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IMPROVING THE PERFORMANCE OF GRADE SIX LEARNERS IN MATHEMATICS USING DIGITAL-BASED LEARNING MATERIALS AT SAN GABRIEL ELEMENTARY SCHOOL, PHILIPPINES

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Abstract

The digital education is a valuable tool in this age of information technology that improves the skills and abilities of learners in their studies and academic life.The Digital Technology has an important impact on education of the pupils in the world of technology.The study determined the effects of the digital-based learning materials on Grade IV pupils on their mathematics academic performances in school years 2022-2023.Specifically, this study sought to answer the following: What are the Mastery level of numeracy competencies of the Grade VI Mathematics at the San Gabriel Elementary School? What is the validity and acceptance level of digital-based learning materials in teaching mathematics to Grade VI - Considering the following: format; presentation and organization; content and evaluation; and What are the pupil' s achievement test scores before and after exposure to digital-based learning materials in Grade 6? The study used descriptive correlational & experimental design for single-group study. The study was conducted at the San Gabriel Elementary school for academic year 2022-2023 with 32 respondent-pupils and seven teacher- evaluators.The finding shows that the Grade VI pupils in San Gabriel Elementary School are highly numerate. The level of validity of the digital-based learning materials obtained a highly reliability in terms of format, presentation and organization, content and evaluation that conform with DepEd standard. The level of acceptability of digital-based learning materials for the utilization are generally acceptable to the respondents. The digital-based learning materials are effective in improving the performance of the Grade VI pupils in Mathematics instruction. There is a significant difference in the pretest and posttest that indicates that the digital-based learning materials is effective in teaching Mathematics.

Keywords: Digital instruction, academic performance, effect, instructional materials, correlational, single-group experimental

INTRODUCTION

For this generation, learners are equipped with the ability to digitally learn. It is in their present education by their experience and their formal training.Nowadays, the internet is one of recent tools of the information technology which offers individuals not only social interactions but also academic perspectives and technical knowledge for advancement in learning activity.

This individual contained the capacity to display a dominant act for a good performance.The use of digital technology was growing and affected rapid development in the diversity and extent of knowledge now available (Amit, 2021) The perspective of Internet recognized through improving academic performances by technological change and innovation.

However, conditions in the primary school are constantly pressured to improve student learning (Benito, Bantulo, Hauda, 2022).Because of the digitalization and learning in basic education are intending superior opportunities to provide effective learning (Brink et al. 2020; Nuncio

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and al.The use of technology has a number of advantages such as enabling students to watch filmed lectures before a class and engage in more interactive activities at ease, or students can collaborate and better rely on the instructor as a facilitator, and the higher education system was not ready for such a scenario (Mahlangu, 2018).DLM improve efficiency of learning and over a wide range of specialized learning experiences without constraints of time, space and place (Lee and Hung, 2015)Despite the advantages of digital-based learning materials, the use of technology alone may not provide sufficient benefits for learning to warrant research in the development of such applications (Kalyuga and Liu, 2015) Thus, the scientific literature indicates that DLM should be accompanied with appropriate educational approaches (Noroozi, Busstra & al, 2012).Digital-based educational materials like instructional clips, online guidance, content structure, and collaboration tools can be used in technology based environments in which students interact meaningfully with learning materials and their peers (Noroozi and al. ; 2012).It can also facilitate the students' selection, organization and intégration of new information and knowledge. The Framework and tools used for classroom learning can have important impact on teacher practices and student achievement.

The learning right is an important component in fostering positive learning experiences and academic success (Neumann & Co, 2019). Similarly, DepEd school educators must understand the use of data that support informed decision making in order to improve educational processes , but the data should be accurate and validated for an effective and efficient intervention.

The ability to analyze standardized testing data provides a tool for educators to use in their effort to combat the deficiency in learning of students (Stephens, 2010).The quarterly examination results and National Achievement Test in the Filipino education system are the primary source for educational information about student performance. Educational leaders are at forefront of implementing policies and practices which foster rigorous teaching and learning.

Educational leaders can afford themselves the opportunity to make informed choices by accepting and implementing technology (Jacoby, 2007)The educational learning area adapted to the growing use of technology trends in learning and technology include a shift from paper to computer testing for learning of all kinds (Hensley, 2015)

There is a mounting interest in validating instructional materials for authentic learning due to the slack for education purposes.Since many complex factors can influence a questionnaire's dependability, validation is a complex process (Amit 2021). The validity test of an instrument is a process of analyzing the survey questions for dependability.

The validity of a questionnaire is determined by knowing what it is meant to measure.Validity explains how well collected data cover the actual investigation (Ozdemir et al.Devon & al, 2007, 2019; ; Devon et al., 2019).According to Ozdemir et al's research paper (2019) content knowledge includes knowledge of the subject and its organizational structures.In line with this, technology also aid in the process of learning assessment, analysis and interpretation.The problem above encourages the researcher to conduct this study to determine how digital learning may use its impact in improving pupils' numeracy skills.In the researcher’s view it is

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believed the utilization of validated digital-based learning materials for students, especially those who struggle academically, could be beneficial. Referring to the monitoring and evaluation of the first and the second quarters of 2022-2023 school year, the mean percentage score for Mathematics 6 were recorded at 78% & 81% respectively.This scores fall short of the 85% target of Department of Education.Thus, the findings drawn from this study may best help to improve the performance of teachers and students as the key elements in an effective and performing school. Thus, this research focused on the effect of digital-based learning materials on pupil performance in Math VI in San Gabriel Elementary School.

RESEARCH QUESTION

This study aimed to validate the degree to which pupils, teachers, and experts in San Gabriel Elementary School used digital learning in Mathematics. Hence, this ascertained the validity and acceptability of digital learning for academic use among Grade VI pupils and teachers in San Gabriel Elementary School during school year 2022-2023.

Specifically, this research study sought to answer the following questions:

1. What is the mastery level of numeracy competencies of Grade VI Mathematics in San Gabriel Elementary School?
2. What is the level of validity and acceptability in using digital-based learning materials in teaching Mathematics in Grade VI considering the following:
    a. format;
    b. presentation and organization;
    c. content; and
    d. evaluation?
3. What are the pupil's achievement test scores before and after exposing them to digital-based learning materials in Mathematics 6?
4. Is there a significant difference encountered by the Grade VI pupils in San Gabriel Elementary School?

The hypothesis of the Study

There is no significant difference encountered by the Grade VI pupils in San Gabriel Elementary School

PROPOSED INNOVATION, INTERVENTION, AND STRATEGY

The proposed innovation were leveraging technology in the school, such as educational software, interactive tools, and multimedia resources, to create engaging and interactive learning experiences for teachers and pupils. The researcher propose an intervention as a supplemental plan to the teachers to reach out and deliver the lesson to the non-numerate pupils that were focused on implementing the digital-based learning approach in mathematics lessons.

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The strategies were: an appropriate digital-based learning materials, resources, and activities aligned with the curriculum and targeted learning goals in mathematics subjects. These materials can include interactive simulations, online quizzes, video tutorials, and virtual manipulative.

METHODOLOGY

The study used the descriptive-correlation and single-group experimental method of research. The group were given pre-evaluation regarding on their digital learning application in school testing mechanism. Then, an orientation on digital learning application were conducted to the sampled teachers-evaluators and pupils-evaluators in San Gabriel Elementary School. After utilizing the digital learning for second and third quarter learning, the teacher was given post evaluation to the pupils. The respondents of this study are the Grade VI pupils and teachers in San Gabriel Elementary School during the school year 2022-2023. A total of 32 Grade VI pupils and 7 teachers' respondents were participated in this study using the purposive sampling technique. The mastery level of pupils in Mathematics were categorized as Advance; Highly Numerate; Numerate and Low Numerate. The teacher-validators instrument was a standardized evaluation tool for the digital platform adopted from adopted from DepEd LRMDS. The pupil's evaluation checklist was a researcher-made instrument subjected to content and construct validity. These digital-based learning materials were evaluated by the Grade VI pupils in San Jose Elementary School for dry run consisting of 20 items divided into four categories in terms of format, presentation and organization, content and evaluation adopted from DepEd LRMDS. The validity of the digital learning application were rated with high reliability; fair reliability and low reliability, likewise the acceptability were measured to highly acceptable; acceptable; fairly acceptable; less acceptable and not acceptable. The pretest and posttest performance of pupils were categorized into outstanding, very satisfactory, satisfactory and poor. The Cronbach's Alpha utilized to measure the internal consistency and reliability of the instruments. The data collected tabulated and analyzed through SPSS 20.0 version. To established the effect of digital learning application to the performance of Grade VI in mathematics the used a descriptive statistic such as percentage, frequency and means score and weighted mean. Likewise, inferential statistics were used to correlate the level of validity, and the level of acceptability, Pearson r Coefficients Correlation were used. t-test for uncorrelated samples was used to test the significance of the difference between the pretest and post-test mean scores of Grade VI pupils.

RESULTS

Numeracy Level of Pupils

The study determines the mastery level of numeracy competencies of Grade VI Mathematics in San Gabriel Elementary School during school year 2022-2023.

Level of Numeracy Competencies. Table 1 below revealed the results of level of numeracy competencies of the DepEd Grade VI pupils in San Gabriel Elementary School by devising a tool called Numeracy Inventory Tool for Grade VI which consists of the basic topics that

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require mastery of skills in (1) Reading and Recognizing Numbers; (2) Ordering and Comparing of Numbers; (3) Performing Operations on Numbers; (4) Analyzing Patterns & Graphs. This tool categorizes pupils as advanced, highly numerate, numerate and non-numerate depending on the obtained score. As shown in Table 2 below, more than half of the respondents are considered to be highly numerate with a frequency of 18 (56.25%) and more than a half of them have highly numerate and advance rating with frequencies 8 (25%) and 4 (12.5%), respectively of the basic numerical skills such as reading, recognizing, ordering and comparing numbers, performing operations and analyzing patterns, graph or data on topics such as whole numbers, integers, rational numbers and decimals. Only 2 or 6.25% of the respondents were found to have low level of numeracy. The obtained mean for numeracy scores is 24.28 which is considerably relatively high performance.

Due to the high performance of the pupils in the least learned lessons as disclosed in Table 1.2, the researcher considered in selecting the digital-based learning materials with corresponding lesson plan and module, as a tool for the multimedia classroom instruction. This supports the findings in the study of Brink, et al., (2020), by using digital devices in class can create a particular level of ease and comfort but also knowing students' experiences of using digital tools, also makes it difficult in teaching and learning. Likewise, Nuncio et al. (2020) found that students will succeed and be well-versed in the use of technology if provided with chances such as access to online educational resources and exposure to a safe and child-friendly online environment. In contrast, Mahlangu (2018) further argues some of the challenges of hybrid and distance learning are quality assurance, passive resistance, not enough lecturer training to use digital tools, and lack of tools and technologies that facilitate adaptability.

Table 1: Descriptive summary of respondents' numeracy level prior to the digital-based learning materials

Level	Frequency	Percent	Mean
Advanced	8	25	24.28
Highly numerate	18	56.25	
Numerate	4	12.5	
Low Numerate	2	6.25	
Total	**32**	**100**	

Level of Validity of the Digital-based learning materials

Table 2.1 presents the result of the teachers-validators and pupils-validators to validate the supplemental instructional materials. The criteria for evaluation include: format, presentation and organization, content and evaluation. As far as the validity of the digital-based learning materials is concerned, the teachers-evaluators and pupils-evaluator registered an Alpha of 0.979 and 0.866 which means high reliability, respectively. This implies that the digital-based learning materials have good quality as rated by the teachers-validators and pupils-validators. Thus, it can be surmised that both validators consider the digital-based learning materials to possess a great extent of validity. This conforms to the findings of Nabayra, (2020) study on validating an e-module for flipped classroom instruction. The findings of Terciano (2022) and

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Kusumawati and Nayazik (2018) align with the notion that learning materials should meet certain criteria. These criteria include having specific, measurable, attainable, reliable, and time-bound objectives. Furthermore, the learning materials should incorporate activities that are manageable, logically organized, and properly sequenced, thereby aiding learners in comprehending and applying concepts in the subject area. Additionally, the evaluation component of the learning materials should reinforce learners' mastery of concepts and align with the behavioral objectives outlined in each activity.

Table 2.1: Level of Validity of the Digital-based Learning Materials

Indicators	No. of Items	Cronbach's α
Teachers-validators	20	0.979
Pupils-validators	20	0.866

Acceptability level of the Digital-based Learning Materials

The acceptability of the developed was evaluated based on format, presentation and organization, content and evaluation.

Format. Table 2.2 below disclosed the evaluation results of the acceptability of digital-based learning materials for Mathematics 6 in terms of format. Table 4.2 below revealed the valuation results of the acceptability of digital-based learning materials for Mathematics VI in terms of format. Respondents rated at the format of the adopted digital-based learning materials for the evaluation using the Pupils Evaluation checklist. Results showed that among the statement, " are aligned with the MELCs" got the highest mean (M=4.72, SD=.467) and was verbally interpreted as "Highly Acceptable". On the contrary, the lowest rating was on statement, "are appropriate to the expectations and needs of the learners" with a mean (M=3.90, SD=.831) and was verbally interpreted as "Acceptable". The main reason for this was that pupils consider digital-based learning materials to serve as new materials that address their learning needs and styles. This means that this appropriateness of content, format, presentation of the digital-based learning materials reflects the application principle suitable to pupils' level of understanding. Furthermore, the format of the digital-based learning materials in Mathematics 6 obtained an overall rating of (M=4.20, SD=.322) and was verbally interpreted as "Highly Acceptable". This means that this format was complete in terms of knowledge and ideas being presented in every topic presented in the digital-based learning materials. This means that teachers-experts believe that the digital-based learning materials could reinforce, enrich, and / or lead to the mastery of certain learning competencies for the level and subject they were intended, the information and facts used are updated, and the visuals used have the potential to arouse the pupils' interest, convey the message of the topic and are fitted for use in school. This result is conforming with Amit (2021) shows that graphical user interface and navigation provided to communicate to the learner were significantly found highly acceptable in terms e-Courseware content. Moreover, the extent of validity, Ozdemir et al. (2019), asserts that having accurate format it makes valuable ways of representing and formulating the subject that make it comprehensible to others. Furthermore, content validity is the most valuable forms of representing and communicating consistency and how students best learn a subject's specific concepts and topics

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(Devon et al., 2007).

Table 2.2: Level of Acceptability of Digital-based learning in terms of Format

Item	Mean	Std Dev	Interpretation
are aligned with the MELCs	4.72	0.467	Highly Acceptable
are clearly presented	4.27	0.786	Highly Acceptable
are consistent with the lesson	4.09	0.539	Acceptable
are appropriate to the expectations and needs of the learners	3.90	0.831	Acceptable
are SMART	4.00	0.632	Acceptable
Grand Mean	**4.20**	**0.322**	**Highly Acceptable**

Presentation and Organization

Table 2.3 below disclosed the evaluation results of the acceptability of digital-based learning materials for Mathematics 6 in terms of presentation and organization. Evaluators looked at the presentation and organization of the adopted digital-based learning materials for the validation using the Pupils Evaluation checklist. Results showed that among the statement, "topics covered are logically presented throughout the material." obtained the highest mean (M=4.46, SD=.523) and was verbally interpreted as "Highly Acceptable". On the contrary, the lowest rating was on statement, "Material promotes development of higher cognitive skills such as critical thinking, creativity, learning by doing, problem solving and other similar skills" with a mean (M=4.16, SD=.750) and was verbally interpreted as "Acceptable". The main reason for this was the time element were bounded for presentation in the video lessons. Moreover, the presentation and organization of the adopted digital-based learning materials in Mathematics I got an overall rating of (M=4.26, SD=.270) and was verbally interpreted as "Highly Acceptable". This means that the digital-based learning materials material met all the standards in terms of presentation and organization on the final acceptability. The present study is similar with the study of Nabayra (2020) the e-module is highly acceptable in terms of learning objectives, content, organization and presentation, format and design, learning activities, learning, and in terms of its overall rating. This implies that the developed e-module is worthy and can serve as an instructional material in a flipped classroom model that will help students learn at their own pace. Moreover, this study affirms Liu, and Elms, (2019) assertion that using animated videos assist different student cohorts in significantly different ways.

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Table 2.3: Level of Acceptability of Digital-based learning materials in terms of Presentation and Organization

Indicator	Mean	Standard Deviation	Interpretation
Topics covered are logically presented throughout the material.	4.46	0.523	Highly Acceptable
Units/chapters and lessons are arranged from simple to complex, from observable to abstract.	4.18	0.750	Acceptable
Exercises contain useful introductions, summaries, and other devices that facilitate smooth progression from one exercise to another.	4.27	0.786	Highly Acceptable
Development of lessons in the material allows review, comparison, and integration with previous lessons.	4.18	0.750	Acceptable
Material promotes development of higher cognitive skills such as critical thinking, creativity, learning by doing, problem solving and other similar skills.	4.16	0.750	Acceptable
Grand Mean	**4.25**	**0.711**	**Highly Acceptable**

Content. Table 2.4 revealed the level of acceptability of the digital-based learning materials on selected Grade 6 Mathematics topics as to the content. The level of acceptability of digital-based learning materials was described in terms of content was highly acceptable supported by the grand mean of 4.21. This means that the evaluators perceived that the content of the digital-based learning materials were beyond the acceptable standards. The validators strongly agree that the content is aligned with the MELCs which gained the highest (M=4.45, SD=0.522). Similarly, they rated acceptable that the content is appropriate to the expectations and needs of the learners in which obtained the lowest (M=4.17, SD=0.750), respectively.The results further imply that the contents of the supplemental instructional materials are appropriate to students' needs in which the can integrates real-world experiences. This means that the contents of recorded digital-based learning materials certainly are suitable to the learner's ability and needs. This result conforms with Basilio, and Sigua, (2021), who stated that a module contains planned activities designed to help students to achieve a set of objectives. The relevance of content is logically developed and organized, that stimulates and promotes critical thinking, language is appropriate to the target user level. Likewise, it contained precise concepts in reference to the K-12 Curriculum Guide. This directly implies that the digital-based learning materials possess valid and relevant knowledge that is accurately aligned with the K-12 curriculum guide, with objectives that are congruent and fitted to the skills of Grades I pupils. Thus, it can be surmised that the evaluators consider the educational video tutorials to possess a great extent of content validity. Thus, the recent study confirms the idea of Jones (2003) that if the educational use and key issues of PowerPoint are well – thoroughly considered at both individual and authoritative level, the utilization of PowerPoint in class can be a good means for instruction.

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Table 2.4: Level of Acceptability of Digital-based Learning Materials in terms of Content

Item	Mean	Std. Deviation	Interpretation
are aligned with the MELCs	4.45	0.522	Highly Acceptable
are clearly presented	4.18	0.750	Acceptable
are consistent with the lesson	4.27	0.786	Highly Acceptable
are appropriate to the expectations and needs of the learners	4.17	0.750	Acceptable
are SMART	4.18	0.750	Acceptable
Grand Mean	**4.21**	**0.711**	**Highly Acceptable**

Evaluation. Table 2.5 revealed the level of acceptability of the digital-based learning materials on selected Grade VI Mathematics topics in terms of evaluation. The level of acceptability of supplemental instructional materials was described in terms of evaluation was highly acceptable supported by the grand mean of 4.80. This means that the evaluators perceived that the evaluation of the digital-based learning materials were beyond the acceptable standards. The validators strongly agree that the evaluation is relevant to the overall learning goals, non-discriminatory, encourages learner's engagement and measures what is intended to measure which obtained the highest (M=4.84, SD=0.408). Likewise, they rated highly acceptable that the assessment and outcome are establishes reliability which shows accuracy and consistency to the lessons/topics in which got the lowest (M=4.67, SD=0.516). This implies that the digital-based learning material caters the needs of students in carrying out their performance. These statements are consistent with the findings of previous studies. According to Heramil (2016), assessment and evaluation should incorporate a diverse range of measurement instruments and techniques to effectively gauge the efficacy of instructional materials. The high level of acceptability aligns with the research conducted by Terciano (2022), which suggests that the assessment and outcomes of recorded videos promote learner engagement, motivation, and provide a means to measure students' comprehension of concepts based on the given objectives. Additionally, the study conducted by Benito et al. (2022) supports these findings, indicating that the validity and appropriateness of the options and evaluation rating system were highly regarded. Similarly, Kusumawati and Nayazik (2018) observed that learners who utilized modules achieved better average mathematical learning outcomes compared to those who did not use the modules. In contrast, Tolentino (2020) noted that low-quality assessments fail to accurately and precisely measure changes in student achievement and cannot contribute to the continuous improvement of the educational program.

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Table 2.5. Level of Acceptability of Digital-based Learning Materials in terms of Evaluation

Item	Mean	Std. Deviation	Interpretation
measures what is intended to measure based on the objectives	4.84	0.408	Highly Acceptable
establishes reliability which shows accuracy and consistency to the lessons/topics	4.67	0.516	Highly Acceptable
is non-discriminatory among the student's capability and matches expectations	4.83	0.408	Highly Acceptable
encourages learner's engagement and motivation	4.81	0.405	Highly Acceptable
is relevant to the overall learning goals of the lesson	4.82	0.407	Highly Acceptable
Grand Mean	**4.80**	**0.428**	**Highly Acceptable**

This section shows the summary of level of acceptability of the digital-based learning materials. Table 2.6 below shows that based on the agreement given by the respondents, all of the indicators obtained a highly acceptable rating. The findings show that in terms of acceptability, respondents have an agreement that conforms with the standard. Over-all, evaluation has obtained the highest mean rating indicating that this has the highest acceptability among the four factors.

Table 2.6: **Summary of level of acceptability of the digital-based learning materials**

Indicators	Mean	Standard Deviation	Interpretation
Format	4.20	0.322	Highly Acceptable
Presentation and Organization	4.25	0.711	Highly Acceptable
Content	4.21	0.711	Highly Acceptable
Evaluation	4.80	0.428	Highly Acceptable
Over-all Mean	**4.36**	**0.543**	**Highly Acceptable**

Pupils Achievement Test Score

Table 3 below shows the result of the pretest and posttest achievement test score of the pupils. The overall mean achievement level of the pupils in the pretest was 11.25, described as “Satisfactory”. On the other hand, the overall mean performance level of the pupils in the posttest was 23.54, described as moving towards mastery. The result shows that the pupils meet the passing rate of 75% set by the DepEd in the posttest. It also shows an increase in the performance of the pupils after the utilization of the digital-based learning materials. The mean rating increased from 11.25 to 23.54. This shows that pupil’ achievement in Mathematics 6 was greatly improved after their exposure to digital-based learning materials. This implies that the use of digital-based learning materials in enhancing the performance of pupils may have been

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effective. Table 3 shows that the standard deviation of the control group was higher compared with the experimental group. The lower value in the experimental group's standard deviation indicates that the students were, to some extent, homogeneous in their scores compared to the control group. However, the higher value of the control group's standard deviation implies that their scores were widely dispersed compared to the experimental group. This findings aligns with a previous study conducted by Bawa (2018), which revealed that students who were exposed to MIA (Multimodal Interactive Approach) performed better in learning chemistry concepts compared to those taught through conventional teaching methods. Similarly, the findings of Kuo et al. (2018) support this observation, as they discovered that students who were exposed to multimodal presentations outperformed those who were taught using blackboard/marker board presentations. Furthermore, the findings of Bicomong et al. (2015) further corroborate this, as their investigation into the use of the multimodal approach in teaching algebra (Measurement) revealed that students who were exposed to MIA demonstrated superior performance compared to those taught through conventional methods.

Table 3: Descriptive Summary of pupils' pre-test and post-test achievement scores in mathematics

Indicators	Mean Score	Standard Deviation	Interpretation
Pre-test	11.25	1.745	Satisfactory
Post-test	23.54	3.639	Very Satisfactory

Difference Between Pupils' Pre-test and Post-test Achievement Scores in Mathematics 6

Table 4 revealed that there is a significant difference between the pretest and posttest scores of the pupils' respondents, t = -2.181 (df = 31); p = .000. At 99% confidence level, the mean difference of .12 in favor of the posttest indicates that the pupils performed better in this test than in the pretest. With these findings, it can be assumed that the digital-based learning materials used by the pupils was effective. It implies that there was an increase in the performance and the analysis was significant. Based on the data, it was shown that there was a significant difference between pre-test and posttest mean scores of students using digital-based learning materials at 0.01 level of significance. It showed that the null hypothesis stating that—There is no significant difference between pre-test and posttest mean scores of pupils using digital-based learning materials was rejected, it can be inferred that there is —significant‖ difference between them. This result is true from the study of Terciano (2022) revealed that there's a significant difference in the pre-test and post-test scores for a recorded video utilized in classroom instruction. This implies that the pupils' performance may have been enhanced with the use of video lessons. This observation was that most of the pupils are likely to experience better performance when video lesson is utilized in the teaching-learning process. Similarly, Thomas & Israel (2014) stated that the posttest scores of the experimental group taught with animated cartoons achieved greater academic performance in science. It further asserted that there was a significant difference in the performance of students exposed to cartoon style multimedia teaching and those that are conventionally taught. This study further agrees with Akinoso (2018) on effect of the use of multimedia on students' performance in

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Secondary Mathematics revealed that there was no significant difference between the mean achievement of male and female students taught using Multimedia.

Table 4: Test of difference between pupils' pre-test and post-test achievement scores in mathematics

Test	Mean	Mean difference	Computed t-value (df=31)	pvalue	Interpretation
Pretest	11.25	-12.29	-2.181	0.000	Significant
Posttest	23.54				

**Significant at .01 level

CONCLUSIONS

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

1. The level of numeracy competencies of Grade VI pupils in San Gabriel Elementary School is in highly numerate performance.
2. The level of validity of the digital-based learning materials obtained a highly reliability in terms of format, presentation and organization, content and evaluation that conform with DepEd standard.
3. The level of acceptability of digital-based learning materials for the utilization are generally acceptable to the respondents.
4. The digital-based learning materials are effective in improving the performance of the Grade VI pupils in Mathematics instruction.
5. There is a significant difference in the pretest and posttest that indicates that the digital-based learning materials is effective in teaching Mathematics.

RECOMMENDATIONS

The foregoing conclusions served as the basis for the following recommendations:

1. Mathematics teachers are suggested to utilized digital-based learning materials that enhance critical thinking of the pupils.
2. The school heads may encourage the teachers to utilized digital-based learning materials in teaching in all learning areas.
3. The digital-based learning materials may be further reviewed and validated to better improve its quality along content quality, instructional quality, technical quality and mechanics using DepEd LRMDS.
4. The school administration may conduct seminars to assist teachers in making this kind of learning materials suited for each type of learners.

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5. Another related study or research should be conducted to further verify the findings of the current study using a much bigger population and locale.

WORKPLAN

MAJOR ACTIVITIES	TIMELINE															
	Jan 2023				Feb 2023				Mar 2023				April 2023			
	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W 4
Crafting the research proposal																
Submission / Presentation of the research proposal for correction																
Revision / Rewriting the research proposal based on corrections																
Submission of the research proposal to the Division Office																
Data gathering																
Analysis of data by a statistician																
Writing the findings, recommendations, and other parts of the research paper																
Finalization of the research paper																

Legend: Green – Done Yellow – Ongoing Red – Still to be done

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COST ESTIMATES

PARTICULARS	COST ESTIMATES
Printing of research proposal, research instruments, and final completed research	5, 000.00
Data gathering	5, 000.00
Miscellaneous expenses	3,000.00
TOTAL	**PHP 13, 000.00**

PLAN FOR DISSEMINATION AND ADVOCACY

This research study utilized Grade VI pupils has officially enrolled in San Gabriel Elementary School and has over 32 respondents. This study aims to determines the effects of the digital-based learning materials to the Grade VI pupils in their academic performance in Mathematics during school year 2022-2023. The researchers are motivated to pursue this study to assess the true situation of the pupils in the new normal, especially because the numeracy performance is very alarming in our school, so this study emphasizes the need to innovate instructional materials to sustain the diversity of learners in the digital education. The outcome of this action research to the teachers to improved the performance of pupils in mathematics subjects. Share the results of this study to pupils and/or respondents for their own reference. Provide additional learning to educators handling the same subject matter and/or related subject areas. Additionally, apply the findings of this study to the teaching and learning process and share this potential knowledge to a broad audience including:

- National Research Committee (NRC)
- Regional Research Committee (RRC)
- The Schools Division Research Committee (SDRC)
- City Education Research Committee (MRC)

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