

# Development and Validation of Video Lessons as Supplemental Materials in Teaching Mathematics for Grade 1 Pupils

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## ABSTRACT

This study aimed to develop and validate video lessons in terms of format, numeracy, content, and evaluation. The developed and validated supplemental materials was tested on its acceptability in terms of learning competencies, appropriateness, presentation and organization, and usefulness. Further, the video lessons were used to grade 1 pupil in the Eastern Samar Division wherein their achievement was measured through test scores before and after exposing them to supplemental video lesson. The study used the descriptive, and experimental research method. The chosen respondents of the study were 680 pupils and 8 teachers' experts in

Eastern Samar Division during SY 2022-2023. There are four instruments used in the study, diagnostic test for numeracy competency, level of validity of video lesson, level of acceptability of the video lesson and the pretest and post-test instrument. Data were analyzed using frequency, percentage, mean, and weighted mean, and standard deviation, and t-test. The results show that the mastery level of numeracy competencies of Grade I pupils in the Division of Eastern Samar is in numerate performance. The level of validity of the video lesson that only the format of the developed Video Lesson obtained a high reliability while all other factors have shown low reliability. The level of acceptability of the video lesson in terms of learning competencies, appropriateness, presentation and organization, and usefulness are very highly evident. The pupil's achievement test score in Mathematics I is very satisfactory. There is a significant difference between the pretest and post-test scores of the pupil's respondents. It is recommended that Mathematics teachers should utilized video lesson that enhance scientific and digital ability of the pupils.

**Keywords:** *Development, validation, acceptability, achievement, correlation, experimental*

## INTRODUCTION

Mathematics is a fundamental subject in every educational system that provides the foundation for most scientific disciplines. However, several studies have reported that mathematics is one of the most challenging subjects for students at all levels of education (Van Zoest et al., 2017; Flores & Flores, 2020). This challenge is attributed to factors such as difficulty in understanding concepts, abstract nature of the

subject, lack of motivation, and inadequate teaching methods (Dörfler & Johnson, 2018; Lavigne et al., 2021). As such, educators have been exploring various teaching methods and supplemental materials to improve students' mathematics skills. The use of video lessons as supplemental materials in teaching mathematics has gained increasing attention in recent years. Video lessons have been defined as a visual presentation of a lesson delivered through a recorded video (Choi et al., 2020). The use of video lessons has been reported to improve students' engagement, understanding, and retention of mathematics concepts (Mohan et al., 2018; Ebrahim & Issa, 2021). Additionally, video lessons have the potential to provide a flexible and accessible learning environment that caters to the individual needs of students (Kanuka & Jugdev, 2020).

The effectiveness of video lessons as a supplemental material in teaching mathematics is dependent on the quality of the videos. The development and validation of high-quality video lessons that align with the curriculum and meet the learning needs of students are crucial. The development and validation process require a thorough understanding of the subject matter, curriculum, and pedagogical strategies (Choi et al., 2020). Additionally, the validation process involves testing the videos' effectiveness in improving students' learning outcomes.

According to the Philippine Institute for Development Studies (PIDS) (2017), the low performance of Filipino students in mathematics and science is a significant concern for the country's human resource development. This concern is further highlighted by the results of the 2018 Programme for International Student Assessment (PISA), which showed that the Philippines ranked 79th out of 79 countries in mathematics and 78th out of 79 countries in science (OECD, 2019). These results reveal a significant gap in the Philippines' educational system that needs to be addressed. In response to these challenges, the Philippine government established various programs aimed at improving the quality of education, such as the K-12 curriculum and the "Public Schools of the Future Digital Rise Program" (DepEd Common, 2020). These programs aim to enhance the learners' skills and equip them with digital literacy skills needed in the 21st century.

In conclusion, the low performance of students in mathematics is a significant concern for the human resource development. The development and validation of video lessons as a supplemental material in teaching mathematics to Grade I pupils have the potential to improve mathematics learning outcomes. This study's development and validation process aimed to meet the learning needs of pupils. The study's findings will be useful to educators, curriculum developers, and policymakers in developing engaging mathematics teaching methods. The use of video lessons in teaching mathematics has the potential to provide a flexible and accessible learning environment that caters to the individual needs of students (Kanuka & Jugdev, 2020; Brame, 2016; Kozma, 1991; Mayer, 2014). Overall, this study aimed to contribute to the ongoing efforts to improve the quality of mathematics education in our school district and in the country as a whole.

The study aimed to contribute to the body of knowledge on the effectiveness of video lessons as supplemental material in teaching Mathematics to Grade I pupils. It involved the development of a supplemental video in Mathematics for Grade I in the DepEd Eastern Samar Division and its validation in terms of format, numeracy, content, and evaluation. The study also assessed the level of acceptability of the video in terms of learning competencies, appropriateness, presentation and organization, and usefulness,

and gathered teachers' feedback on its use. Furthermore, it determined the pupils' achievement test scores before and after exposure to the video lessons and examined whether there was a significant difference in their performance.

## METHODOLOGY

### Research Design

The study employed a mixed-methods research design, integrating both descriptive and experimental approaches. The descriptive aspect focused on the development of supplemental video lessons, their validation and acceptability, and the feedback and opinions of teachers regarding their use in teaching Grade I Mathematics. The experimental aspect involved analyzing the pretest and posttest results of Grade I pupils before and after exposure to the video lessons to determine if there was a significant difference in their performance.

### Locale of the Study

The study was conducted in the Division of Eastern Samar, which consists of sixty school districts. For practicality and convenience, two districts—Dolores I and Llorente I—were selected as the research sites, representing the largest districts in the northern and southern parts of the division.

### Respondent of the Study

The study involved two main groups of participants. The first group consists of Grade I pupils from Dolores Central School and Llorente Central School, both located in Eastern Samar, Philippines. Samples were randomly selected from the entire populations of Grade I pupils from these schools during the School Year 2022-2023. The second group of participants comprises expert teacher validators. Eight expert teacher validators were selected from the participating schools. This group included two instructional material development experts and three content experts from each school. The expert teacher validators played a crucial role in evaluating the face and content validity of the video lessons. Their expertise and insights contributed to ensuring the quality and relevance of the video lessons as supplemental materials for mathematics instruction in Grade I. This combination of participants offered a holistic perspective on the use of video lessons as supplemental materials in teaching mathematics to Grade I pupils in Eastern Samar.

#### Distribution of Respondents

School District	Number of Teachers per District	Number of Teachers Respondents	Number of Pupils per District	Number of Pupils Respondents	Total
Dolores	19	3	2580	379	350
Llorente	22	3	2040	301	338

IMs Expert		2			2
Total	41	8	4620	680	690

### Sampling Procedure

In determining the total sample population of the pupils and expert teachers' respondents, the study employed proportional sampling technique for the pupil respondents and purposive sampling for IMs experts and faculty experts. Purposive sampling is often far easier to implement in schools, such as the public elementary school in the Eastern Samar Division in the province of Eastern Samar. The acceptable number of expert evaluators for educational research is composed of at least three evaluators whose works are independent from each other.

### Research Instrument

*Evaluation Checklist.* An evaluation checklist was utilized to assess the effectiveness of the video lessons from the perspective of Grade I pupils. This checklist consisted of specific criteria and indicators for pupils to evaluate their learning experiences, including learning competencies, appropriateness, presentation and organization, and usefulness in improving their mathematics skills. The checklist was adopted from the DepEd Learning Resources Management and Development System (LRMDS).

*Expert Validator's Instrument.* The teacher-expert validator's instrument served as a standardized evaluation tool for the video lessons, also adopted from DepEd LRMDS. This instrument guided the expert teacher validators in evaluating the face and content validity of the video lessons. It outlined specific criteria and standards to assess various aspects, such as format, language, content accuracy, and instructional effectiveness.

The combination of these research instruments facilitated the collection of data on the acceptability and perceptions of teachers and pupils towards the video lessons, as well as the effectiveness of the instructional materials in enhancing mathematics learning outcomes. These research instruments provided a systematic and standardized approach to gather and evaluate the relevant data required to address the research objectives.

### Development and Implementation of Video Lessons as Instructional Materials

The experimental treatment employed in this study aimed to enhance the numeracy competencies of Grade I pupils in mathematics. The methodology involved a systematic approach, including the development of video lessons as instructional materials. The following sections outline the key steps undertaken in the development and implementation of the video lessons.

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### **Pre-Implementation Phase**

The initial phase of the study focused on preparing for the implementation of the experimental treatment. During this phase, the development of video lessons took place in accordance with the K-3 Curriculum Guide for Mathematics I. Lesson plans and scripts were meticulously crafted to align with the curriculum standards and cater to the specific needs of the Grade I pupils. The objective was to create engaging and informative video lessons that would effectively support the teaching and learning process.

### **Implementation Phase**

The implementation phase involved the actual use of the developed video lessons as instructional materials. The video lessons were designed to deliver targeted instruction on numeracy competencies to Grade I pupils. They were carefully evaluated for face and content validity, taking into consideration aspects such as format, language, content, and evaluation methods. Expert teachers and educational specialists were actively involved in reviewing and providing feedback on the video lessons, contributing to their refinement and improvement.

The revised video lessons, incorporating the suggestions and recommendations from the experts, underwent a final evaluation. The experts' feedback played a crucial role in enhancing the video lessons' acceptability in terms of learning competencies, appropriateness, presentation, and organization. The final output of the educational video lessons was then submitted to an Education Specialist Supervisor expert for a final viewing and evaluation.

Following the validation process, the experimental treatment consisted of 18 meetings in which the Grade I pupils were instructed using the video lessons. The single-group experimental design allowed for a focused examination of the treatment's impact on the numeracy competencies of the pupils.

The video lessons were implemented in a blended learning environment, combining online video instruction with traditional classroom activities. The entire duration of the experimental treatment spanned 18 school days, commencing with a pretest and concluding with a posttest.

Both the pretest and posttest were administered to evaluate the pupils' performance and determine any significant differences resulting from the utilization of the video lessons. The posttest aimed to assess the effectiveness of the experimental treatment in improving the numeracy competencies of the Grade I pupils.

In conclusion, this study involved a comprehensive approach to the development and implementation of video lessons as an experimental treatment. The development phase encompassed aligning the video lessons with the curriculum standards, crafting lesson plans and scripts, and incorporating expert feedback for revisions. The implementation phase involved utilizing the video lessons with Grade I pupils, using pretest-posttest assessments to measure the impact on numeracy competencies. This meticulous methodology ensures the validity and effectiveness of the experimental treatment.

## Data Gathering Procedure

The data collection process involved several steps. Initially, a permission letter, cover letter, and informed consent documents were secured from the office of two school division superintendents in the province of Eastern Samar. These documents granted the researcher authorization to administer the survey questionnaire, conduct interviews, and access relevant documents to corroborate respondents' answers.

Upon obtaining approval, the questionnaire was distributed to the respondents, and retrieval took place immediately after the completion of the questionnaires. Clear instructions were provided to the respondents regarding how to answer the test. They were given a one-hour time limit to complete the 30-item multiple-choice test. The researcher collected the test papers and answer sheets, and the results were carefully checked, recorded, and made available for statistical interpretation.

The video lessons used in the study were adopted and validated by experts, ensuring their alignment with the most essential learning competencies in Mathematics I. The validation process was conducted by experts from January 27, 2023, to March 18, 2023. A total of five adopted video lessons were shared with the participants through a mobile application called SHAREit. Each video lesson had a duration of approximately 8 to 15 minutes and was intended to be used over a four-week period. The researcher also provided printed SMILE modules, obtained from the Department of Education, corresponding to each topic in Mathematics I to support the video lessons.

To facilitate communication and instruction, the researcher requested the participants to create an exclusive messenger group chat. This group chat served as a platform for the teacher (researcher) to provide instructions and guidance throughout the experiment. The experiment itself took place from March 20, 2023, to April 14, 2023, with the scheduled time for watching the video lessons and answering the SMILE modules set from 7:30 to 8:30 in the morning. Following the utilization of the video lessons, a posttest was administered to assess the significant difference in the students' performance. The entire activity spanned 18 school days, encompassing the pretest and posttest phases.

## Measurement of Variables

For the level of validity of the supplemental video lessons, the following range scale and verbal interpretations was used:

<b>Scale</b>	<b>Verbal Interpretation</b>
0.80 and above	High reliability
0.40 – 0.79	Fair reliability
0.39 and below	Low reliability

To rate the video lessons in terms of format, language, content, and evaluation, the following five-point graduated scale was utilized. The weighted score, range, and verbal interpretations are as follows:

Range	Scale	Interpretation
22 – 30	4	Outstanding
15 – 21	3	Very Satisfactory
8 – 14	2	Satisfactory
1 – 7	1	Poor

  

Calculation Pattern	Calculation	Verbal Interpretation
$\bar{x} > Mi + 1.8SDi$	$\bar{x} > 4.20$	Very Good
$Mi + 0.6SDi < \bar{x} \leq Mi + 1.8SDi$	$3.40 < \bar{x} \leq 4.20$	Good
$Mi - 0.6SDi < \bar{x} \leq Mi + 0.6SDi$	$2.60 < \bar{x} \leq 3.40$	Moderate
$Mi - 1.8SDi < \bar{x} \leq Mi - 0.6SDi$	$1.80 < \bar{x} \leq 2.60$	Low
$\bar{x} \leq Mi - 1.8SDi$	$\bar{x} \leq 1.80$	Very Low

To assess the level of acceptability of the supplemental video lessons, the following five-point graduated scale was used. The weighted score, range, and verbal interpretations are as follows:

Weighted Score	Range	Verbal Interpretation
5	4.20 – 5.00	Very Evident (VE)
4	3.41 – 4.19	Evident (E)
3	2.61 – 3.40	Moderately Evident (ME)
2	1.81 – 2.60	Less Evident (LE)
1	1.00 – 1.80	Least Evident (LE)

For the interpretation of the pretest and posttest scores in both groups, the following range, scale, and interpretations will be used:

### Analysis of Data

The collected data were systematically analyzed to derive meaningful insights and valid conclusions. Face validation was conducted to assess the validity of the video lessons, and the responses from the questionnaires were collected, tabulated, analyzed, and interpreted using weighted mean and grand mean. Descriptive statistics, including mean and standard deviation, were also used to interpret pupils' scores, as well as the levels of validity and acceptability. Expert validation and trial phases further informed the analysis, with their comments and suggestions used for revisions. To determine if there was a significant difference between the pretest and posttest mean scores of the experimental and control groups, a t-test for uncorrelated samples was applied at a 0.05 level of significance.

### Ethical Consideration

The study secured approval from the Dean of the Graduate School of Eastern Samar State University and obtained permission from the Schools Division Superintendent before conducting the research. Throughout the process, the researcher upheld ethical principles, integrity, and respect for

participants' rights. Informed consent was obtained by clearly explaining the purpose and procedures of the study, ensuring voluntary participation, and allowing respondents to withdraw at any time or decline to answer questions. Anonymity and confidentiality were maintained by not collecting identifying information, and participants were assured that their responses would be used solely for research purposes. Contact details were also provided for any concerns, ensuring transparency and adherence to ethical standards.

## RESULTS AND DISCUSSION

Table 1. Level of Validity of the Developed Video Lesson based on Cronbach's Alpha value

Factors	Cronbach's Alpha <sup>a</sup>	Interpretation
Format	0.703	High
Language	0.395	Low
Content	0.068	Low
Evaluation	0.383	Low

Table 2.1 Level of Acceptability of Video Lessons in terms of Learning Competencies

Indicator	Mean	Standard Deviation	Interpretation
Learning competencies (LC) for the subject and grade level of the video lesson are appropriate	4.09	0.831	Evident
Development of learning competencies is sufficient.	3.45	1.128	Evident
Learning competencies include development of cognitive domain.	3.27	0.467	Evident
Learning competencies include development of psychomotor.	4.09	0.539	Evident
Affective domain is one of the learning competencies for the subject.	4.72	0.467	Very Highly Evident
<b>Average</b>	<b>3.92</b>	<b>0.412</b>	<b>Evident</b>

**Table 2.2. Level of Acceptability of Video Lessons in terms of Appropriateness**

Indicator	Mean	Standard Deviation	Interpretation
Content is appropriate to the pupils grade level.	4.72	0.467	Very Highly Evident
Vocabulary and length of sentences are suitable to target learner.	4.27	0.786	Very Highly Evident
Material encourages integration of positive values and is mindful of health and safety of pupils.	4.09	0.539	Evident
Text, visuals, illustrations, layout, and design are interesting and suitable to the target Grade I pupils.	3.90	0.831	Evident
Material is free of controversial and sensitive issues which may be difficult to discuss in the classroom.	4.00	0.632	Very Highly Evident
<b>Average</b>	<b>4.20</b>	<b>0.322</b>	<b>Very Highly Evident</b>

**Table 2.3. Level of Acceptability of Video Lessons in terms of Presentation and Organization.**

Indicator	Mean	Standard Deviation	Interpretation
Topics covered are logically presented throughout the material.	4.45	0.522	Very Highly Evident
Units/chapters and lessons are arranged from simple to complex, from observable to abstract.	4.18	0.750	Evident
Exercises contain useful introductions, summaries, and other devices that facilitate smooth progression from one exercise to another.	4.27	0.786	Very Highly Evident
Development of lessons in the material allows review, comparison, and integration with previous lessons.	4.18	0.750	Evident
Material promotes development of higher cognitive skills such as critical thinking, creativity, learning by doing, problem solving and other similar skills.	4.17	0.750	Evident
<b>Average</b>	<b>4.25</b>	<b>0.269</b>	<b>Very Highly Evident</b>

**Table 2.4. Level of Acceptability of Video Lessons in terms of Usefulness.**

<b>Indicator</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Interpretation</b>
Easy to understand	3.90	0.94	Evident
Provides knowledge and skill	4.27	0.46	Very Highly Evident
Encourages creative and critical thinking	4.45	0.82	Very Highly Evident
Serves as an instructional tool	3.72	0.64	Evident
Helps facilitate lesson presentation	4.44	0.68	Very Highly Evident
<b>Average</b>	<b>4.16</b>	<b>0.35</b>	<b>Evident</b>

**Table 2.5. Summary of level of acceptability of the video lesson.**

<b>Indicators</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Interpretation</b>
Learning competencies,	3.92	0.412	Evident
Appropriateness,	4.20	0.322	Very Highly Evident
Presentation and Organization	4.25	0.269	Very Highly Evident
Usefulness	4.16	0.355	Evident
<b>Average</b>	<b>4.13</b>	<b>0.340</b>	<b>Evident</b>

**Table 3. Feedback and Strengths of Video Lessons for Grade I Mathematics**

<b>Key Areas</b>	<b>Feedback For Improvement</b>	<b>Strength</b>
<b>Format</b>	<ul style="list-style-type: none"> <li>- Incorporate more visual aids</li> <li>- Include captions or subtitles</li> <li>- Enhance the pacing of the video</li> <li>- Add interactive elements or quizzes</li> </ul>	<ul style="list-style-type: none"> <li>- Effective use of animations and graphics</li> <li>- Visually engaging presentation</li> </ul>
<b>Language</b>	<ul style="list-style-type: none"> <li>- Simplify complex vocabulary and sentence structures</li> <li>- Provide clear and concise explanations</li> <li>- Add more examples and real-life scenarios</li> <li>- Ensure clear and audible audio narration</li> </ul>	<ul style="list-style-type: none"> <li>- Use of mother tongue or familiar language</li> <li>- Promotes a comfortable and inclusive learning environment</li> </ul>
<b>Content</b>	<ul style="list-style-type: none"> <li>- Cover all essential learning competencies</li> </ul>	<ul style="list-style-type: none"> <li>- Sequential and logical progression of concepts</li> </ul>

<b>Evaluation</b>	<ul style="list-style-type: none"> <li>- Provide more opportunities for practice and application</li> <li>- Include additional real-world examples and contexts</li> <li>- Break down complex topics into smaller segments</li> </ul>	<ul style="list-style-type: none"> <li>- Supports understanding of mathematical principles</li> </ul>
	<ul style="list-style-type: none"> <li>- Offer more varied and interactive assessment methods</li> <li>- Clearly communicate evaluation criteria and expectations</li> <li>- Incorporate formative assessment strategies</li> <li>- Include more open-ended questions or prompts</li> </ul>	<ul style="list-style-type: none"> <li>- Clear overview of learning objectives and expectations</li> <li>- Provides guidance for student progress and improvement</li> </ul>

**Table 4. Descriptive Summary of pupils' pre-test and post-test achievement scores in mathematics**

Indicators	Mean Score	Standard Deviation	Interpretation
Pre-test	18.25	2.849	Very Satisfactory
Post-test	18.54	3.639	Very Satisfactory

**Table 5. Test of difference between pupils' pre-test and post-test achievement scores in mathematics**

Test	Mean	Mean difference	Computed t-value (df=66)	p value	Interpretation
Pretest	18.25				
Posttest	18.54	-0.29	-1.111	0.000	Significant

*\*\*Significant at .01 level*

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