



## Development of Fractions Learning Videos to Improve Mathematics Comprehension Ability for Class 3 Elementary School Students in the Pandemic Time

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### **Abstract**

The relevance of this research is that the development of mathematics learning videos on fractions can improve students' understanding abilities in elementary schools. This research method uses a mixed-method, namely by combining two forms of qualitative research and quantitative research, in which qualitative research is to determine the feasibility of videos for learning mathematics with fractions and quantitative materials to determine the effectiveness of video products for learning mathematics with fractions. The results obtained are by applying the mathematics learning videos of fractions that have been developed to have an increase in students' understanding abilities. The results of the effectiveness test using the t-test showed differences in students' understanding abilities before being given a video of learning mathematics with fractions and after being given a video of learning mathematics with fractions. This study concludes that the video learning mathematics with fractions can improve students' understanding abilities in elementary schools during the pandemic.

**Keywords:** *Learning Videos; Mathematics Comprehension Ability; Elementary School*

### **Introduction**

In December 2019 the world health agency WHO was alerted about a similar case of pneumonia in Wuhan, China. This coronavirus or COVID-19 is thought to have originated from a seafood market in the city of Wuhan (Lee, 2020). This covid-19 case has spread widely in various countries, one of which is in Indonesia, this covid-19 virus has been endemic since early March 2020. The government has also made various efforts to minimize the spread of the covid-19 virus, starting by implementing 3M, namely wearing masks, wash hands and wear masks. In addition, the government has also implemented PSBB or large-scale social restrictions in several areas that are considered COVID-19 red zones (Mujiati, 2020).

This covid-19 virus has a very impact on human life because during this covid-19 pandemic all activities are limited from entertainment places, shopping places, offices to schools. To minimize the spread of the Covid-19 virus, schools were closed, teaching and learning activities were carried out online from their respective homes (Nur & Mustaji, 2021). In the absence of face-to-face learning, the teacher provides PJJ or distance-learning where all students participate in learning activities from their respective

homes (Wahyudiana et al., 2021). Because health and safety, as well as growth and development and psychosocial conditions of students, teachers, and education personnel, are the main priorities in setting learning policies (rahmad, 2021).

The implementation of learning during this pandemic is carried out online or online. Because online learning is considered effective during this pandemic where teachers and students work together and learn from their respective homes to reduce the spread of the COVID-19 virus. Even though learning during this pandemic is done online, it is still necessary to pay attention to the achievement of competencies that must be achieved by students (Irawan & Iasha, 2021). Because basic education is the initial foundation for students because the learning process in basic education is oriented to equip students with the ability to read, write well, and count skills. One of the requirements to continue education to a higher level is through learning mathematics (Susanto, 2013). Because by learning mathematics students will learn to think logically, systematically, analytically, critically and must be presented with a clear structure and must be adapted to the intellectual development of students and the prerequisite abilities that students have (Dwi & Herawati, n.d.).

According to (Susanto, 2013) Mathematics in elementary schools aims for students to have the following abilities:

1. Understand mathematical concepts, explain the relationship between concepts, and apply concepts or algorithms.
2. Using reasoning on patterns and traits, performing mathematical manipulations in generalizations, constructing proofs, or explaining mathematical ideas and statements.
3. Solving problems which includes the ability to understand problems, design mathematical models, complete models, and interpret the solutions obtained.
4. Communicating ideas with symbols, tables, diagrams, or other media to explain the situation or problem.
5. Have an attitude of appreciating the use of mathematics in everyday life.

One of the goals of mathematics in elementary schools contained in the curriculum is that students understand mathematical concepts, explain the relationships between concepts, and apply concepts or algorithms. The purpose of the curriculum in mathematics subjects must be poured into the learning process so that students can achieve these goals (Wantika, 2017). This gives an understanding that the teacher provides materials that will be provided by students not only for memorizing, but it is more desirable that students can better understand the concepts of the material they are studying. Because with the ability to understand students can remember the material that has been studied well when students forget (Mujiati, 2020).

In line with this statement, based on the results of preliminary observations through interviews with third-grade elementary school teachers in the Larangan sub-district. At the Larangan 1 State Elementary School in both teachers, researchers obtained information that mathematics lessons on fractions still had problems faced by students. One of these obstacles is because fractional material is material that has just been studied in class II, so students still do not understand the difference between the denominator and numerator infractions and when connecting the material that has been obtained with problem-solving if students are given different questions with examples, especially with questions. stories and addition or subtraction infractions, students will have difficulty. Therefore, learning outcomes in the fractional material in theme 2 are still low, this can be proven in the daily test results 72% of students still have scores below the KKM (Minimum Completeness Criteria) (Kusniati, 2020).

In addition to interviewing the two teachers who teach in class III, the researchers also conducted a needs analysis by distributing questionnaires to teachers and students via Google Forms to collect data on the perceived obstacles in the learning process during the pandemic.

Based on the results of the needs analysis questionnaire shown to teachers, which states that 45.5% of teachers provide mathematics subject matter to students utilizing students reading their textbooks after the teacher gives students assignments that must be done today, then the learning media used by teachers in Mathematics lessons 63.6% answered using learning media in the form of pictures and 45.5% teachers answered that teachers only provided learning media on certain materials or materials that were considered difficult by students.

From the results of teacher interviews and the questionnaire above, namely the lack of students' understanding of the fraction material, many factors cause a lack of student understanding, especially during this covid-19 pandemic which requires students to study online. It is seen that teachers rarely use learning media to support mathematics learning in class. teachers feel the need to develop learning media that can support mathematics learning in class so that students find it easier to understand the material provided and feel happy when learning mathematics on fractional material, and teachers are aware of learning media that are of interest or can improve student understanding during a pandemic or online learning (online) that is by using learning media based on video learning.

In addition to providing questionnaires to teachers, the researchers also dig up information about the analysis of student needs by providing a questionnaire given through the google form. 40.6% of students answered that the fraction material was material that was considered difficult in mathematics in grade 3, because the questions in the fractional material were difficult for students to understand, especially during conditions like this, students study online from their respective homes. Therefore, students need learning media that can improve understanding of the material 56.7% of students answered learning media based on learning videos, learning videos that contain examples of questions and exercises, in the form of pictures and sounds, related to everyday life and which looks interesting, not boring.

Learning media in this pandemic situation is needed by students and teachers, because learning media serves as a tool or liaison for teaching and learning activities, so that learning becomes fun, increases student interest in learning, and makes learning easy for students to understand. Therefore, a teacher must provide learning media that can indeed help in learning so that what students learn is truly embedded in their memories in the long term (Saputra, Thalia, & Gustiningsi, 2020). The learning media needed during the COVID-19 pandemic based on preliminary research is video-based learning media. By using learning videos as an attraction that is of interest to students, learning becomes more concrete, not monotonous, and not boring (Nurdin, Ma, Amir, & Azmi, 2019). The development of learning videos is currently growing very rapidly, especially during this pandemic all activities are carried out online which requires students and teachers to be technology literate. Learning must be supported by unlimited technological developments, namely education in the industrial revolution 4.0 (Herliandry & Suban, 2020). The reality in the field is that the form of learning videos for students is short while the material provided includes learning Indonesian, PPKN, SBDP, PJOK, and mathematics, students are less satisfied and want a learning video development.

Seeing from the results of the analysis of the needs of teachers and students, as well as various previous research studies, it is necessary to develop to answer the problems that exist in the field. The following are the differences in the learning videos that will be developed by researchers with existing learning videos: (1) the curriculum used is still old, it has not used the latest revised 2013 curriculum, where mathematics learning is not integrated with the theme. For this reason, the researcher developed a video based on the 2013 curriculum, the latest revision of mathematics, which is independent but still follows the existing theme. (2) the existing learning videos only have a few practice questions and discussions, but the researchers tried to make learning videos that had quite a lot of practice questions and discussions related to everyday life. Based on this, there is a need for development research, namely

"Development of learning videos for fractions to improve the ability to understand mathematics for grade 3 elementary school students during the pandemic".

### ***Research Methodology***

This research method is a design research type of development study which aims to produce a learning video of mathematics subject matter of fractions. This research is directed at developing or producing certain products or improving existing products and conducting testing to determine the effectiveness of a product to be developed.

Researchers conducted research and development of videos for learning mathematics with fractions to improve the understanding ability of elementary school students. The feasibility of the learning videos developed was obtained through validation by media experts, material experts, and language experts. In addition, a feasibility test was also carried out by the class teacher and a readability test by students.

Researchers also tested the effectiveness of learning videos on the understanding abilities of third-grade elementary school students. testing the effectiveness of this study using a quasi-experimental or quasi-experimental method with a mixed-method approach. This research combines two forms of research, namely qualitative research and quantitative research. (Sugiyono, 2011a) mixed methods research is research that combines qualitative and quantitative approaches to obtain more comprehensive, valid, reliable, and objective data. This study uses a nonequivalent group posttest-only design technique.

### ***Results and Discussion***

The research results are presented in the form of data used to analyze and reveal in-depth the research data.

#### ***1. Results of Needs Analysis***

Preliminary research is carried out by analyzing the needs in the field, needs analysis is the initial stage before this research is carried out. Needs analysis in the development of learning videos for fractions to improve the mathematical understanding of grade 3 elementary school students during the pandemic in the form of observations, questionnaires to teachers and students, and teacher interviews to collect data about problems that exist in the learning process, especially during the COVID-19 pandemic.

This needs analysis can be used as a reference in developing learning videos for fractions in elementary schools. The learning video for fractions is shown for third-grade elementary school students, considering that the developmental stages of students at that age are still in the concrete operational stage, students learn through concrete objects that are around them in daily life. so that students can construct their knowledge. The selection of learning video media especially during this pandemic is based on problems in the field, namely, teachers rarely use appropriate learning media for students learning online. These results are supported by teacher questionnaire data via an online google form.

From the results of the teacher's questionnaire, it is seen that teachers rarely use learning media to support mathematics learning in class. teachers feel the need to develop learning media that can support mathematics learning in class so that students find it easy to understand the material provided and feel happy when learning mathematics on fractional material, and teachers are aware of learning media that are of interest or can improve student understanding during a pandemic or online learning (online) that is by using learning media based on video learning.

In addition to giving questionnaires to teachers, the researchers also interviewed classroom teachers who teach in grade 3 to find out the obstacles experienced in the learning process, especially in mathematics.

Based on the results of the first teacher interview that the fraction material is considered difficult by students because the fraction material is material that has just been studied in grade 3, especially in theme 2. This causes most students' practice scores on this fractional material to be considered low from the KKM of 70. Not every teacher's learning provides learning media only material that is considered difficult. The teacher also provides learning videos from existing ones, for example using the TangerangLive application, but the lack of discussion for each subject is only short because one video is used for three meetings. For this reason, the teacher hopes for development in learning media, especially in learning videos because during this pandemic the teacher cannot explain the material directly to students, with the learning video, it is hoped that the student teacher will understand the material given, instead of the explanation given by the teacher.

In addition to providing questionnaires and interviews to teachers, the researchers also provided a needs analysis questionnaire for students, to find out the needs needed by students during online learning during the pandemic.

Based on the results of the questionnaire, the 3<sup>rd</sup>-grade material that is considered difficult for students is 11.9% answering subtraction using borrowing techniques, 7.9% answering multiplication, 39.6% answering division, and 40.6% answering fractions. Why do students find the material difficult, the questions in the material are difficult to understand as much as 67.8%, the lack of variety of teachers in providing the material is 21.1%, the teacher's delivery method is difficult to understand as much as 11.1%. As many as 92.4% of students answered the need for development in learning media used to improve understanding of learning mathematics and 7.6% answered that there was no need for the development of learning media. What form of instructional media is appropriate and can improve students' understanding of mathematics subjects as much as 31.1% answered textbooks, 56.7% answered learning videos, 2.1% answered pictures, and 10.1% answered the other. What kind of learning media do students want to improve their understanding of learning mathematics 60% answered that there were pictures and sounds, 30% answered that it looked interesting, 87.8% answered that there were examples of questions and exercises, and 42.2% answered related to everyday life. Based on the results above, students find it difficult to learn fractions, especially in a pandemic situation wherein the learning process students have to study online. Therefore, students want the development of learning media used to improve students' mathematical understanding, learning media that have audio and visual, interesting, and there are examples of questions and exercises.

## *2. Product Design*

In this product design stage, researchers looked at the material in the mathematics textbooks for grade 3 elementary school students and looked for other book sources about fractions material to expand and make it easier for students to understand the material provided, and look at the core competencies in the curriculum so that the material, not more than it should be.

This learning video is in mp4 format which includes PowerPoint, animation, and sound. Researchers use slides go in designing learning videos. Furthermore, this video learning fractions material was validated by experts to identify the shortcomings of the video, then improvements were made to produce a fractional material learning video product that can be used by teachers in delivering fractional material and can improve students' understanding abilities.

### 3. *Revision Design*

After making learning video media, then validation is carried out by experts, namely material experts, media experts, and language experts.

#### a. Matter Expert

Math learning videos on fractions have been developed and consulted with the expert judgment which aims to obtain mathematics learning materials in the form of valid learning videos. Material validation was carried out by two experts in their fields who were lecturers in the mathematics education study program at Muhammadiyah University, Prof. DR Hamka. The results of expert validation in the form of input adding test instruments in the form of questions measuring C4. Observing the suggestions and inputs from mathematicians above, the researchers improved and completed the video for learning mathematics for grade 3 elementary school fractions. As a follow-up carried out by researchers.

#### b. Media Expert

Math learning videos on fractions are given to media experts to obtain appropriate learning media for use in elementary schools. The results of the media expert's validation received criticism and suggestions, namely the learning objectives should be written in the video, not just mentioned. Observing the criticisms and suggestions from media experts, the researchers made improvements and completed the mathematics learning videos on fractional material, as a follow-up carried out by the researchers.

#### c. Language Expert

A video of learning mathematics with fractions was given to linguists to obtain appropriate learning media for use in elementary schools. the results of the validation of linguists obtained suggestions that writing or spelling and punctuation need to be considered. Observing the suggestions from linguists, the researchers corrected and completed the mathematics learning videos on fractions, as a follow-up carried out by the researchers.

### 4. *Final Draft*

The final draft is the result of a small group trial which will then be tested on a large group. At this trial stage, using fractions learning videos for grade 3 elementary school students.

To find out that this fractional learning video can improve students' mathematical understanding skills, the researchers used two groups or two classes, namely the experimental class and the control class. Where the experimental class in the learning process is given a different treatment, namely by being given a video of learning mathematics with fractions while in the control class it is not given. And then after being given a learning video of fractional material, a posttest was given to measure students' understanding ability after being given treatment. The posttest given in the learning process is in the form of 7 essay questions.

### 5. *Theoretical Validity*

Theoretical validity functions in assessing the feasibility of the fractional material learning video which was developed based on the assessments obtained from material experts, media experts, and language experts. The following are the results of validation by experts as follows:

a. Material Expert Validation

Validation by material experts is done by providing a learning video that has been made then the material expert assesses the learning video in the form of a questionnaire. The number of material experts in this assessment is 2 people.

**Table 1.** Material Expert Assessment

No	Aspect	Number of Items	Average Score	Percentage
1	Content eligibility	18	4.67	93%
Criteria				Very Worthy

Based on the table above, shows that the percentage score of this feasibility aspect given by the validator is 93%. Based on the score interpretation table, the learning video can be categorized as very feasible so that it is feasible to be used as a learning medium.

b. Media Expert Validation

Validation by media experts is done by providing learning videos that have been made then media experts assessing the learning videos in the form of a questionnaire. The number of media experts in this assessment is 2 people.

**Table 2.** Media Expert Assessment

No	Aspect	Number of Items	Average Score	Percentage
1	Graphics	4	4.5	90%
2	Coloring	3	4.6	93%
3	Voice	4	4.75	95%
4	Interactivity	10	4.5	90%
Total		21	4.48	90%
Criteria				Very Worthy

Based on the table above, shows that the percentage score of the graphic aspect given by the validator is 90%. For the coloring aspect, a percentage score of 93% was obtained, while for the voice aspect the validator gave a percentage score of 95% and the interactive aspect was 90%. Based on the score interpretation table, the learning video can be categorized as very feasible so that it is feasible to be used as a learning medium.

c. Language Expert Validation

Validation by linguists is done by providing a learning video that has been made and then the linguist gives an assessment of the learning video in the form of a questionnaire. The number of media experts in this assessment is 2 people.

**Table 3.** Language Expert Assessment

No	Aspect	Number of Items	Average Score	Percentage
1	Linguistic eligibility	9	4.67	93%
Criteria				Very Worthy

Based on the table above, shows that the percentage score of the linguistic feasibility aspect given by the validator is 93%. Based on the score interpretation table, the learning video can be categorized as very feasible so that it is feasible to be used as a learning medium.

## 6. Empirical Validation

### 1. Small group trial

Small group trials were given to 10 students who were selected heterogeneously, which included different students' abilities. Small group trial activities were carried out in learning mathematics with online teaching. Where the teacher is the main actor to direct students to listen to this fractional learning video.

The implementation of small group trials is given to students with the teacher providing a YouTube link for learning fractions material that has been made by researchers to class groups for students to both watch the video from their respective homes. Then the teacher gives a google form link in the form of an assessment questionnaire from the learning video, then students are assisted by parents to fill out the questionnaire. In the process of the small group trial stage, the researchers collaborated with teachers and parents to find out what was missing from this learning video.

The following is a table of data acquisition from the results of small group trials on the development of learning videos for fractions.

**Table 4.** Eligibility of Small Group Trial

No	Aspect	Number of Items	Average Score	Percentage
1	Feasibility of content and presentation of material	3	4.5	90%
2	Graphics	3	4.53	91%
3	Interactivity	5	4.5	90%
4	Voice	2	4.6	92%
5	Language	2	4.6	92%
Total		15	4.53	91%
Criteria				Very Worthy

Based on the table above, the results of the small group trial obtained a percentage score of 91%, this can be categorized that the learning video is very feasible to use, therefore the fractional learning video is very suitable to be used for the large group trial stage.

### 2. Large group trial

The large group trial was carried out after the improvement in the small group trial stage. At the trial stage, this large group was given to 33 students or respondents. Implementation of large group trials given to students by providing a YouTube link for a revised math learning video and a google form.

The implementation of a large group trial was given to students with the teacher providing a YouTube link for learning fractions material that had been made and revised by the researcher to class groups for students to both watches the video from their respective homes. Then the teacher gives a google form link in the form of an assessment questionnaire from the learning video, then students are assisted by parents to fill out the questionnaire.

The following is a table of data acquisition from the results of large group trials on the development of learning videos for fractions.



**Tabel 5.** Eligibility of Large Group Trial

No	Aspect	Number of Items	Average Score	Percentage
1	Feasibility of content and presentation of material	3	4.48	90%
2	Graphics	3	4.58	92%
3	Interactivity	5	4.56	91%
4	Voice	2	4.52	90%
5	Language	2	4.53	91%
Total		15	4.54	91%
Criteria				Very Worthy

Based on the table above, the results of the large group trial obtained a percentage score of 91%, this can be categorized that the learning video is very feasible to be used and published.

#### 7. The effectiveness of learning video media by increasing mathematical understanding skills

At the effectiveness stage, the researcher wants to know the effectiveness of the mathematics learning videos for fractions that have been developed, whether these learning videos can have an effect on increasing students' understanding abilities who are given a video of learning mathematics with fractions and those who are not given a video of learning mathematics.

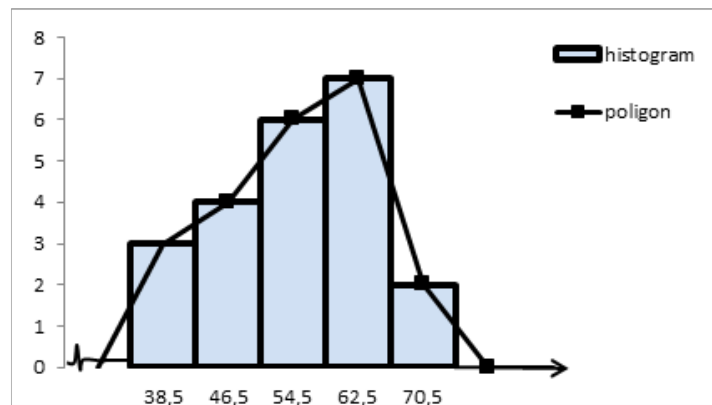


Figure 1. The result of understanding ability in the control class

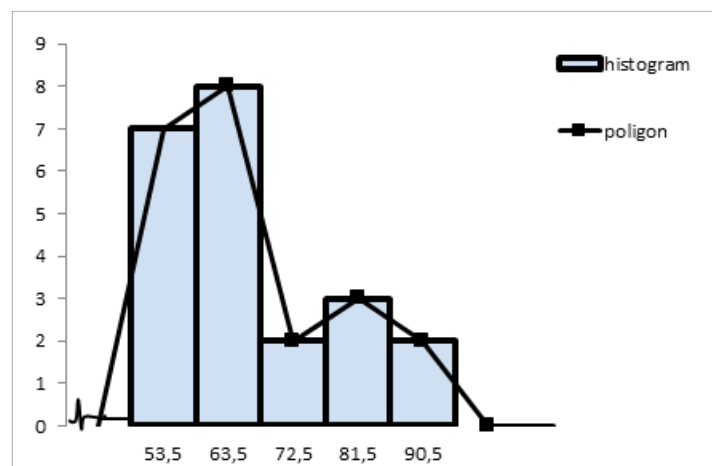


Figure 2. The result of understanding ability in the experimental class

This study uses the normality test with the Kolmogorov-Smirnov test using SPSS.21.0 at a significance level ( $\alpha$ ) of 0.05.

**Tabel 6.** Normality test result

No	Class	n	Average	K-S (Z)	Sig	H <sub>0</sub>
1	Experiment	22	69.500	0.137	200	Accepted
2	Control	22	58.773	0.135	200	Accepted

Based on table 6 the results of the normality test show that the overall probability value (Sig) for both classes with a significant level of 0.05 and states that H<sub>0</sub> is accepted. With this, it can be concluded that both groups come from a normally distributed population.

The homogeneity test of the data used Levene's test using SPSS.21.0 with a significance level of 0.05.

**Table 7.** Homogeneity test result

No	Class	n	Average	Statistik Levene (F)	Sig	H <sub>0</sub>
1	Experiment	22	69.500	1.133	0.293	Accepted
2	Control	22	58.773			Accepted

Based on table 7 shows that the data from both the experimental group and the control group with a sig value of 0.293 more than 0.05 then H<sub>0</sub> is accepted. Thus it can be concluded that the two groups have homogeneous variance.

The research hypothesis was to test the difference between the experimental class that was treated with a video of mathematics learning on fractions and the control class that did not receive treatment. The calculation results are as follows:

**Table 8.** T-test result

<i>t</i>	Sig	H <sub>0</sub>
3.044	0.004	Rejected

Based on table 4.12, it can be seen that the value of sig 0.004 is smaller than the significance level of 0.05, so it can be concluded that H<sub>0</sub> is rejected, which states that there is a difference between the experimental class and the control class.

## Conclusion

Based on the results of research and discussion of research that has been described, it can be concluded as follows:

1. The steps are taken in the process of developing a mathematics learning video on the remaining fraction material for grade 3 elementary schools using the Dick and Carey development model through 10 stages.
2. Development of video learning mathematics on fractions material is suitable for use by grade 3 elementary school students. This can be seen from the assessments of experts and the results of small group trials to large group trials.
3. The understanding ability of students who were given a mathematics learning video was higher than that of students who were not treated using a learning video.

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