Development of Learning Video to improve Numeracy Skills Elementary School Students

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Abstrack. The aim of the research is to develop appropriate and effective learning videos to improve the numeracy skills of grade III elementary school students regarding the concept of time and its application. Including the type of development research referring to the ADDIE model, with stages, (1) Needs Analysis, carried out field studies and literature studies; (2) Product Design; (3) Development and (4) Implementation, including validation processes with experts and video testing with students carried out in a circular manner; (5) Evaluation, a Pretest-Posttest Control Group Design experiment was carried out to determine the effectiveness of the video in improving the numeracy skills of class III students in 6 elementary schools, sampling 170 students, 93 students as the experimental group and 77 students as the control group, and interviews to determine student responses towards the use of learning videos. Obtaining a score in the "very appropriate" category with a percentage of 85.35% and there is a significant difference in the average posttest score of the experimental group of 80 and the control group of 58, this is confirmed by the students' positive response to the use of learning videos.

Keywords: Media, Video Development, Learning Videos, Numeracy Skills, SD.

1 Introduction

In mathematics, one of the competencies that students must master is numeracy skills. Numeration is a person's skill and confidence in developing knowledge and skills in applying mathematics in all aspects of life [1]. Numeracy is the ability to apply exact mathematical concepts and terms in daily activities. Based on the Elementary School Graduate Competency Standards (SKL), students are expected to be able to use various numbers (numbers) and simple mathematical symbols learned at school to solve problems they encounter in real life [2].

Indonesian students' numeracy skills are low. PISA of Indonesian students in general from 2000 to 2018 in the numeracy aspect decreased [3], [4], [5]. The results of the Public Education Report Card which contains an overview of the quality of education performance or the effectiveness of educational unit's report learning achievements in aspects of numeracy

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skills of less than 50% [6]. The sources above are also corroborated by the results of research [7], [8].

The situation got worse after problems were discovered caused by the teacher's lack of ability to direct students to problem solving resulting in students having difficulty integrating mathematical concepts and principles being studied with students' daily problems, the lack of use of learning media resulted in passive learning and did not stimulate problem solving abilities. Therefore, there is a need to improve problem solving skills instilled through learning media to improve numeracy skills. In improving numeracy skills, students use skills to understand basic mathematical concepts, reason to solve problems with the mathematical concepts learned, then apply the learned mathematical understanding in everyday life problems [1]. Numeracy skills is important because it is one of the standards determining the quality of human resources (HR) in a country [9]. Numeracy skilss grows one's self-confidence in developing knowledge and skills in applying mathematics in all aspects of life [1]. Having numeracy skills means knowing the benefits of learning mathematics and its relation to daily life activities.

Media in the opinion of Sashi and Brynildsen [10] is used to stimulate interaction due to the message conveyed. If the message conveyed cannot be understood properly, it means that the message is experiencing obstacles [11], and vice versa. Factors that cause messages to be difficult to understand are usually because there are obstacles or disturbances in the delivery process. In carrying out learning the teacher must know the characteristics of his students so that he can adjust the learning approach, methods, media, and the right type of evaluation for children which will affect their learning outcomes [12]. Media affects the effectiveness of learning [13], [14]. Learning videos are a solution to overcome students' low numeracy abilities. because with videos the subject matter is clearer and structured, students get complete visualization, namely visual and audio effects at the same time [13], the use of learning videos will help students reason and make conclusions by visualizing the content of the material as attractive as possible through video [15] because of the use of video as an introduction to learning messages has several objectives at once, namely cognitive, affective, and psychomotor goals [16]. Videos can develop attention skills (noticing skills), videos are effective in developing critical thinking skills of elementary school students [17], [18], [19], and are practical because they can be used independently and repeatedly [20], [21]. Videos can be used for various practical purposes to make videos enjoyable for users, therefore there is no age limit for using videos. Videos can be used in learning for preschool age, elementary school level, middle and high school levels as well as adults such as the use of videos in training [22]. The videos can even be used in teaching math to students with autism or spectrum disordersutism spectrum disorder (ASD) which is implemented using a learning approachconcrete-representational-abstract (CRA) with video-based instruction (VBI) aims to provide focused and explicit instructions in clear, concise, and consistent mathematical language [23]. Video recordings can be modifiedframe-by-frame it is adjusted and aligned with the content or material that will be included in the video structurally in each learning sequence because content alignment affects the representation of content topics.

Constructivism theory states that the learning environment affects learning outcomes. In addition to the knowledge provided by the teacher, students must also be able to build their own knowledge within themselves. In this case the teacher facilitates learning by letting

students find and explore their own ideas, making students aware that they can find learning strategies that they like themselves.

Learning Style Theory, the most common learning style isel Fleming's VARKor commonly abbreviated as VAK (Visual, Auditory, and Kinesthetic), namely: (a) Visual, is learning by seeing what is being learned (sense of sight); (b) Auditory, is learning by listening to instructions or information from what is being learned (sense of hearing); and (c) Kinesthetic, learning by working directly in what activity is being studied (actively moving).

The video that is developed and needed is a complete video, contains content that is aligned with learning objectives, structured and precise in presenting the material, represents explicitly the abstractness of mathematical language, motivates students, focuses student concentration, and helps students absorb subject matter quickly, makes it easier for students' reason and integrate learned mathematical concepts in real life.

2 Method

2.1 Research Design

This study aims to develop learning videos on time material as a solution to real problems in elementary schools adopting the type of development research (development research) using the ADDIE model (analysis, design, development, implementation, evaluation). Evaluation was carried out using a quasi-experimental quantitative methodPretest-Postest Control Group Design [24] and interviews. The pre-test was given before the intervention was carried out and the post-test was given three months after the intervention.

2.2 Sample and Population

The population in this study were 36 elementary school students in Medan Perjuangan sub-district consisting of 11 public schools and 15 private schools. Samples were taken using the cluster random sampling technique, and a total of 6 schools were obtained, namely 3 public elementary schools and 3 private elementary schools. 3 schools as the experimental group totaling 93 studentsdand 3 schools as the control group totaling 77 students. Overall, the participants involved were 170 students.

2.3 Research Implementation Procedures

According to Ching Yee Yong et al. [25], the ADDIE model is a traditional process commonly used by a developer in designing teaching and training. The following is an image of the design of learning video development using the ADDIE model in this study.

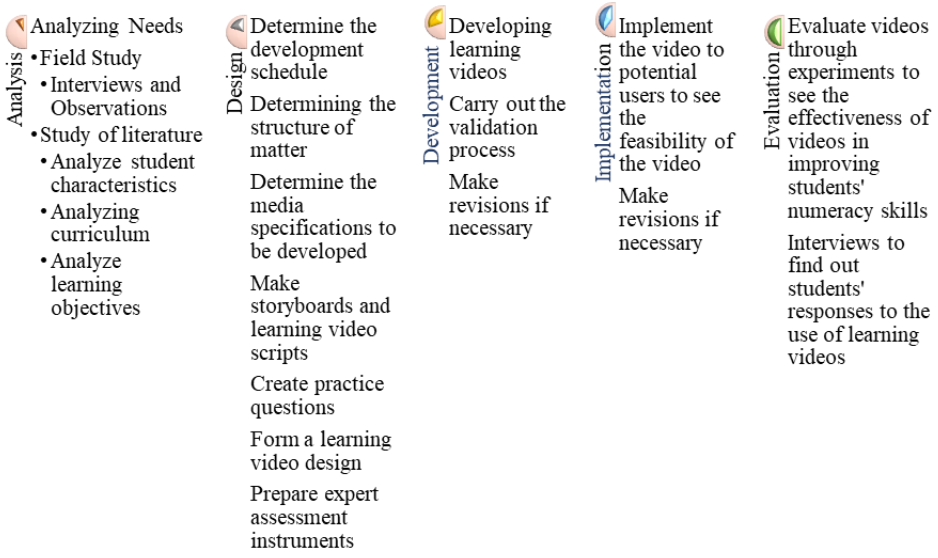

Fig. 1. Development Research Model [**24**]

Numeracy is also referred to as a skill using mathematical concepts, mathematical procedures and facts, as well as tools to describe, explain and predict various events [4]. Numeration can be said as a useful knowledge for, (1) Using numbers (numbers) and mathematical symbols to solve life's problems; (2) Analyze information from various presentation forms (tables, graphs, charts and others), then interpret the results of the analysis to make decisions and find solutions [2].

Table 1. Numeracy Skills Indicators

No	Rated aspect	Indicators
1	Understanding	Students understand the basic concepts of mathematics. For example, solving simple math problems that are routine.
2	Reasoning	Students are able to reason to solve complex and non-routine problems based on their mathematical concepts.
3	Application	Students are able to apply their mathematical knowledge in more diverse contexts.

Source: [26]

In this study, video is the choice of technology-based media used in learning. Videos can illustrate various mathematical objects, such as two- and three-dimensional shapes (circles, triangles, rectangles, etc.). Video clips can imitate real objects, such as clockwise rotation clips in Time material which can be adjusted for the duration of the rotation time [27] and can be embellished with various color choices [28]. In addition, video also has narrative power that can be arranged in images, speech, sound effects, motion, speed, and structured

sequences. Video segments can be adjusted between content and duration to predict the time and students' reasoning ability to solve a given problem. Videos are designed to help students learn subject matter while at the same time linking the relevance of the topic of the subject matter to the topic of everyday life problems to see their numeracy skills. Videos also facilitate different student learning styles, both students who like to learn by seeing (watching), listening, moving actively, alone, and in groups [27]. The development of learning videos to improve the numeracy skills of primary school students is implemented gradually. The development process is carried out in accordance with the stages of the development process using ADDIE which consists of stages of analysis (analysis), planning (design), development (development), implementation (implementation), and evaluation (evaluation).

2.3.1 Analysis Phase

In this stage, a needs analysis is carried out covering all the initial information needed by researchers to find out the problems experienced by the school. Needs analysis data obtained from field studies and literature studies. Field studies by directly observing teaching and learning activities in schools and conducting interviews with four teachers to find out their difficulties in teaching time material, their need for mathematics learning media to hone the numeracy skills of third grade elementary school students. Literature study to determine the characteristics and demands of the curriculum. Then analyze the learning objectives to narrow down the learning achievement indicators (GPA) based on the Basic Competency (KD) of the 2013 curriculum on the Time material contained in the 6th grade class III Elementary School theme and analyze student characteristics through interviews with the homeroom teacher of class III.

2.3.2 Design Phase

Based on the results of the analysis obtained, the design of the learning video is formed. There are six steps in this design stage, namely choosing the application used to make learning videos. Students have difficulty integrating abstract mathematical concepts and rules with everyday problems which are also due to the limited availability of mathematics learning media in schools [29]. Developing learning videos is the choice of researchers. Learning videos are according to students' needs because learning videos can help hone elementary school students' numeracy skills ([30], [31], [32], [33], [34], [35], [36]). Next, the researcher determines the application to make learning videos; prepare lesson materials. The researcher dissected the 2013 curriculum book used by teachers and students. The book used was Book K13 Revised 2018 Edition. The researcher determined the scope of learning Mathematics in class 3, namely on the theme 6 Energy Sources. Basic Competency (KD), Learning Achievement Indicators (GPA), and Numeral Indicators to be measured are found in three sub-themes of theme 6, namely sub-theme 1, sub-theme 2, and sub-theme 3; prepare the technical presentation of the subject matter. The video consists of the introductory material in each sub-theme, sample questions, contains learning videos that are relevant to the material, phases of cognitive development and the diversity of student learning styles, conditions and daily life of students, and of course must be relevant to teacher competence, practice questions, and enrichment; makestoryboard and video scripts. Researchers preparestoryboard and the video script according to the subject matter, then inserted the narrative text and audio ([37], [38], [39], [40]), create practice questions that refer to the subject matter. The practice questions that are made refer to the subject matter Time and indicators numeracy skills [27],

forming a learning video design. The video design is adapted to the age level of third grade SD students. An interesting video display, such as the selection of colors, fonts and tools [28]. which corresponds to the time material. The material presented is also coherent in accordance with the KD sequence, starting from the opening, presenting the material accompanied by examples of questions and discussion, presenting daily video compilations in accordance with the sub-themes being taught to direct students to direct experience that they have actually done in their daily lives to on enrichment and practice questions to find out how far they understand the material that has been taught.

2.3.3 Statistical Hypothesis

Testing the hypothesis in this development research using Test Independent Sample T-Test (2-tailed) with IBM SPSS 29 with the formulation of the hypothesis to be tested (1), namely:

H_0: There is no significant difference between students' numeracy abilities taught using learning videos and ordinary learning.

H_a: There is a significant difference between students' numeracy skills taught using learning videos and ordinary learning.

$$H_0: \mu_1 = \mu_2 \quad (1)$$

with testing criteria:

If the significant value (2-tailed) < 0.05, then H0 rejected, and Ha accepted.

If the significant value (2-tailed) > 0.05, then H0 accepted, and Ha rejected.

2.3.4 Validity and Reliability

The tests given are in the form of multiple-choice tests and essays which have previously been validated by subject matter experts, tested for validity and reliability, and tested for difficulty level, discriminating power, distracting distractions on the multiple-choice test instrument items, carried out to see how far the accuracy and accuracy of the tool has been. measure performs its measurements [41], [42], [43]. The validity of the instrument was tested using the Pearson Product Moment correlation using Excel 2021. After testing, the value of rcount > rtable (significance level of 0.05 or 5%) is obtained, which means the instrument is valid. The reliability of the multiple-choice test instrument was tested using the KR-20 formula and the test instrument in the essay form was tested using the Alpha Croncbach formula using Excel 2021. After testing the multiple-choice test instrument, a score of 0.534 was obtained and an essay test instrument test obtained a value of 0.464, included in the criteria "Enough". From the results of the multiple choice test difficulty level, there is one question in the "difficult" category, namely question number 4 and nine other questions in the "moderate" category. From the results of the multiple-choice test, there are three questions in the "good" category, namely questions number 4, 7 and 10 and seven other questions in the "satisfactory" category. From the results of the multiple-choice distraction test, all questions were included in the "accepted" category because the results obtained were greater than 0.05 (5%), the "accepted"

category without revision. Meanwhile, students' learning attitudes and motivation were traced through a list of interview questions.

3 Results and Discussion

3.1 Development and Implementation Phase (Circular)

The development and implementation stages are carried out in a circular manner. The initial product that has been formed is validated by several validators who are experts in their fields and implemented to students as potential users. At the development stage, the media is made based on the design that was made before. Making learning media in the form of videos is done separately and in stages. Material summaries, examples of questions and discussions, and supporting video compilations are combined into the developed learning videos. Meanwhile, the guidebook for using instructional videos and practice questions is made separately hard file. Preparation of practice questions (evaluation) of numeracy skills in Time material based on indicators of Time material in accordance with the 2013 Curriculum and indicators of numeracy skills. At this stage socialization was also carried out regarding the use of learning videos developed for teachers and students. The socialization was carried out by giving a brief explanation of the learning video. Furthermore, the learning videos were validated by involving 1 material expert validator from the lecturer element, 5 material expert validators from the teacher element, 1 instructional design expert validator from the lecturer element and 1 media expert validator from the lecturer element [44], [45], [46] and implemented to students through individual and small group trials [24]. Criticism and input from the participants became a guide in revising the learning videos which were developed so that the basic concept of time material, especially the units of seconds and minutes, was simplified in presentation according to the maturity level of students. Media experts suggest adjusting the appearance of the video to the age level of students such as choosing colors to make it more attractive. Material experts recommend paying attention to the selection of KKO and then adapting it to the numeracy skills indicators contained in the practice questions. Students provide input related to sound clarity so that it is clearer to avoid noise which interferes with hearing. All input becomes a guide in revising the learning videos which are then implemented to a larger number of students and re-validated by the validators involved. The results of the validator's and student's assessment in the second implementation found no criticism or input with the developed learning video assessment. This illustrates that the learning video is feasible to use.

Table 2. Average Percentage of Learning Video Feasibility Assessment

No	Evaluation	Mean Skor	Percentage	Interpretation
1	Material Expert	4,24	84,80%	Very Worth it
2	Instructional Design Expert	4,33	86,70%	Very Worth it
3	Media Expert	4,21	84,30%	Very Worth it
4	Student (Individual)	4,10	82,00%	Very Worth it
5	Students (Small Group)	4,45	88,93%	Very Worth it
	Mean Skor Total	4,27	85,35%	Very Worth it

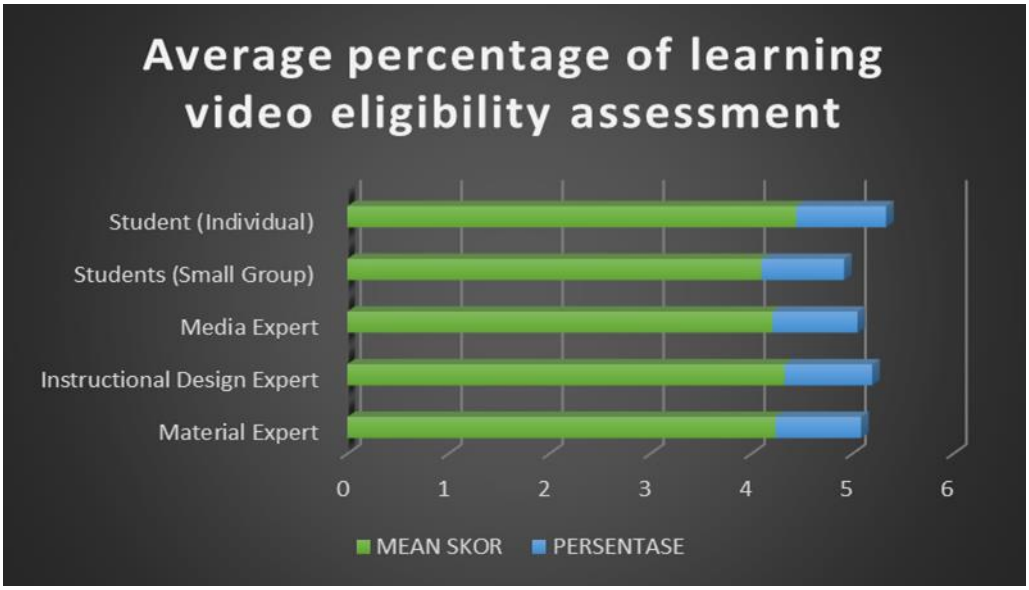

Fig. 2. Average Percentage of Learning Video Feasibility Assessment

3.2 Evaluation Phase

The developed learning videos were evaluated through experiments involving 6 elementary schools consisting of 3 schools as the experimental group totaling 93 grade III students and 3 schools as the control group totaling 77 grade III students. Overall, the participants involved totaled 170 grade III elementary school students.

In addition to strengthening the value of the learning outcomes that have been obtained, interviews with students are also conducted to find out student responses to the use of video during learning and the responses are positive.

Table 3. Distribution of Student Learning Outcomes

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Experiment Pretest	93	37.0	63.0	48.731	6.2869
PostTest Experiment	93	65.0	95.0	79.667	6.7120
PreTest Kontrol	77	38.0	64.0	48.636	5.7466
PostTest Control	77	45.0	71.0	57.455	6.4717

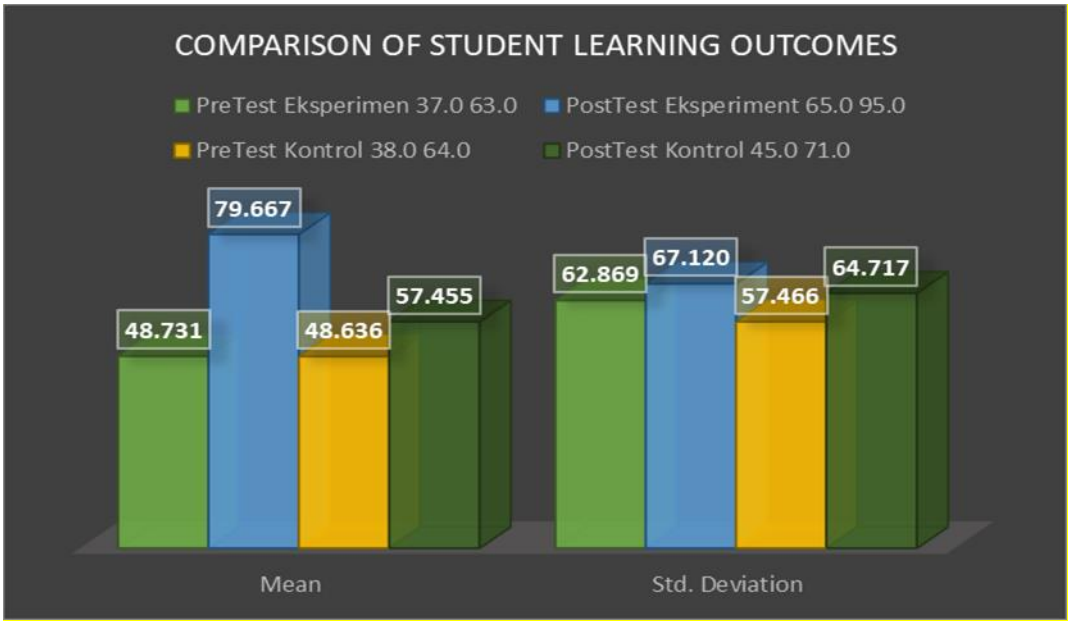

Fig. 3. Differences in Student Learning Outcomes

4 Conclusion and Recommendation

4.1 Conclusion

The development of learning media products for elementary school students pays attention to the principles of learning starting from the analysis of school needs, analysis of the characteristics of elementary school students, literature studies, adjustments to learning objectives, video design, and the design of the presentation of the material in the video [47], [48], [17]. Video is very appropriate to be used as a medium for learning mathematics, therefore researchers develop a learning video that can visualize abstract mathematical objects by utilizing tools technology and combined with real video compilations to support the delivery of the message of the Time material so that it can hone students' numeracy skills at the elementary school level.

A learning media product is said to be effective after it is proven to be able to show good results in achieving the learning goals that have been determined. In the research, the effectiveness of the product has been tested on learning activities through learning outcomes tests after learning using the developed product. From the data processing of the learning outcomes that have been done for students in the field of numeracy who learn using learning videos in Class III SD materials, an average of 80 is obtained. While the learning outcomes of students who learn without using learning videos are obtained on average 58. In addition to to strengthen the value of the learning outcomes that have been obtained, interviews were also conducted with students to find out the students' response to the use of video during learning

and that the response was positive. Students say that learning mathematics becomes more enjoyable while watching learning videos. They like the look of animations, pictures, and video compilations found in the video because they can clearly see the animated movement of the clock, the order of the month and year dates in the calendar, and real-life examples of the application of time in everyday life. They know how to read the date and time limit for the use of goods (expiration) and they realize that all this time they have been using the concept of time in their daily activities from morning until they meet again in the morning. The results of this research are in line with the research done by Maulidiyah [18] in class II SD, Alifa et al. [19] in class IV SD, Fitri and Ardipal [21] in class V SD who said that the use of videos in learning is very practical and can improve student learning activities and results so it can be concluded that in addition to being practical, video learning is also effective in improving student learning results in the field of numeracy skills at the elementary school level.

4.2 Suggestion

This learning video is a tool to facilitate the process of delivering subject matter, especially mathematics subject theme 6, Time material, therefore the existence and role of the teacher is still very much needed as a learning facilitator so that students remain actively involved in the learning process.

The learning video of the results of this research is expected to be a learning media to improve the numeracy skills of third grade SD students in understanding the Time material in mathematics subjects. The product of this development research is expected to be one of the teaching materials used in the process.

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