



Development of Contextual-Based E-LKPD to Improve the Ability to Understand Fraction Concepts

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Abstract

The ability to understand concepts is basic in learning mathematics, which is essential for students to have so that students can understand the concepts of the material being studied. This study thus aims to determine feasibility, improve the ability to understand the concept of fractions and find out students' responses to contextually-based E-LKPD (e-student worksheets). This research was conducted at SDN Sepang with 32 students in class V elementary school as subjects. This study used the Research and Development (R&D) method, with ADDIE (analysis, design, development, implementation, evaluation) stages. Data collection was obtained using questionnaires, interviews, documentation, and tests. The study results showed that (1) the feasibility of contextually based E-LKPD was in a very decent qualification with an average percentage of the feasibility of 86% for material experts, 90% for media experts, and 90% for linguists. (2) There was an increase in students' understanding of fractions after using the E-LKPD with an N-gain of 0.61, with moderate qualifications. (3) The average percentage of student responses was 83% in the small group test and 89% in the group test, with very good qualifications. Based on the trial results, it can be concluded that contextually based E-LKPD was very feasible to use and could improve the ability to understand fraction concepts and obtain excellent student responses. Electronic worksheets combined with contextual content could be alternative to be developed in other conceptual learning.

Keywords:

E-LKPD, Contextual Learning, Understanding the Fraction Concept

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Abstrak

Kemampuan memahami konsep merupakan hal mendasar dalam pembelajaran matematika yang sangat penting dimiliki siswa agar siswa dapat memahami konsep dari materi yang dipelajari. Penelitian ini bertujuan untuk mengetahui kelayakan, meningkatkan kemampuan memahami konsep pecahan dan mengetahui respon siswa terhadap E-LKPD (lembar kerja siswa elektronik) berbasis kontekstual. Penelitian ini dilakukan di SDN Sepang dengan subjek sebanyak 32 siswa kelas V sekolah dasar. Penelitian ini menggunakan metode Research and Development (R&D) dengan tahapan ADDIE (analisis, desain, pengembangan, implementasi, evaluasi). Pengumpulan data diperoleh dengan menggunakan angket, wawancara, dokumentasi, dan tes. Hasil penelitian menunjukkan bahwa (1) kelayakan E-LKPD berbasis kontekstual berada pada kualifikasi sangat layak dengan rata-rata persentase kelayakan 86% untuk ahli materi, 90% untuk ahli media, dan 90% untuk ahli bahasa. (2) Terdapat peningkatan pemahaman siswa terhadap pecahan setelah menggunakan E-LKPD dengan N-gain sebesar 0,61, dengan kualifikasi sedang. (3) Persentase rata-rata respon siswa 83% pada tes kelompok kecil dan 89% pada tes kelompok dengan kualifikasi sangat baik. Berdasarkan hasil uji coba dapat disimpulkan bahwa E-LKPD berbasis kontekstual sangat layak digunakan dan dapat meningkatkan kemampuan memahami konsep pecahan dan memperoleh respon siswa yang sangat baik. LKPD elektronik yang dipadukan dengan konten kontekstual dapat menjadi alternatif untuk dikembangkan dalam pembelajaran konseptual lainnya.

Kata Kunci:

E-LKPD, Pembelajaran Kontekstual, Pemahaman Konsep Pecahan

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INTRODUCTION

Education is an essential thing in life. Everything cannot be separated from education, be it education carried out in schools or education taught at home by parents. Education is needed to develop and improve one's quality of life. Therefore, education is a place to develop knowledge, personality, and soft skills. Education is expected to produce intelligent, qualified, and competitive human beings to face life in the future. Under the aspirations of the Indonesian people contained in the Preamble of the 1945 Constitution, it is to make the Indonesian nation an intelligent and patriotic nation. It proves that education has always been crucial.

Learning in schools contains several subjects taught, one of which is mathematics. Mathematics is a scientific discipline essential to every aspect of life. In everyday life, people are constantly faced with problems related to the scientific field of mathematics, starting from small things to pushing for the development of sophisticated technology like today (Kurniawati et al., 2022).

Based on the data obtained from the TIMSS (Trend in International Mathematics and Science Study) test results developed by the IEA (Association for the Evaluation of Educational Achievement), it can be explained that in 2011, Indonesia obtained an average mathematics score of 386, which ranked 38th of the 42 participating countries. Meanwhile, in 2015, Indonesia obtained an average score of 397, ranking 22nd out of 49 participating countries. From these data, it can be concluded that the mathematics scores of Indonesian students were below the international average score, and the mathematical abilities of Indonesian students could be categorized as low (Hadi & Novaliyosi, 2019). One reason students were weak in mathematics was that students could not understand basic mathematical concepts related to the subject matter discussed (Purwaningsih in Hidayat et al., 2020).

The ability to understand mathematical concepts is fundamental in learning mathematics, which is vital for students because to work on math problems, students need to understand the concepts of the questions presented. In learning mathematics

in elementary schools, there is a material of fractions (Fahrudin et al., 2018). Fraction material is one of the materials for learning mathematics, and the process is quite complicated. It is consistent with previous research conducted by Hayatunnizar (2016), which stated that in learning mathematics in elementary schools, students experienced difficulties in understanding fractional material. In line with this, Pangaribuan et al. (2021) explained that most students experienced difficulties in solving fractional arithmetic operations, especially dividing fractions; almost all students could not explain their answers logically. In teaching the concept of dividing fractions, the teacher did not require students to learn meaningfully but only conveyed formulas, theory, and practice questions. Therefore, there is a need to increase math skills through teachers providing practice questions in learning mathematics and carrying out meaningful learning. Meaningful learning can be done using a contextual learning approach.

Contextual learning can be applied to all subjects, including mathematics. This learning approach can be educators' choice in learning since it can improve students' abilities, such as problem-solving abilities, critical thinking, conceptual understanding, and other mathematical abilities (Santoso, 2017). Consistent with this, referring to research done previously by Mardiana et al. (2018), contextual teaching and learning in learning mathematics influences and can improve students' conceptual understanding skills. In addition, research conducted by Marita (2018) found that applying contextual learning could increase student motivation and learning outcomes in addition and subtraction of fractions. In contextual learning, students are involved in relating the concepts of the material being studied to the real life of students. Thus, applying a contextual approach can increase students' motivation in learning because students become more aware of the uses and interrelationships of material concepts with the realities of their lives, making learning more meaningful.

Further, contextual learning is an effort to realize 21st-century learning. In 21st-century learning, learning is more student-centered, and the teacher is a facilitator. In this

case, supporting learning tools are needed to make students active in the learning process and encourage students to do learning independently. LKPD (student worksheet) is one of the teaching materials that can make students study independently because it contains instructions for learning activities, materials, and a summary of the material. Thus, with the use of learning LKPD, it is expected to be more optimal (Gusmiro et al., 2017).

On the other hand, technological developments are increasingly rapidly changing various aspects of life, one of which is the aspect of education. Therefore, educators need to innovate in learning following the development of science and technology, such as making LKPD in electronic form or E-LKPD. In the E-LKPD (e-student worksheet), educators can include videos, pictures, sounds, and interactive game links. In addition, students easily access E-LKPD, and educators can control students' work results online. It corroborates with the research of Putra et al. (2021) that E-LKPD can attract interest and motivate students to learn. In addition, E-LKPD can facilitate online learning. In line with this, the research results of Pribadi et al. (2021) revealed that E-LKPD makes it easier for students to understand concepts because students are invited to find concepts and solve problems given through several fun processes; students are actively involved in learning. Moreover, E-LKPD could improve students' mathematical understanding, critical thinking, and active learning (Bombang et al., 2022; Hidayah & Kuntjoro, 2022; Shalahuddin & Hayuhantika, 2022).

For this reason, this research and development aim to (1) determine the feasibility of contextually-based E-LKPD to improve the ability to understand fraction concepts, (2) determine the increase in students' ability to understand fraction concepts after using contextually-based E-LKPD, and (3) find out the response students on contextual-based E-LKPD.

METHODS

The research method used in this study was research and development, or R&D, with the ADDIE development model. The ADDIE development model uses systematic research

stages so that this model is feasible for use in developing various products, such as teaching materials, learning media, learning strategies, learning methods, and models.

Development with the ADDIE model consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The following describes the stages of the ADDIE development model.

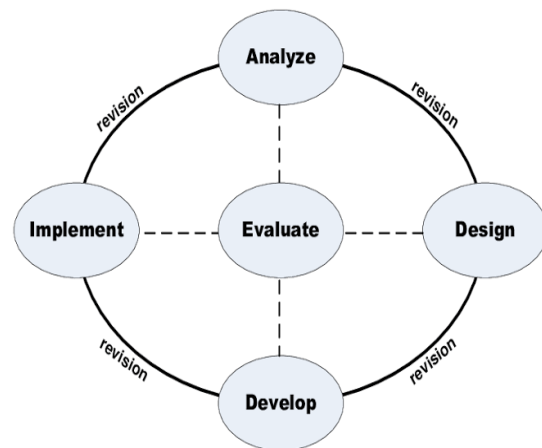


Figure 1. Procedure for developing the ADDIE model

The first stage of the ADDIE model in developing the E-LKPD aimed to analyze school needs and problems. The analysis phase was carried out in the form of needs analysis, material analysis, and analysis of student characteristics. The needs analysis stage was used to identify the teaching materials needed to improve students' understanding of concepts. The data collection technique employed at the analysis stage was conducting unstructured interviews and observations of fifth-grade students at SDN Sepang as research subjects.

The second stage was the planning stage (design) to design teaching materials according to the needs and characteristics of students. The steps for designing teaching materials in E-LKPD were seen in terms of material, language, and design. Researchers collected materials per learning objectives and then designed or packaged the material. In this step, the researchers also compiled an assessment instrument used to assess the E-LKPD.

The third stage was development. The E-LKPD product development was carried out

at this stage per the design. After the E-LKPD was created, the feasibility of the E-LKPD was tested by expert tests consisting of media, language, and material experts. Then, revisions were made following the advice given by experts. The score obtained from the expert validation results was calculated using the formula:

$$NP = \frac{R}{SM} \times 100\% \dots \dots \dots \text{(Formula 1)}$$

Description:

- NP = Average value in percent (%) given
- R = The score obtained
- SM = Maximum score of all aspects

The values obtained were then converted into qualitative according to the rules specified in Table 1 to determine the feasibility category of the E-LKPD tested the feasibility category is taken from *Introduction to Statistics: For Educational, Social, Economic, Communication, and Business Research* by Riduwan.

Table 1. E-LKPD Feasibility Qualifications

Percentage	Qualification
$80 < NP \leq 100\%$	Very feasible
$60 < NP \leq 80\%$	Feasible
$40 < NP \leq 60\%$	Quite feasible
$20 < NP \leq 40\%$	Not feasible
$0 < NP \leq 20\%$	Very not feasible

The fourth stage was implementation. In this step, the E-LKPD was implemented in the learning process at school. Implementation was carried out by conducting small-scale trials and large-scale trials. The trial was carried out by involving students to obtain student responses to the developed E-LKPD. A questionnaire was also distributed to teachers and students to determine E-LKPD's practical value. A post-test was conducted to find out the increase in students' understanding of the concept of fractions. The trial was carried out at SDN Sepang by taking 32 class V SD test subjects, divided into two groups: 8 small and 24 students in the large group trial.

The scores obtained from the results of student responses were calculated using the same formula as calculating the validation

results in Formula 1. The values obtained were then converted to qualitative according to the rules specified in Table 2 to determine the criteria for student responses to the E-LKPD tested.

Table 2. Interpretation of Student Responses

Percentage	Qualification
$80 < NP \leq 100\%$	Very good
$60 < NP \leq 80\%$	Good
$40 < NP \leq 60\%$	Enough
$20 < NP \leq 40\%$	Not good
$0 < NP \leq 20\%$	Very Not Good

Data analysis of test results was calculated using the N-gain formula as follows:

$$(g) = \frac{\text{Post-test score} - \text{Pre test score}}{\text{Maximum score} - \text{Pre-test score}} \dots \dots \dots \text{(Formula 2)}$$

Description:

- (g) = N-gain
- Pre-test score = Initial test score
- Post-test score = Final test score
- Maximum score = Maximum score

Table 3. N-Gain Criteria

N-Gain value (g)	Criteria
$g > 0.7$	High
$0.7 > g > 0.3$	Moderate
$g < 0.3$	Low

E-LKPD can be effective when learning results are obtained from a student's ability to understand the concept of fractions, with the minimum N-gain test acquisition being in the moderate category (Subakti et al., 2021).

The final stage in the ADDIE model was evaluation. An evaluation was used to see whether the developed E-LKPD followed the original expectations. Evaluation can be done formally or publicly. First, formative assessments were carried out after each step of the ADDIE model development process. Meanwhile, a summative evaluation was conducted at the end of the activity after all procedures had been carried out. Furthermore, revisions could be made if needed.

RESULTS AND DISCUSSION

In this research, the product developed was a contextual-based E-LKPD. Contextual-based E-LKPD is a student worksheet in electronic form containing fractional material presented by applying contextual learning components, which are expected to improve the ability to understand the concept of fractions. The stages in this research and development used the ADDIE development model.

Analysis

At this stage, a needs analysis, a students' characteristics analysis, and a material analysis were carried out. The analysis phase was conducted through literature studies, observations, and interviews with teachers and students. The analysis phase was done to collect information related to the inhibiting factors and drivers of the mathematics learning process in class V SD, which could later be given a solution to the problem by developing a product. Analysis activities were conducted at SD N Sepang with class VA student respondents and VA and VB class teachers.

From the analysis results, it was found that contextual-based E-LKPD had never been used in learning. Teachers used teaching materials in the form of textbooks and student worksheets purchased from publishers. In addition, the researchers found that students still had difficulty understanding fractional material. Students had difficulty determining the denominator's equalization and the denominator's size after the denominator was equated, and many students did not memorize multiplication.

Design

After doing the analysis, the next step was to design the product. The design of the E-LKPD was seen in terms of material, language, and design. The researchers collected material under the learning objectives and then made a design or packaging of the material. The scope of material used in development was for adding and subtracting fractions found in the odd semester learning.

Table 4. Basic Competencies and Indicators

Basic Competencies	Indicator
3.2 Explain and add and subtract two fractions with different denominators	3.2.1 Explain the addition and subtraction of two fractions with different denominators
4.2 Solve problems related to the addition and subtraction of two fractions with different denominators	4.2.1 Identify problems related to the addition and subtraction of two fractions with different denominators

After determining the scope of the material, the next step was to make an E-LKPD storyboard. The developed E-LKPD consisted of several sections, including learning materials, activity sheets 1 and 2, answer keys for activity sheets 1 and 2, competency tests, author profiles, and a question/discussion feature via WhatsApp. It aligns with Prastowo's opinion cited again by Asmaranti et al. (2018), who argue that making an LKPD should contain elements, including the title, basic competencies, processing time, tools and materials needed, brief information, and steps activity step.

Contextual-based E-LKPD was designed by integrating contextual components, including seven components: constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment. It is consistent with Trianto's opinion in Ramdani (2018) that a lesson can use a contextual approach if it applies the seven main components of contextual teaching-learning, including constructivism, inquiry, questioning, learning communities, modeling, reflection, and authentic assessment.

Additionally, the software used in making E-LKPD included Microsoft Word, Canva, Wordwall, Live Worksheet, and Linktree. The following is the E-LKPD storyboard. Besides making a storyboard, the researchers also made an instrument for assessing the E-LKPD feasibility for media experts, linguists, and material experts at this stage. They also made an instrument for testing the understanding of fractions.

Development

At this stage, the development of the E-LKPD was carried out per the storyboard made. Furthermore, the E-LKPD made was validated by experts, including material, media, and language experts. Each category consisted of two experts, so the developed E-LKPD was valid. The validation stage was conducted to obtain suggestions, input, and evaluation and measure the feasibility of the E-LKPD, where the E-LKPD can be said to be feasible if it fulfills a minimum score of 61% in the feasible category.

The e-LKPD feasibility test assessed the feasibility of the material, media, and language. Contextual-based E-LKPD was tested for feasibility by six expert lecturers: Dr. NA, M.Pd. and PAR, M.Pd. as material experts, Dr. LN, M.Pd., and ASP, M.Pd. as media experts, and DAKD, M.Pd. and SR, M.Pd. as a linguist. A questionnaire with a scale of 1-5 was used to obtain an assessment from the validator, which was processed using quantitative data analysis. Meanwhile, the suggestions and comments given by the validator were processed using a qualitative descriptive analysis. The following is a recapitulation of the expert assessment results.

Table 5. Recapitulation of Expert Test Assessment Results

Assessment	Total Items	Score	Max Score	%
Material expert	18	77	90	86
Media expert	14	63	70	90
Linguist	12	52	60	86
Total	44	192	220	262
Total percentage				87,3

Judging from the percentage obtained from the validation results of the E-LKPD, a percentage score of 87.3% was obtained, with very feasible criteria for testing. It denotes that the E-LKPD developed by researchers met the feasibility requirements of LKPD, such as conformity with inactive requirements, constructive requirements, and technical requirements. Aside from providing an assessment, the validator also provided suggestions and input for improving the E-LKPD. The following is the display of

contextual-based E-LKPD before and after revision.

1. Improved word selection and instructions for working on E-LKPD

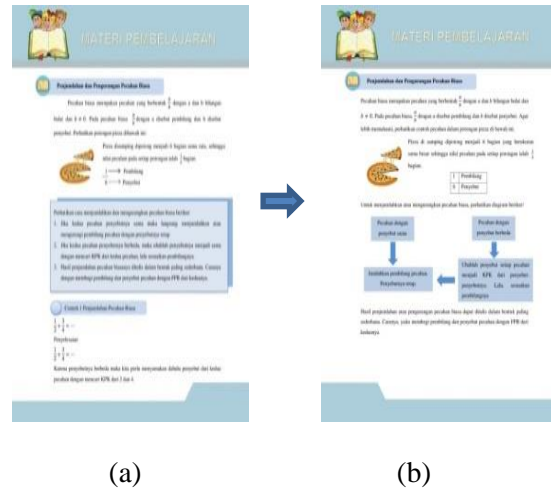


Figure 2. Improved word choice in material (a) before revision; (b) after revision

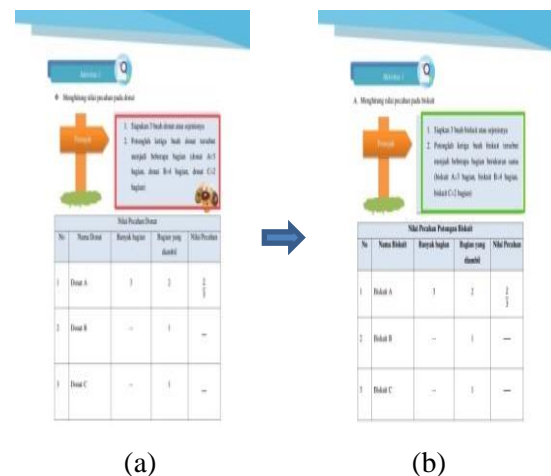


Figure 3. Improved work instructions (a) before revision; (b) after revision

In the figures above, it can be seen that researcher improve the design by changing the word choice (Figure 2) and revising the instruction for the assignment examples (Figure 3).

2. Improved cover design and author profile

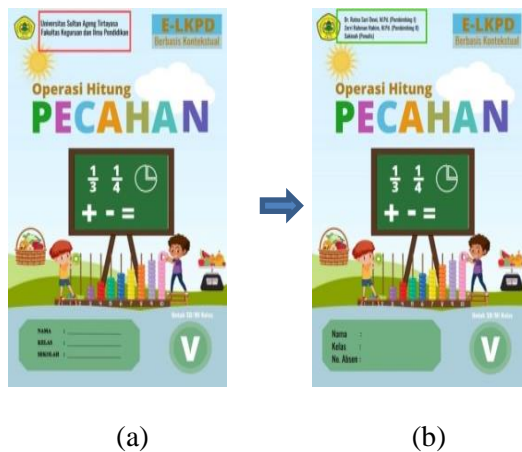


Figure 4. E-LKPD cover improvement (a) before revision; (b) after revision

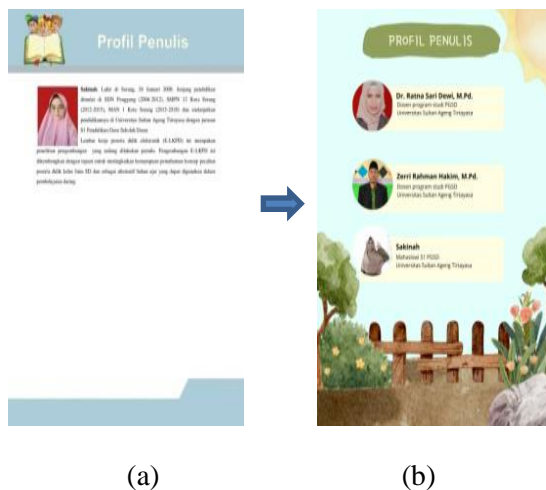


Figure 5. Improved author profile (a) before revision; (b) after revision

In the figures above, it can be seen that researcher improve the cover design by changing the identity column (Figure 4) and completing the author profile with two additional authors (supervisors). The below figure indicates that authors improved the wording and technical writing such as sentence structure and punctuation (Figure 6).

3. Improved sentence structure and punctuation to produce effective sentences

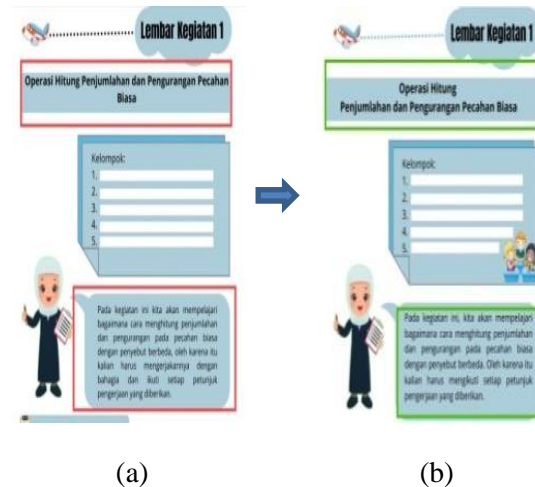


Figure 6. Improvement of sentence structure and punctuation (a) before revision; (b) after revision

Implementation

After the E-LKPD was declared feasible for implementation in schools, the next step was to conduct trials of the E-LKPD product in small and large groups to see students' responses to the E-LKPD being developed. The tryout was carried out in the VA class of SDN Sepang, with eight students in the small group test and 24 in the large group test. Before the trial, students were given pre-test questions to see their ability to understand fraction concepts before using the E-LKPD. They were given post-test questions to see students' ability to understand fraction concepts after using the E-LKPD.

From the concept comprehension test results, students scored higher after using the contextual-based E-LKPD than before using the E-LKPD. Before using the E-LKPD, the average test score for understanding the concept of fractions was 60. After participating in learning activities using the E-LKPD, the average test score was 85. Afterward, the initial and final test scores for understanding the concept of fractions were calculated using the N-gain (Normalized Gain) formula to measure the increased ability to understand students' fraction concepts. Based on the calculation results of increasing the ability to understand the concept of fractions, an N-gain of 0.63 was produced with a moderate

interpretation. Meanwhile, an increase in each indicator of the ability to understand the fraction concept can be seen in Figure 7.

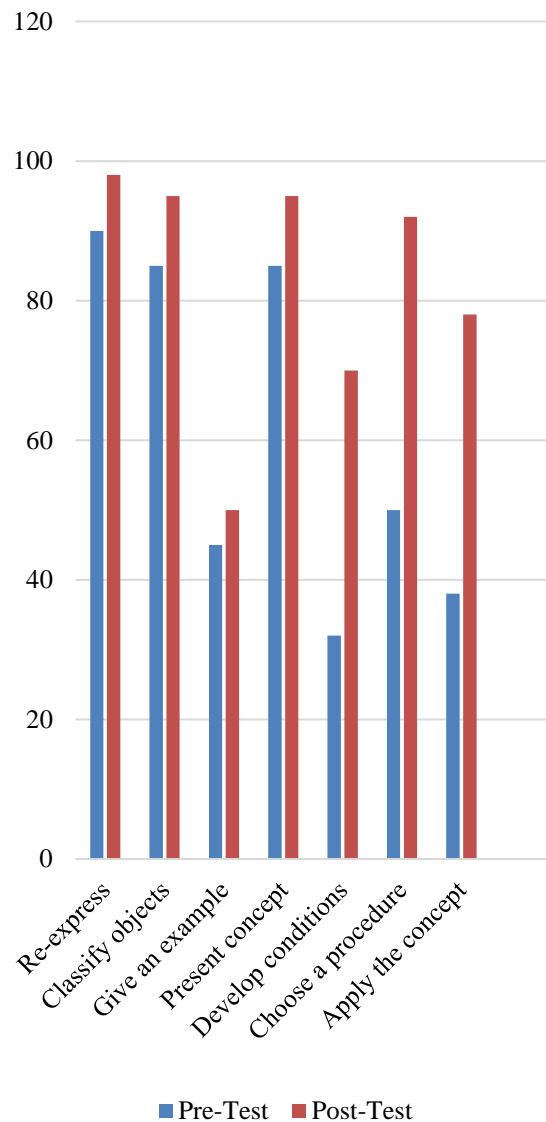


Figure 7. Improved ability to understand concepts for each indicator

Mudhiah and Shodikin (2019) revealed that the ability to understand concepts has seven indicators, including re-expressing concepts, grouping objects based on specific characteristics according to concepts, giving examples and non-examples, presenting concepts in various mathematical representations, developing necessary or sufficient conditions for concepts, choosing specific procedures or operations, and applying concepts or algorithms to problem-solving. The understanding of the concepts in

each of these indicators increased since the contextual-based E-LKPD emphasized students in the process of being directly involved in finding theories so that students gain learning experience. In addition, the concept of the material being studied was linked to the reality of students' daily lives. In line with this, Lestari and Yudhanegara (2017) and Santoso (2017) asserted that contextual learning applies learning concepts to the real world around students' environments, thus encouraging students to explore their abilities.

In addition to being given a test for understanding the concept of fractions, students were given a response questionnaire to find out students' responses to the contextual-based E-LKPD used in learning activities. Contextual-based E-LKPD as a whole obtained a percentage value of 85%, with the response criterion of "very good." Besides, teachers were also given a questionnaire to determine the teacher's response to the contextual-based E-LKPD, which obtained a percentage of 80%, with the criterion "good."

Evaluation

The evaluation was the final step in the development of the ADDIE model. Based on the contextual-based E-LKPD expert test results, the E-LKPD was considered very feasible for use in learning activities and met the feasibility requirements of an LKPD. Aidin et al. (2019) suggested that an LKPD can be feasible if it meets the feasibility requirements, including didactic, constructive, and technical requirements. In this study, students were happy and interested in using the E-LKPD. It was easier to understand fractional material because it was related to the reality of students' daily lives. The interactivity of electronic resources is powerful (Maulidiana et al., 2021).

There were videos of examples of solving fractional problems so that students understood the material better and gave very good responses. In addition, contextual-based E-LKPD could improve understanding of the concept of fractions. It is in line with the results of previous research by Putra et al. (2021) that E-LKPD can attract interest and motivate students to learn.

Furthermore, E-LKPD can also facilitate online learning. Furthermore, the research results of Pribadi et al. (2021) revealed that E-LKPD makes it easier for students to understand concepts because students are invited to find concepts and solve problems given through several fun processes; students are actively involved in learning through self-inquiry (Sari et al., 2022). Similarly, Amthari et al. (2021) stated that E-LKPD could increase mathematical understanding and student learning activity.

CONCLUSION

Based on the research and development results of contextual-based E-LKPD to improve the ability to understand fraction concepts, it can be concluded that the feasibility of contextual-based E-LKPD was very feasible to use in learning activities. It could be seen from the acquisition of the expert test assessment. For material experts, an average percentage of feasibility was obtained by 86%, with the criterion "very feasible"; for linguists, an average percentage of feasibility was obtained by 86%, with very feasible criteria; for media experts, an average percentage of 90% was obtained, with the criteria of "very feasible." If calculated as a whole, the average percentage of feasibility based on contextual E-LKPD reached 87%, with the criteria of "very feasible."

Moreover, there was an increase in students' understanding of the concept of fractions after using the contextual-based E-LKPD, with an average N-gain of 0.61, included in the criteria of moderate improvement. The use of E-LKPD in learning at school received a very good response, as seen from the results of calculating the questionnaire filled out by students in the small and large group tests, which obtained an average of 86% with very good criteria.

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