpretation of *Below Average* while the post-test (M=5.62, SD=1.05) gained an interpretation of *Average*. The scores revealed that the post-test scores of the students are higher than the pre-test scores. This indicates that the scores of the students on the assessment tool for analytical skills increased compared with their pre-test scores.

The result is supported by Kunpol (2015) in his research indicating that developing analytical skills in mathematics of 805 students and evaluating the results of the development of these analytical skills in the learning of mathematics was through the integration of collaborative learning and case-based learning in the learning process. The development of analytical skills in mathematics using the case studies which emphasize collaborative learning are presented for the analytical skills in the target group of students in the following five areas: matching, classifying, analyzing errors, generalizing, and specifying.

Table 6. Level of the Students' Mathematical Skills in Terms of Computational Skills

Pre-test			Post-Test	
Score	Frequency	Percent	Frequency	Percent
9-10	0	0.00%	1	2.50%
7-8	2	5.00%	11	27.50%
5-6	15	37.50%	28	70.00%
3-4	20	50.00%	0	0.00%
0-2	3	7.50%	0	0.00%
Mean	4.23		6.25	
SD	1.25		0.81	
V.I.	Average		Good	

Legend:

- 8.01 – 10.00 Very Good (VG)
 6.01 – 8.00 Good (G)
 4.01 – 6.00 Average (A)
 2.01 – 4.00 Below Average (BA)
 0.00 – 2.00 Poor (P)

The table shows the mean level of the student's mathematical skills in terms of computational skills, the results show the pre-test (M=4.23, SD=1.25) of the students gained an interpretation of *Average* while the post-test (M=6.25, SD=0.81) gained an interpretation of *Good*. The scores revealed that the post-test scores of the students are higher than the pre-test scores. This indicates that the scores of the students on the assessment tool for computational skills increased compared with their pre-test scores.

The result is supported by the study of Ioannou et. al. (2018) that mentioned Computational thinking (CT) as an important concept in modern education. The scientific community is not only investigating the skills involved in CT but, is also trying to establish how these skills can be developed and through what technological means.

Table 7. Level of the Students' Mathematical Skills in Terms of Graphing Skills

Pre-test			Post-Test	
Score	Frequency	Percent	Frequency	Percent
9-10	0	0.00%	0	0.00%
7-8	0	0.00%	2	5.00%
5-6	5	12.50%	30	75.00%
3-4	19	47.50%	8	20.00%
0-2	16	40.00%	0	0.00%
Mean	3.08		5.25	
SD	1.21		0.90	
V.I.	Below Average		Average	

Legend:

- 8.01 – 10.00 Very Good (VG)
 6.01 – 8.00 Good (G)
 4.01 – 6.00 Average (A)
 2.01 – 4.00 Below Average (BA)
 0.00 – 2.00 Poor (P)

The results show the pre-test ($M=3.08$, $SD=1.21$) of the students gained an interpretation of *Below Average* while the post-test ($M=5.25$, $SD=0.90$) gained an interpretation of *Average*. The scores revealed that the post-test scores of the students are higher than the pre-test scores. This indicates that the scores of the students on the assessment tool for graphing skills increased compared with their pre-test scores.

The result is supported by the study of Muad (2020) that revealed Graphs and Graphing function are crucial aspects of understanding, yet difficult to students. Their research paper offered a quiet distinct way of thinking to help ease such difficulty. It focuses on analyzing, connecting silent features of functions with the improvement of graphing skills and concepts of concavities, and increasing and decreasing phenomena. The impact of learning such methods on enhancing graphing skills and on understanding concavity was remarkable. Students' enthusiastic involvement and use of basic skills and previous knowledge helped them in the process of assimilating and accommodating concepts that were previously procedurally learned. Thus, their graphing skills were significantly enhanced.

Table 8. Level of the Students' Mathematical Skills in Terms of Problem-Solving Skills

Pre-test			Post-Test	
Score	Frequency	Percent	Frequency	Percent
9-10	0	0.00%	3	7.50%
7-8	2	5.00%	11	27.50%
5-6	5	12.50%	20	50.00%
3-4	24	60.00%	17	42.50%
0-2	9	22.50%	0	0.00%
Mean	3.73		6.92	
SD	1.36		1.21	
V.I.	Below Average		Good	

Legend:

- 8.01 – 10.00 Very Good (VG)
- 6.01 – 8.00 Good (G)
- 4.01 – 6.00 Average (A)
- 2.01 – 4.00 Below Average (BA)
- 0.00 – 2.00 Poor (P)

The results show the pre-test ($M=3.73$, $SD=1.36$) of the students gained an interpretation of *Below Average* while the post-test ($M=6.92$, $SD=1.21$) gained an interpretation of *Good*. The scores revealed that the post-test scores of the students are higher than the pre-test scores. This indicates that the scores of the students on the assessment tool for problem-solving skills increased compared with their pre-test scores.

The result is related to Rahman et. al. (2017) study that identified the relationship between problem solving skills, metacognitive awareness, and mathematics achievement as well as to identify the role of metacognitive awareness as a mediator. The research suggested the importance of problem-solving skills in influencing secondary school students' mathematics achievement through the development of metacognitive awareness.

Table 9. Significant Difference on the level of Students' Mathematical Skills Before and After the Use of Digi-tech Apps

Skills	<i>t</i>	<i>p-value</i>	Analysis
Analytical Skills	9.60	0.000	Significant
Computational Skills	8.78	0.000	Significant
Graphing Skills	9.74	0.000	Significant
Problem-solving Skills	11.62	0.000	Significant

Table 9 reveals the significance difference on the students' mathematical skills. The results showed that there is a significant difference between the pre-test and post-test scores of the students on the use of assessment tool in analytical skills. In testing the difference, it was found that there is a significant difference on the performance of the students ($t=9.60$, $p=0.000$) which is lower than the 0.05 level of significance. This means that using Digi-tech Apps, student performance in post-test improved.

The results also concluded that there is a significant difference between the pre-test and post-test scores of the students on the use of assessment tool of computational skills. In testing the difference, it was found that there is a significant difference on the performance of the students ($t=8.78$, $p=0.000$) which is lower than the 0.05 level of significance. This means that even the computational skills in the level on the assessment test where students find difficult, the performance of the students improved.

The results also revealed that there is a significant difference between the pre-test and post-test scores of the students on the assessment tool of graphing skills. In testing the difference, it was found that there is a significant difference on the performance of the students ($t=9.74$, $p=0.000$) which is lower than the 0.05 level of significance. This means that graphical skills of the students developed with the help of Digi-tech app as the result of the post-test improved.

This also show that there is a significant difference between the pre-test and post-test scores of the students on the use of assessment tool of problem-solving skills. In testing the difference, it was found that there is a significant difference on the performance of the students ($t=11.62$, $p=0.000$) which is lower than the 0.05 level of significance. This means that problem solving as one of the parts in the assessment where student find difficult got the higher mean among the skill of the student. This proves that Digi-tech is useful for the student.

The result is supported by the study of Levin & Verner (2021) that indicated mathematical skills and the ability to solve practical problems were through creating and exploring their mathematical models. They help to mediate between practical, real-world problems and the abstraction of pure mathematics and enable the application of mathematical methods to other disciplines, such as science, engineering, and economics. Applied Mathematical Skills include the ability to analyze real-life situations, make abstractions, and synthesize events through a mathematical point of view.

Significant Effect of Digi-tech Apps on the Mathematical Skills of the Students

The results revealed that the Digi-tech apps used in the study have *significant* effect on the mathematical skills of the students. Specifically, analytical skills gained ($p=0.000$), computational skills gained ($p=0.000$), graphing skills gained ($p=0.000$), and problem-solving skills gained ($p=0.000$), which were all lower than (0.05) level of significance which supported the result of the analysis. This explains more that the learner's evaluation on the attributes of Digi-tech apps has an impact on the mathematical skills of the students.

Table 10. Significant Effect of Digi-tech Apps on the Mathematical Skills of the Students

Mathematical Skills	<i>t</i>	<i>p-value</i>	Analysis
Analytical Skills	16.997	0.000	Significant
Computational Skills	14.584	0.000	Significant
Graphing Skills	20.003	0.000	Significant
Problem-solving Skills	8.862	0.000	Significant

Therefore, this only shows that Digi-tech apps are very useful and considered as appropriate tool for the students. The result of the study is supported by the study of Etcuban & Pantinople (2018) as they concluded that the use of the mobile application in teaching mathematics to Grade 8 students in a public national high school by using the mobile application had somehow helped enhanced students' achievement and learning. In line with the quality education, the administrator should enforce and include the use of the mobile application in carrying out learning to its maximum. The teacher must also equip with the latest trend for learners to become globally competitive.

4. Summary of Findings

This chapter includes the presentation of a summary, findings, conclusion based on the hypothesis, and the corresponding recommendations.

Summary

The purpose of the study was to determine the effectiveness of using Digi-tech apps such as desmos, geogebra, mathway and photomath as supplementary tool to enhance the mathematical skills of selected grade eight students of who were under the modular distance learning modality in Lumban National High School. They were purposely taken as the respondents of the study.

The main instrument used in this research study was a forty (40) item Assessment tool that was divided into four (4) parts corresponding to the mathematical skills of the student which was prepared and modified by the researcher. A researcher-made questionnaire in the form of checklist was also prepared to collect the needed data from the students with regards to the attributes of the Digi-tech apps. The pretest/post-test and survey questionnaire were modified and validated by subject experts before distributed to the respondents.

The researcher conducted a pre-test using the assessment tool made by the researcher. After the pre-test, the researcher helped the students to install the applications on the gadgets and explained how to use the applications. Then the students used the application as a tool in studying their lesson.

The responses from the respondents were recorded, tallied, computed, and analyzed. The statistical treatments used in computing the data were mean, standard deviation, and t-test.

From the instruments that yielded the data gathered by the researcher summarized the following findings.

The level of the attributes of Digi-tech apps in terms of accessibility was very high. This shows that the students agree that the Digi-tech apps can be used independently and is easy to use. The level of the attributes of Digi-tech apps in terms of appropriateness was very high. This further indicates that the Digi-tech apps were appropriate to use for the lesson as well as it served the purpose of providing accurate solutions to problems. The level of the attributes of Digi-tech apps in terms of clarity of the content was very high. This implies that the apps provided the students information that is well-written and well-explained that can guide the student to understand the lesson. Lastly, the level of the attributes of Digi-tech apps in terms of usability was very high. This indicates further the usefulness of the Digi-tech apps as it helps the students enhance their skills on the lesson.

The level of student's mathematical skills in terms of analytical skills on the pre-test was below average while average on the post-test. This indicates that the scores of the students on the assessment tool for analytical skills increased compared with their pre-test scores. The level of student's computational skills on the pre-test was average while good on the post-test. This indicates that the scores of the students on the assessment tool for computational skills increased compared with their pre-test scores. On the other hand, the level of student's graphing skills on the pre-test was below average while average on the post-test. This indicates that the scores of the students increased compared with their pre-test scores. Lastly, the level of students problem-solving skills on the pre-test was below average while good on the post-test. This further indicates that using the Digi-tech apps helped the students to increase their performance on the subject.

The results also showed that there is a significant difference between the pre-test and post-test scores of the students on the assessment tool in terms of analytical skills ($t=9.60$, $p=0.000$), computational skills ($t=8.78$, $p=0.000$), graphing skills ($t=9.74$, $p=0.000$) and problem-solving skills ($t=11.62$, $p=0.000$). This further indicates that after using the Digi-tech applications, the scores of the students on the assessment tool increased showing high performance of the students.

The results revealed that the Digi-tech apps used in the study have significant effect on the mathematical skills of the students. This clarifies further that the learner's evaluation on the attributes of Digi-tech apps has an impact on the mathematical skills of the students.

Conclusion

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

The test of difference between the scores of the students on the assessment tool for the mathematical skills before and after the utilization of the Digi-tech apps of the respondents resulted in rejecting the null hypothesis. This implies that there is a significant difference on the mathematical skills of students. Moreover, it shows how the Digi-tech apps significantly affect the mathematical skills of students in terms of their analytical skills, computational skills, graphing skills, and problem-solving skills.

The study implies that Digi-tech apps are self-learning tools that motivate the students to manage their interest in mathematics subject under the modular distance learning. Hence, teachers should promote self-learning among the students to make them better learners. With the help of Digi-tech apps, students can learn according to their own pace and interest which enhance their confidence in their own learning.

Recommendations

Based on the results and conclusion posted in this study, the following recommendations was formulated;

1. It is highly recommended the continuous utilization of Digi-tech Apps used in this study as an additional learning tool for the students especially those who are under the modular distance learning modality. The utilization of Digi-tech apps as a tool may help the students to learn and improve their Mathematical skills.
2. It is suggested that students must have regular access to technologies that support learning to advance their mathematical skills. The continuous advancement of technology leading to new learning tools must be applied to the learning setting to ensure the provision of quality education.
3. Teacher may use the Digi-tech apps that can be paired with selected learning competencies. Teachers may add activity that fits the skills of the students.
4. Further related studies may be conducted in line with the new normal education that may improve the teaching-learning process.

References

- Etcuban, J. O., & Pantinople, L. D. (2018). The Effects Of Mobile Application In Teaching High School Mathematics. *International Electronic Journal Of Mathematics Education*, 13(3), 249-259.
- Igcasama, R. M. (2021). TEACHERS AND STUDENTS' PERCEPTIONS ON THE IMPLEMENTATION OF K-12 SPIRAL PROGRESSION APPROACH. *IJIET (International Journal of Indonesian Education and Teaching)*, 5(1), 116-124.

Ioannou, A., & Constantinou, V. (2018) Development Of Computational Thinking Skills Through Educational Robotics.

809

Kunpol, S. (2015). The Development Of Analytical Skills In Mathematics Of Grade 6 Students. *Rangsit Journal Of Educational Studies*, 2(2), 41-55.

Kusrini, E., & Rizkianto, I. (2018, January). Developing Mathematics Learning Materials Based On Multiple Intelligence Theory, Learning Trajectory, And Conceptual Knowledge In The Topic Of Probability For Eighth Graders. In University Of Muhammadiyah Malang's 1st International Conference Of Mathematics Education (Incomed 2017) (Pp. 301-308). Atlantis Press.

Leobrera, R. L. (2016) Module On Shortcut Technique In Teaching Grade 8 Mathematics. Unpublished Master's Thesis, Laguna State Polytechnic University, Sta. Cruz Campus, Sta. Cruz, Laguna.

Levin, L., & Verner, I. M. (2021). Teachers Uncover The Potential Of 3d Printing Activities To Promote Analytical And Applied Mathematical Skills.

Muad, M. S. (2020) Interrogation Of Silent Features, Creative Reasoning And Function Sense For Graphing Functions.

Narenderan, S. T., Meyyanathan, S. N., & Karri, V. V. S. R. (2019). Experimental design in pesticide extraction methods: A review. *Food chemistry*, 289, 384-395.

Nichols, T. P., & Leblanc, R. J. (2020). Beyond Apps: Digital Literacies In A Platform Society. *The Reading Teacher*, 74(1), 103-109.

Pairan, M., Saundarajan, K., Osman, S., Kumar, J., Daud, M., & Abu, M. (2020). Learning Algebra Using Augmented Reality: A Preliminary Investigation On The Application Of Photomath For Lower Secondary Education. *International Journal Of Emerging Technologies In Learning (Ijet)*, 15(16), 123-133. Kassel, Germany: International Journal Of Emerging Technology In Learning. Retrieved November 11, 2021.

Rahman, S., & Hassan, N. M. (2017). Problem Solving Skills, Metacognitive Awareness, And Mathematics Achievement: A Mediation Model. *The New Educational Review*, 49(3), 201-212

Tortosa, S. O., Batanero-Ochaíta, C., De-Marcos, L., Rivera, L. F., Holvikivi, J., & Hilera, J. R. (2021). Improving Accessibility In Online Education: Comparative Analysis Of Attitudes Of Blind And Deaf Students Toward An Adapted Learning Platform. *Ieee Access*, 9, 99968-99982

Williams, R. (2020). The Use Of Digital Applications And Websites In Completing Math Assignments (Thesis, Concordia University, St. Paul).