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Development of learning videos through the problem-based learning model to improve learning outcomes and creativity of Grade V students

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ABSTRACT

This study assessed the feasibility and effectiveness of developing Problem-Based Learning (PBL) learning videos related to fractional lesson content for fifth-grade students at SDN 101764 Bandar Klippa. This research is related to implementing the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation) in the research and development of learning videos. This study involved twenty-five students in Class V of SDN 101764 Bandar Klippa. The instruments used by researchers for data acquisition include observation, interviews, validation questionnaires, and tests. The developed Problem-Based Learning model is validated by expert validators based on the findings of learning research videos. From the results of the validity test by validators, the percentage of material expert eligibility of 95.2 percent of the criteria is very valid, the design expert's feasibility percentage of 96.19 percent is considered very valid, the media expert produces a validity level of 90 percent of the very valid criteria. The small group trial resulted in an efficient criteria percentage of 89.89 percent. The percentage of practicality of field test results of 91.48 percent is an efficient criterion. Effectiveness was achieved at the field trial stage, with 22 students (approximately 88 percent) passing the post-test. A gain score of 0.615 meets the criteria of moderate effectiveness. Based on empirical observations that show an increase in learning outcomes by 84 percent and an increase in student creativity by 100 percent, it is determined that Problem-Based Learning learning videos can effectively perfect the mathematics curriculum of grade V students of SDN 101764 Bandar Klippa.

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ABSTRAK

Tujuan penelitian ini adalah untuk menilai kelayakan dan efektivitas pengembangan video pembelajaran berbasis Problem Based Learning (PBL) yang berkaitan dengan isi pelajaran pecahan untuk peserta didik kelas lima di SDN 101764 Bandar Klippa. Penelitian ini berkaitan dengan implementasi model pengembangan ADDIE (Analysis, Design, Development, Implementation, Evaluation) dalam konteks penelitian dan pengembangan video pembelajaran. Penelitian ini melibatkan dua puluh lima peserta didik yang terdaftar di Kelas V SDN 101764 Bandar Klippa. Instrumen yang digunakan peneliti untuk perolehan data meliputi observasi, wawancara, angket validasi, dan tes. Model Problem Based Learning yang dikembangkan divalidasi oleh validator ahli berdasarkan temuan video penelitian pembelajaran. Dari hasil uji validitas oleh validator persentase kelayakan ahli materi sebesar 95,2 persen kriteria sangat valid, ahli desain persentase kelayakan sebesar 96,19 persen dinilai sangat valid, ahli media menghasilkan tingkat validitas 90 persen kriteria sangat valid. Hasil uji coba kelompok kecil menghasilkan persentase kriteria sangat praktis sebesar 89,89 persen. Persentase kepraktisan hasil uji lapangan sebesar 91,48 persen merupakan kriteria sangat praktis. Efektivitas dicapai pada tahap uji coba lapangan dengan 22 peserta didik (sekitar 88 persen) yang lulus post-test; skor gain sebesar 0,615 memenuhi kriteria efektivitas sedang. Berdasarkan observasi empiris yang menunjukkan adanya peningkatan hasil belajar sebesar 84 persen dan peningkatan kreativitas peserta didik sebesar 100 persen, ditetapkan bahwa video pembelajaran Problem Based Learning dapat menjadi sarana yang efektif untuk menyempurnakan kurikulum matematika peserta didik kelas V SDN 101764 Bandar Klippa.

***Kata Kunci**: hasil belajar; kreativitas; pembelajaran berbasis masalah; video pembelajaran*

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INTRODUCTION

Mathematics is one of the subjects included in the current curriculum. Mathematics studies include logically investigating interconnected concepts, configurations, quantities, and shapes. Mathematics is a basic science utilized to understand other disciplines (Wati & Wulansari, 2021). Because Mathematics, a basic discipline and part of academic education, is one of the subjects that significantly influences how well educational initiatives work (Matulessy et al., 2022). Mathematics has the potential to foster learners' ingenuity, improve their critical thinking skills, and arouse their curiosity about the subject (Lubis et al., 2023).

Creativity is so important to improve that it is a priority for academic achievement and must be possessed by 21st-century learners (Widana & Septiari, 2021). Therefore, the correlation between learners' creativity level and academic achievement is direct. Creativity greatly influences A person's existence (Fakhriyani, 2016). Therefore, creativity should be nurtured and enhanced from infancy; it should not be ignored but encouraged and developed in children. However, based on the field findings, children's cognitive learning creativity is not conspicuous in learning activities, either in solving or presenting a case. This is supported by one teacher's statement that V-grade children are still not all active in generating broad ideas. From specific gaps, it will not be clear to educators how strategies can be used so students can develop their creativity.

In reality, national education intends to develop potential and shape the character and civilization of a dignified nation in order to educate the nation's life. In this section, teachers must have competence in their fields and be able to educate students. Fauzan and Arifin in the book “Desain Kurikulum dan Pembelajaran Abad-21” identify a minimum of ten competencies that educators must have (1) expertise in teaching materials; (2) ability to supervise learning programs; (3) talent in managing classes; (4) proficiency in utilizing media or learning resources; (5) understanding of the nature of education; (6) ability to refresh the learning environment; (7) ability to evaluate progress at the academic level; (8) ability to identify functions and programs; (9) ability to recognize and organize education administration; (10) ability to find teaching resource references as a basis for teaching.

Evident from the researchers' review in the field, it has not produced satisfactory results in achieving learning objectives. In the learning process, many educators do not utilize learning media and facilities that facilitate the learning process. Making teaching materials is complicated and challenging due to insufficient preparation time. Teachers still use variations of the usual learning models and have limited capacity in managing learning media to support learning activities (Rahayu et al., 2019). Teachers continue to show deficiencies in understanding learning models and approaches related to the subject matter, resulting in suboptimal application of knowledge and challenges for learners in following a given learning trajectory. Other research shows educators face challenges integrating technology into the educational environment (Buchori, 2019). As a result, the learning process becomes conventional and the lack of learner involvement in it (Wahyuni & Suprapto, 2016; Putri & Rakhmawati, 2018). Previous research shows that educators can utilize technology to create learning support media for their students (Rahmi et al., 2020). Mukminin et al (2023) stated that about 90% of learning outcomes are obtained through visual perception, 5% through auditory perception, and 5% through alternative sensory modalities. Thus, it is clear that the media significantly impacts educational endeavors.

Following the published *Peraturan Menteri Pendidikan dan Kebudayaan Nomor 22 Tahun 2016*, learning activities must pay attention to the following learning principles when viewed from the perspective of current curriculum development: (1) learners need to change from passively receiving information to actively seeking information; (2) The classroom is no longer the only realm of education; (3) The scientific

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method should take precedence over the literary method; (4) The process of applying the scientific method should be more frequent than content-based learning; (5) The use of ICT to improve the effectiveness and efficiency of the learning process; (6) Recognizing learners' individual differences and cultural diversity. Ignoring these learning principles during teaching can adversely affect learners' learning outcomes and stifle their creativity, thus inhibiting the exploration of their full learning potential.

Learning models in the twenty-first century must be inventive, independent, and smell of science and technology. Fauzan and Arifin, in their book, state that some learning strategies considered equivalent to the needs of the twenty-first century, and following the principles of the empirical approach, are problem-based learning. Through problem-based learning models, learners can be challenged to solve a case, encouraged to solve a problem, and motivated to learn continuously (Yulianti & Gunawan, 2019; Savitri & Manuaba, 2022).

Given the identified challenges, the researcher designed an alternative action by creating video-based educational materials incorporating a problem-based learning framework designed explicitly for fraction content. The effectiveness of learning media as a method to facilitate the learning process has been established (Nugraha & Wahyono, 2019). Learners instructed to use educational tools experience a better learning environment, facilitating their understanding of the material presented (Hadiyanti et al., 2021). However, students' boredom in learning activities will be reduced if learning media are used (Budiman et al., 2019). Therefore, students' learning outcomes can be improved through media utilization (Wibowo et al., 2024; Hasbullah et al., 2022).

Videos that educate viewers about procedures, messages, information, and instructions are learning media. Humans utilize their visual and auditory abilities to capture, understand, and illustrate information communicated through media (Manurung et al., 2016). If learning videos can be applied to a lesson, they play an important role. This follows the findings and states that learning videos include media that can stimulate the senses of sight and hearing (Gabriela, 2021; Nadeak et al., 2023). In addition, learning videos use multimedia to display moving images and facilitate learners' understanding and retention of the subject matter (Anggreni & Suniasih, 2021; Hanif, 2020). Learners who learn best visually and auditorily will benefit from the role of instructional videos. The video can also be listened to to improve learners' learning focus.

In addition, previous research has shown that learning videos have the potential to stimulate learners' creativity and arouse their interest in learning practically (Indarsih & Pangestu, 2021). Students' academic activity and achievement can be improved through the use of learning videos (Widiastuti, 2021). However, there has not been a fraction learning movie for grade V students that can improve learning outcomes and encourage creativity. The developed learning video will have the added advantage of incorporating math concepts, audio effects, and problem-based learning syntax into its production. For learners not to get bored and improve their cognitive learning outcomes and creativity, this educational resource is offered as a movie with an instructional video accompanied by an introductory voice and music. The following are the objectives of this research: (1) To produce a feasible, practical, and effective learning video on Fraction material through the problem-based learning model for class V UPT SPF SDN 101764 Bandar Klippa; and (2) To determine the improvement of learning outcomes and creativity of class V UPT SPF SDN 101764 Bandar Klippa students.

LITERATURE REVIEW

Problem-Based Learning

Problem-Based Learning involves examining real-world problems that demand pragmatic solutions (Karina & Yani, 2020; Langitasari et al., 2021). Problem-Based Learning (PBL) is an additional contextual

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learning strategy that enables students to develop critical thinking and problem-solving skills while acquiring the basics and concepts of the subject matter (Afifah et al., 2019; Purnama et al., 2021). Problem-based learning deviates from using cases and problems to achieve learning objectives (Anggreni & Suniasih, 2021). The syntax of PBL are: (1) Learner orientation to the problem is one component of the problem-based learning model; (2) Learners are organized around the problem; (3) Individual or group experience is guided; (4) Work results are developed and presented; and (5) The problem-solving process is analyzed and evaluated (Langitasari et al., 2021).

Learning outcomes

A person's learning behavior, usually manifested through changes, routines, skills, attitudes, and abilities, can be interpreted as learning outcomes. Every educational endeavor carries expectations or goals that teachers and learners can achieve. After concluding the learning experience, students must show changes, progress, and privileges. Learning outcomes become one indicator that determines whether or not a learning objective is achieved (Moko et al., 2022). Such differences may manifest as differences in talent, wisdom, or attitude. As described in Bloom's work, learning outcomes can be classified into three overarching domains: cognitive, affective, and psychomotor (Magdalena et al., 2020). Dimyati and Mudjiono in the book "*Belajar dan Pembelajaran*" define learning outcomes as numerical results or scores obtained from assessments given at the end of each subject.

Several factors affect student learning outcomes, namely: (1) the way the teacher teaches; (2) the background of students; (3) the school environment; (4) the learning evaluation model; (5) internal and external factors of students in the delivery of learning methods (Ismawati, 2020). Learning outcomes are assessed using indicators from the cognitive domain of Bloom's taxonomy. This domain consists of six subdomains labeled as follows: evaluation (C6), comprehension (C2), memory (C1), and analysis (C4), in order of complexity (Magdalena et al., 2020). The following factors affect learners' learning outcomes: (1) Teaching methods used by teachers; (2) Learners' background; (3) school environment; (4) Learning evaluation model; and (5) internal and external factors that are considered by learners in applying learning strategies (Ismawati, 2020). Learning achievement tests can be used to assess and monitor student learning outcomes (Nurfaridah et al., 2019). According to their purpose and scope, learning achievement tests can be categorized into two categories: formative assessment tests and summative tests (Adinda et al., 2021). Summative tests are an assessment carried out when the learning program has ended and is considered complete. In contrast, formative tests are an assessment that collects data on improving students' learning outcomes in understanding the competencies or teaching materials studied (Adinda et al., 2021). Formative tests are conducted after learning each competency or at the end of the learning material.

Creativity

Susanto, in the book "Teori Belajar dan Pembelajaran di Sekolah Dasar," explains that creative ability refers to the capacity of individuals to produce new concepts or real products that are substantially different from previous concepts. There are at least two definitions of creativity put forward by Cropley in his book "*More Ways Than One: Fostering Creativity in the Classroom*", namely: (1) creativity that focuses on a particular aspect of thinking, this can also be said to be divergent thinking; and (2) creativity that is defined as the production of creative products, such as architectural designs, musical compositions, or works of art. Regarding academic teaching, Cropley's early definition of "creativity" is the capacity to generate new, inventive, and original ideas. Craft's book "Creativity in Schools: Tensions and Dilemmas" explains that

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the definition of creativity, as defined by the National Advisory Committee on Creative and Cultural Education (NACCCE), is an imaginative endeavor that produces new and valuable results.

The degree of a person's creativity is proportional to the number of works produced in their respective fields. Hurlock further supports this in Siswono and Rosyidi (2005), who assert that intelligence is proportional to the level of creativity. Meanwhile, Torrance, cited in the book by Munandar, "Pengembangan Kreativitas Anak Berbakat", revealed that novelty, flexibility, and fluency are the three most important aspects of creativity evaluated. The quantity of ideas generated in response to an order is called fluency. A person can modify their approach when handling an order to show flexibility. Novelty, however, refers to the pioneering nature of an idea generated in reaction to a prompt.

The level of creativity in solving mathematical problems can be seen in **Table 1** (Khumaidi & Budiarto, 2019).

Table 1. Creativity Level Tiering

Level	Characteristics
Level 4 (Very creative)	Learners can show fluency, flexibility, and novelty in solving problems.
Level 3 (Creative)	Learners can show fluency and novelty or fluency and flexibility in solving problems.
Level 2 (Moderately creative)	Learners can show novelty or flexibility in solving problems
Level 1 (Less creative)	Learners can show fluency in solving problems
Level 0 (Not creative)	Learners are unable to show all three aspects of the creativity indicators.

Source: Khumaidi & Budiarto (2019)

Learning Videos

Teaching videos are a form of media that can facilitate learning (Batubara & Batubara, 2020). Using educational media is a creative and reasonable effort to produce educational meetings that can facilitate the learning process of learners (Hasbullah et al., 2022). Learning videos utilize visuals that produce animated movements, auditory elements that facilitate learners' understanding of the content, and background elements that bring the learning process to life; thus, these videos engage more than one sense (Hanif, 2020). Learning videos will benefit learners who have auditory-visual learning preferences. Listening, identification, and analysis skills can be acquired through learning recordings that serve multiple purposes (Saragi & Tegeh, 2022). Learning videos based on the PBL method can improve student learning outcomes (Widiastuti, 2021). Therefore, learning videos can improve the identified deficiencies, especially at the SDN 101764 Bandar Klippa institution.

METHODS

Development research (Research and Development) is a type of research investigation. Sugiyono, in his book "*Metode Penelitian dan Pengembangan: Research and Development*" explains that research and development patterns include systematic scientific approaches used in the investigation, conceptualization, fabrication, and validation of manufactured goods. The main objectives of the research are to establish, validate, innovate, reveal, and describe. The subjects of this study were twenty-five learners enrolled in class V of UPT SPF SDN 101764 Bandar Klippa. These criteria were applied following the purposive sampling method. According to Sugiyono in the book "*Metode Penelitian Kuantitatif dan Kualitatif dan R & D*", the purposive sampling technique is a method of selecting samples according to specific criteria. The subject matter studied was a math learning video related to fractions.

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A reference approach called ADDIE, described by Robert Maribe Branch in Sugiyono's book, is used in development model research. The stages of this technique are analysis, design, development, implementation, and assessment. A product trial was conducted to evaluate the learning video's feasibility, usability, and effectiveness of the learning video. Next, the review stage begins, where subject matter experts, media experts, design experts, and material experts evaluate the video. The usability of the learner response questionnaire can be seen as practicality. Evaluation of effectiveness is done through testing.

Expert Validation Questionnaire

Table 2 shows the assessment instrument for material experts as follows.

Table 2. Material Expert Assessment Instrument

Aspect	Component	Indicator
Content	Curriculum	• Alignment of objectives with the curriculum, Appropriateness of materials to their designation (CP) • Current materials • Appropriateness of media concerning student attributes
	Users	• Appropriateness of delivery methods for learner development • Alignment of objectives with the curriculum, Appropriateness of materials to their designation (CP) • Offer opportunities for self-study. • Encourage student engagement • Consider the uniqueness of each individual
Presentation	Opening	• Captivating titles • Perceptual adherence to teaching materials and objectives
	Core	• Materials are presented in a specific order • Accuracy of educational materials • Clarity of substance • Depth of a material on fractions • Breadth of a material on fractions • Attractiveness of the presentation of learning materials on fractions • Appropriateness of presentation of examples • Completeness of presentation of examples
	Closing	• Correspondence between indicators and practice questions • Test/practice instructions • Ratio of practice instructions • Caliber of feedback
Display	Content	• Appropriateness or accuracy of illustrations to the substance • Harmonious blend of text and illustrations
	Visualization	• Clear images and text present.

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Aspect	Component	Indicator
		• Learners' creativity can be stimulated through visuals of educational materials.
Language	Clarity of sentences	• Sentences are straightforward and do not contain double meanings. • The language used is commutative.

Source: Modified from Devi & Maisaroh (2017)

The design expert assessment instrument is attached in **Table 3** as follows.

Table 3: Design Expert Assessment Instrument

Aspect	Component	Indicator
Content appropriateness	Learning Design Level	• Choosing topics appropriately • Appropriateness of content to learning indicators • Illustration of concerns • Test for consistency against learning indicators
Presentation	Information design quality	• Suppresses motivation • Clarity of description of materials • Clarity of examples provided • Implementation of additional information • Sequencing or framing • Optimizes the learning process
	Relationship level	• Use of learning materials • Definition of terms • Response to student questions • Use of different text to indicate important parts
Graphics	Presentation quality	• Color composition • Use of visuals • Quality of images • Selection of font type and size • Use of music
	Relationship design quality	• Facilitation of use

Source: Sudarman in Wijaya et al., (2021)

Table 4 is a media expert assessment instrument.

Table 4. Instrumen Penilaian Ahli Media

Aspect	Component	Indicator
Content eligibility	Programming	• Instructions for execution • Consistency of flow within a program • Sustainability of a program

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Aspect	Component	Indicator
		• Efficient system performance • Precision display • Disk administration • Consistency between lesson sections • Simple modifications
Graphics	Technical/appearance quality	• Elegance of layered exhibits • Textual readability • High-quality animations, images, and videos • Color Composition capacity • Navigation • Music assistance • Engagement in interaction

Source: Fadillah & Bilda (2019)

The learner response instrument is shown in **Table 5**.

Table 5: Learner Response Instrument

No.	Factors	Indicator
1	*Relative Advantage*	• Using videos helps me understand things better. • Using movies to explain course content • Using videos helps me become more independent in my learning • Using videos helps me overcome my learning challenges
2	*Compatibility*	• The image quality of the instructional video is satisfactory. • The audio quality of the instructional video is satisfactory.. • The video content presented by the instructor is satisfactory. • I appreciate how the instructional video presents the material.
3	*Complexity*	• I have no difficulty in understanding the learning video. • I can utilize the instructional video at various locations • The instructional video is user-friendly media, in my opinion.
4	*Triability*	• I am able to follow the instructions of the instructional video. • I am inclined to the subject of the video before watching it. • Independent access to instructional videos is possible
5	*Observability*	• I agree that watching instructional videos can help me understand more. • I agree that skill development videos can be useful. • I agree that educational videos can support classroom learning.

Source: Aswasulasikin et al. (2021)

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Data Analysis Technique

1. Data analysis of product validity and practicality

   This study used methods for analyzing descriptive, quantitative, and qualitative data. The data investigated included the feasibility and practicality of the learning video. Table 6 shows the validity criteria of the learning video.

Table 6. Criteria for Learning Video Validity

Validity Level	Validity Criteria
85,01%-100,00%	Very authentic; no improvement needed
70,01%-85,00%	Authentic and can be used, but minor improvements are required.
50,01%-70,00%	It is not authentic and not recommended for use, as it requires significant revision.
01,00%-50,00%	Invalid; not suitable for use.

Source: Akbar in the book "Instrumen Perangkat Pembelajaran"

2. Analysis of Creativity Effectiveness

   The following are the criteria for creativity levels, which can be seen in **Table 7**.

Table 7. Creativity Level Criteria

Range	Description
3,5-4	Very Creative
2,5-3,4	Creative
1,5-2,4	Fair
0,5-1,4	Low Creative
0-0,4	Not Creative

Source: Maslinawati (2021)

3. Analysis of the effectiveness of learning outcomes

   The formula for calculating the acquisition score of students can be calculated as follows (Gitriani *et al.*, 2018):

$$student\ acquisition\ score\ = \frac{student's\ total\ score}{ideal\ score\ of\ the\ entire\ test} \times 100\%$$

   The proportion of classical completeness is determined by applying the following formula:

$$P = \frac{T}{n} \times 100\%$$

   with,
   P = Percentage of classical achievement
   T = Total number of learners passing
   n = Total number of all learners

   Table 8 shows the different categories of classical completion percentage.

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Table 8. Classical Completion Group

Interval (%)	Category
$P > 80$	Highly Commendable
$70 < P \leq 80$	Praiseworthy
$60 < P \leq 70$	Fair
$50 < P \leq 60$	Less
$P \leq 50$	Very Less Praiseworthy

Source: Researcher modification results from Widiastika et al. (2021)

The amount of improvement before and after learning is calculated using the Normalized Gain formula (Widiastika *et al*., 2021):

$$Normalized\ Gain\ (g) = \frac{post\ test\ score\ - pre\ test\ score}{100 - pre\ test\ score}$$

The learning video is declared practical in terms of effectiveness if the interpretation is calculated as medium or high.

RESULTS AND DISCUSSION

The findings of this development research relate to three main aspects: describing the procedures involved in making the instructional video, ascertaining the results regarding the credibility and effectiveness of the video. The instructional video development procedure consists of the following five phases.

Analysis Stage

At this stage, three things are analyzed: teacher needs analysis, curriculum analysis, and analysis of learner characteristics. This stage was conducted through observation and interviews. Analysis of teachers' needs shows that the learning materials used by instructors are still limited in variety and support traditional learning approaches, thus inhibiting learners' ability to think creatively about their education. There is a lack of utilization of teaching materials and media to facilitate active learning activities. Based on curriculum searches, SDN 101764 Bandar Klippa, grade V, continues to utilize K13. Fractions are one of the topics covered in the odd semester of the 2023/2024 school year. Examining the learners' disposition showed that grade V learners ranged from 10 to 11 years old. According to Piaget, children can process concrete events logically and follow directions when performing concrete operations at this age. Learners' academic aptitude shows diversity, consisting of large, medium, and small proficiency. Ensure the content and assessment questions are tailored to the learners' abilities.

Design Stage

This process begins to select and decide on a supporting application for making learning videos. Sugiyono, in his book, explains that the design stage is a product design activity as needed. Canva and Adobe Premiere Pro 2023 software programs are used. Developing learning media design concepts, selecting backgrounds, images, characters, and background sounds, and compiling materials, samples, and practice questions.

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Development Stage

The product is developed according to the initial plan. Experts assessed the suitability of the products produced by conducting product validity tests covering the domains of materials, design, and media, as detailed in Table 9. The following figure is a learning video product of the PBL model. Figure 1 shows the appearance of the video home page.

Figure 1. Video home page
Source: Research 2023

The title of the material can be seen in **Figure 2**.

Figure 2. Material title
Source: Research 2023

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Figure 3 shows the learning instructions.

Figure 3. Learning instructions
Source: Research 2023

An overview of the material presented in the lesson can be seen in **Figure 4**.

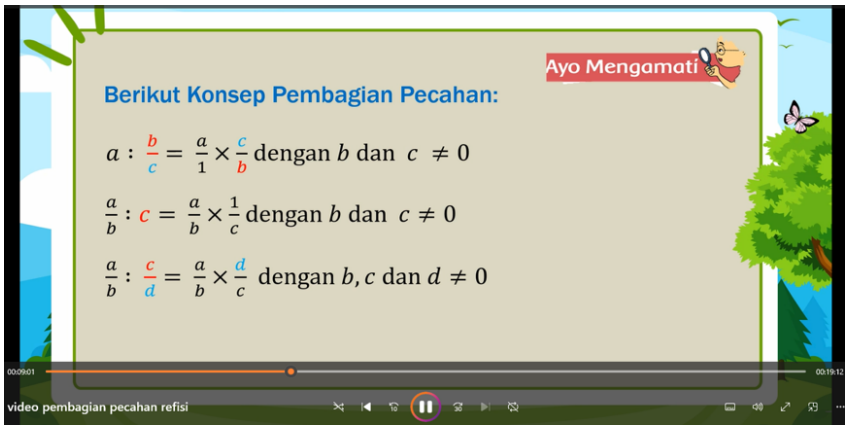

Figure 4. Material
Source: Research 2023

Next is an example of a problem seen in **Figure 5**.

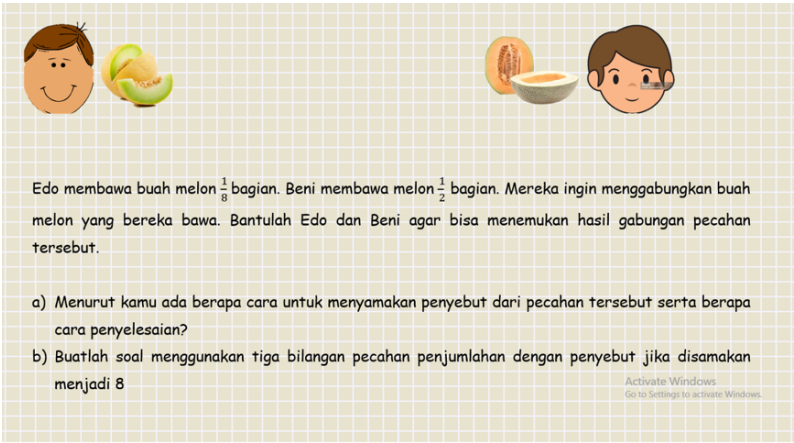

Figure 5. Sample question
Source: Research 2023

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Figure 6 is an example of an exercise question.

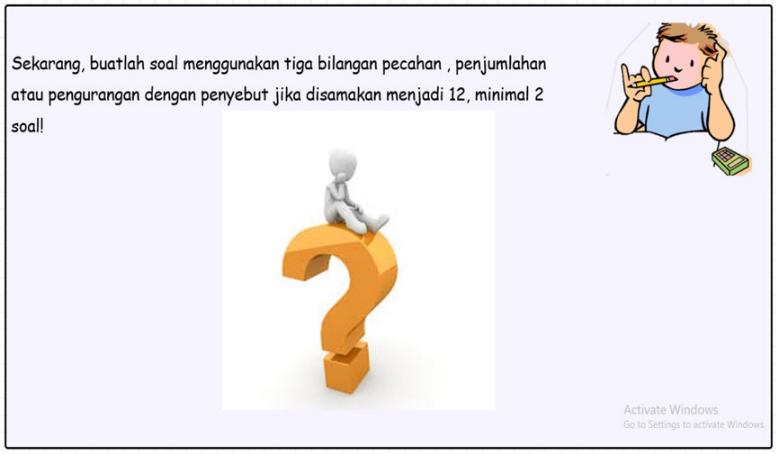

Figure 6. Exercise question
Source: Research 2023

Table 9 shows the results of product validity by experts.

Table 9. Results of Product Validity by Experts

No.	Trial subject	Validity result	Description
1	Material expert experiment	95,2%	Very Valid
2	Design expert experiment	96,19%	Very Valid
3	Media expert experiment	90,66	Very Valid

Source: Research 2023

Table 9 explains that the three results of the validator's assessment of the learning video are very valid, so it is feasible to test students. This is following previous research that a product can be tested when it has been declared feasible by a validator (Saragi & Tegeh, 2022; Setyawati *et al*., 2022).

Implementation Stage

In this step, professionals conducted a pilot test of the verified product. Twenty-five learners were in the field, and nine were randomly selected for the small group setting. The pilot test measures how well learners understand the fraction-related content in the PBL model learning video. The following are the findings from the learners' response questionnaire.

Table 10. Learner Response Results

No.	Trial subject	Response Result	Description
1	Small Group Experiment	89,80%	Very Practical
2	Field Experiment	91,48%	Very Practical

Source: Research 2023

Table 10 explains that researchers get results in small group experiments with efficient results of 89.80%, so it can be concluded that students can follow the PBL model learning video, which is worth testing in the field, namely, class V-A SDN 101764 Bandar Klippa. The results of the field trial showed that 91.48 % of

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students found the responses of 91.48% very practical, meaning that the learning video can adjust learning based on the phase of child development and contribute to activating learning in the classroom.

Evaluation Stage

The assessment stage includes testing the effectiveness of the media in improving academic achievement and encouraging innovation among fifth-grade students of SDN 101764 Bandar Klippa. The following presentation discusses improving learners' learning outcomes and developing creativity. **Table 11** shows the validity of the questions.

Table 11. Validity of questions

No. Question	r_{xy}	Correlation Level	r_{count}	r_{table}	Description
1	0,861	Very Strong	7,175155	0,444	Valid
2	0,767	Strong	5,078589	0,444	Valid
3	0,750	Strong	4,806872	0,444	Valid
4	0,758	Strong	4,933419	0,444	Valid
5	0,747	Strong	4,772428	0,444	Valid

Source: Processed Researcher Data 2023

After the questions are validated, the reliability test is carried out. Table 12 shows the following test reliability results obtained using the SPSS 25 application.

Table 12. Reliability Results

Cronbach's Alpha	N of Items
.859	5

Source: Processed Researcher Data 2023

Table 12 shows that Cronbach's Alpha is 0.859, which indicates that the interpretation's reliability is very high. So, the test is feasible to assess aptitude to improve learners' learning outcomes and develop creativity. **Table 13** shows the completeness of learners' learning outcomes.

Table 13. Completeness of Learners' Learning Outcomes

Score	Cate	*Pre-test*		*Post-test*	
		Frequency	Percentage	Frequency	Percentage
$72 - 100$	Tuntas	1	4%	22	88%
$0 - 71$	Not complete	24	96%	3	12%

Source: Research 2023

By comparing the results of the first and last test, we can see how much the learning outcomes have improved. What was obtained in the initial test showed that out of 25 students, 96% were not complete, while 4% were complete. In addition, the post-test results after utilizing multimedia in learning videos showed that 12% of students did not complete. In comparison, 88% of students completed it (complete). The research relevant to the results of the learning video media research that has been developed is declared effective in improving student learning outcomes (Wijaya *et al*., 2021).

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The following calculations were carried out following the results generated using SPSS 25—analysis of the effect of N-Gain calculations on the academic achievement of class V-A students. Table 14 shows the results of the calculation.

Table 14. N-Gain Calculation Results of Learners' Learning Outcomes.

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	25	.10	.95	.6156	.22223
Valid N (listwise)	25				

Source: Research 2023

Table 14 displays the average N-Gain value of 0.615 determined using SPSS 25. The average used is the "medium" standard. This indicates an overall increase in learner learning outcomes.

The inaccuracy of presenting fractions in their proper form. The following things cause learner errors: failure to understand the given problem, carelessness or lack of diligence in reading and solving problems, forgetting and being unable to understand the concepts presented in the previous material, and failure to be careful or diligent (Yanti, 2017).

One potential strategy to correct errors is to implement remedial instruction. Remedial learning, or simply learning that makes things right, consists of corrective or restorative instruction (Lidi, 2019). Besides getting learners used to practicing problems, requiring learners to draw fractions using tools such as rulers and comparisons can inspire them to learn and be careful when doing calculations.

Nevertheless, students' learning outcomes can be improved by applying the PBL model to learning videos on fraction materials, based on analyzing students' average scores. Learning videos can improve fraction learning outcomes in grade V elementary school students (Widiarti *et al*., 2021). Rofiq in "*Pengembangan Media Video Pembelajaran Interaktif Untuk Meningkatkan Hasil Belajar Materi Pecahan Pada Siswa Kelas III SDN Mulyoagung 1 Bojonegoro*" suggests the use of video learning materials as an alternative to motivate students to be more active in participating in learning, so that it is easier to achieve the required learning objectives. Animated video content can improve Math learning outcomes (Rahmi et al., 2023). One of the learning theories that discusses learning outcomes is cognitive learning theory. In a broad sense, cognitive refers to acquiring, organizing, and applying knowledge. In layman's terms, cognitive abilities consist of a child's ability to reason, solve, and consider more complex issues. The cognitive approach prioritizes the application of academic knowledge by evaluating knowledge outcomes demonstrated through assessment and learning outcomes (outputs). **Table 15** shows the completeness of students' learning creativity.

Table 15. Completion of Learners' Learning Creativity

No	Creativity Level	Number of Learners	
		Pre-test	Post-test
1	Very Creative		10 learners
2	Creative		15 learners
3	Quite Creative	17 learners	
4	Less Creative	8 learners	
5	Not Creative		

Source: Research 2023

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The level of learning creativity shown by students in class V-A has increased. The results of the initial test and the final test will be calculated before and after the use of learning videos. Based on the pre-test results, seventeen learners were classified as moderately creative, while eight were rated less creative. After applying the PBL model learning video, the post-test assessment of students' creativity showed that fifteen students were classified as creative. In comparison, ten students were classified as very creative.

Based on the results of analyzing learners' answer sheets, learners categorized as moderately creative and less creative can only show one creativity indicator per problem: flexibility or fluency; the novelty indicator is the dominant shortcoming. Novelty relates to the ability of learners to offer different and unparalleled answers or solutions, incorporating mathematical concepts or knowledge that are rarely contemplated by their peers and have accurate values (Khumaidi & Budiarto, 2019). The characteristics of novelty are as follows: (1) the ability to produce new and distinctive expressions; (2) the ability to design unusual methods of self-expression; and (3) the ability to assemble components or elements in unconventional ways (Naja *et al*., 2017).

Learning video development is a methodological process that produces a final result, especially learning videos that follow the PBL model. This PBL model learning video was developed to assist students in mathematics education, especially those related to fractions. Confirming that learning videos can improve student learning outcomes (Aliyyah et al., 2021). Arsyad in the book "*Media Pembelajaran*" outlines some of the benefits of interactive multimedia: a) information is presented in the form of living documents that can be viewed visually and aurally on the monitor; and b) information is conveyed in an entertaining, informative, straightforward manner.

CONCLUSION

Based on the results of research and development, it can be concluded that: (1) The feasibility of the Problem Based Learning model learning video developed based on the results of experts shows validation (96.29%), design experts (96.19%), then media experts (90.66%), it can be concluded that it is very feasible so, this product is very suitable for use in mathematics education for grade V students who study fractions. (2) In UPT SPF SDN 101764 Bandar Klippa, the practicality of the learning video through the fraction problem learning model in class V was assessed through students' responses; the small group test resulted in 89.89%, while the field test resulted in 91.48%. This shows how the media is part of the efficient category; (3) The effectiveness of the learning video integrated with the fraction problem-based learning methodology was assessed using a test instrument. The achievement of an 84% increase in learning outcomes in the field trial was classified as "highly commendable". The gain score obtained was 0.615, meeting the criteria of moderate effectiveness. (4) The effectiveness of problem-based learning videos on fraction material in fostering the creativity of class V UPT SPF SDN 101764 Bandar Klippa students increased by 100%.

Indicating that PBL learning videos improve the academic achievement and creativity of SDN 101764 Bandar Klippa grade V students. Learners and educators can independently utilize the Problem Based Learning model learning video, which learners can access online. As a result, learning is no longer limited to the classroom and can transcend academic boundaries. The researcher hopes to utilize the potential of technology in education to be applied in the classroom to facilitate active learning for learners. Hopefully, this research can inspire many other aspiring scientists to create additional learning materials to improve education in Indonesia. Educators are advised to implement the practice of asking divergent questions as a means of assessing learners' creativity in mathematics learning activities. It also enables learners to develop a tendency to tackle problems that require multiple solutions or answers. To achieve this,

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educators should routinely provide appropriate exercises with correct concepts. Educators should emphasize learners' clear understanding of concepts to maximize mathematics learning outcomes.

AUTHOR'S NOTE

The authors confirm that the publication of this article does not involve any conflict of interest, and further validate that the data and article content are free from plagiarism.

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