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# Analysis of E-LKPD Development Needs on Fraction Materials Using the Pmri Approach for Students of SDN 4 Air Balui Musi Banyuasin

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**ABSTRACT**

*The integration of technology in mathematics education has become increasingly crucial in the 21st century, particularly in developing engaging and contextually relevant learning materials. This study aims to analyze the development needs of E-LKPD (Electronic Student Worksheets) based on the PMRI (Indonesian Realistic Mathematics Education) approach on fraction materials for students of SDN 4 Air Balui, Musi Banyuasin. The research method used is Research and Development (R&D) with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). At the analysis stage, data were collected through questionnaires distributed to students and teachers. The results of the analysis show that students have a high need for digital-based E-LKPD that is interesting, contextual, and supports understanding of fraction concepts. As many as 59% of students strongly agree with the contextual relevance of the material to daily life, while 41% agree. The need for digital learning media reached 49% strongly agree and 48% agree. The clarity and ease of material presentation were considered important by 55% of students who strongly agree and 45% who agree. For educators, PMRI-based E-LKPD is expected to help students understand fraction concepts through real-life experiences and to improve their creative mathematical thinking skills. These findings underline the importance of developing PMRI-based E-LKPD as a valid, practical, and effective learning medium.*

***KEYWORDS*** *Creative Mathematical Thinking, E-LKPD, Fractions, PMRI*



## INTRODUCTION

Global trends in mathematics education demonstrate a significant shift toward technology-enhanced learning environments. According to UNESCO (2021), digital learning resources have proven effective in improving student engagement and conceptual understanding, particularly in abstract mathematical concepts. The integration of electronic worksheets (E-LKPD) in mathematics instruction aligns with the demands of the Fourth Industrial Revolution for digital literacy and innovative pedagogical approaches (OECD, 2019). Recent meta-analyses have shown that technology-based mathematics learning can increase student achievement by approximately 0.35 standard deviations compared to traditional methods (Li & Ma, 2023). In the Indonesian context, the Ministry of Education, Culture, Research, and Technology has emphasized the importance of developing digital learning resources that are culturally relevant and contextually appropriate, making the development of PMRI-based E-LKPD particularly timely and significant. Furthermore, research by Burns et al. (2024) indicates that technology-based mathematics practice has a moderate effect on mathematics outcomes, with larger effects seen in students at risk of math difficulties. Additionally, a study by Kandukoori et al. (2024) compared the effectiveness of

digital tools and traditional methods in teaching mathematics, finding that digital tools significantly improved student test scores compared to traditional methods. Research by Cao et al. (2023) also suggests that the use of generative AI in mathematics education can enhance concept understanding and student engagement through multimodal analogy representations.

Learning media that can interest students and facilitate their understanding of the material taught in the learning process include using E-LKPD (Trisnawati & Sudiarto, 2023). The use of E-LKPD can foster students' reading interest, imagination, and creativity because students can actively observe and directly engage with the material presented in real and attractive forms, enabling them to comprehend learning materials as expected (Dany et al., 2024; Ayirahma & Muchlis, 2023). Engaging learning media that simplify the understanding of concepts play a crucial role in the learning process. One example is the E-LKPD (Electronic Student Worksheet), which can enhance students' interest and creativity in understanding mathematical concepts. E-LKPD provides opportunities for students to interact directly with learning material through more engaging media, making them more active and able to absorb material more effectively. The use of E-LKPD also allows students to study independently or in groups, thereby increasing independence, participation, and social skills through discussion and collaboration (Hidayati & Ibrahim, 2021).

However, to achieve optimal learning outcomes, it is necessary to further develop E-LKPD that are both engaging and aligned with student needs. One concept that can be applied in E-LKPD development is *Pendidikan Matematika Realistik Indonesia* (PMRI), which allows students to understand mathematical concepts through everyday life contexts. The PMRI approach emphasizes active learning (Lantakay et al., 2023). Students are encouraged to construct their mathematical knowledge through learning activities. The ability to think creatively in mathematics is essential for learners, as it involves cognitive processes that enable students to generate ideas and solve mathematical problems, especially non-routine ones. Previous research found that the development of LKPD based on the Open-Ended approach can improve students' creative mathematical thinking skills (Kurniasih & Dewi, 2022). Similarly, the development of E-LKPD with a similar approach can yield positive results in enhancing students' creativity in mathematics (Subakti et al., 2021). Nevertheless, traditional E-LKPD still have limitations, such as the delivery of information being primarily visual and the cost of printing and duplication. With technological developments, students are now more connected with digital media, making the development of electronic E-LKPD highly relevant to increasing students' interest and motivation in learning (Renaldi & Bella, 2022). In this context, PMRI can serve as an effective approach for developing E-LKPD on fraction materials because it connects mathematical concepts with students' real-life experiences (Puspita & Dewi, 2021).

Despite the growing body of research on technology-integrated mathematics education, a significant gap remains in understanding how PMRI principles can be effectively embedded within E-LKPD to enhance creative mathematical thinking skills, particularly in the context of fraction learning at the elementary level. While previous studies have examined E-LKPD development (Ayirahma & Muchlis, 2023) and PMRI implementation separately (Lantakay et al., 2023), limited research has systematically investigated the integration of both approaches specifically targeting creative mathematical thinking in fraction concepts. Furthermore, most existing studies have focused on product development without conducting comprehensive

needs analyses from both student and teacher perspectives, leaving a critical gap in understanding the actual requirements and challenges faced in implementing such integrated approaches in Indonesian elementary schools.

Based on preliminary observations at SDN 4 Air Balui, Musi Banyuasin, students demonstrate significant difficulties in solving mathematical problems, particularly those involving fractions when questions differ from examples provided during instruction. This challenge arises from several interconnected factors: first, a lack of deep conceptual understanding of fractions, with students relying mainly on procedural memorization rather than meaningful comprehension; second, the absence of engaging pedagogical methods connecting abstract mathematical concepts to students' real-world experiences; and third, limited exposure to problem-solving strategies that encourage creative and flexible thinking. Students often struggle to transfer their knowledge to new contexts because traditional teaching approaches emphasize rote memorization of formulas without fostering deep understanding of fractional relationships. Additionally, the lack of contextual grounding makes it difficult for students to identify when and how to apply fraction concepts in real-life situations. These problems are compounded by limited access to interactive and engaging learning materials that could bridge the gap between abstract mathematical concepts and concrete experiences, highlighting the urgent need for innovative instructional approaches that integrate realistic contexts with digital technologies.

These difficulties stem from insufficient understanding of mathematical concepts and excessive dependence on memorization. Consequently, students often struggle with unfamiliar problems. Therefore, a more contextual and experience-based approach, such as PMRI, is expected to improve their understanding of mathematical concepts, particularly fractions (Suprapti, 2019). Furthermore, the PMRI approach, which emphasizes real-world experiences, can motivate students to be more active in learning (Purba, 2022). By engaging students in activities relevant to their everyday lives, this approach not only enhances their comprehension of mathematical concepts but also strengthens their creative thinking abilities (Widodo & Daryanto, 2020). In addition, promoting independent and group problem-solving fosters students' social skills in collaboration and discussion—key competencies in education.

The development of PMRI-based E-LKPD holds transformative potential for mathematics education in Indonesia, particularly in addressing persistent challenges in fraction learning at the elementary level. By combining the pedagogical strengths of PMRI—which emphasizes horizontal and vertical mathematization through realistic contexts—with the technological advantages of digital learning environments, this approach can create more engaging, accessible, and effective learning experiences. Its positive impact extends beyond conceptual understanding, encompassing the development of essential 21st-century skills such as digital literacy, creative problem-solving, and collaborative learning. Moreover, within Indonesia’s diverse educational landscape, PMRI-based E-LKPD can offer culturally relevant learning experiences that resonate with students’ daily lives while maintaining mathematical rigor. This aligns with national educational goals of producing creative, critical, and technologically literate graduates capable of competing in the global knowledge economy.

PMRI-based E-LKPD also provides opportunities for students to interact directly with materials through digital technology, which has become an integral part of students’ lives. By incorporating engaging applications or software, students can feel more motivated and less

bored during mathematics lessons. This approach aligns with educational objectives that go beyond rote memorization, encouraging students to understand and apply mathematical concepts in real and relevant contexts.

Based on these issues, this study aims to analyze development needs to design learning media in the form of E-LKPD (Electronic Student Worksheets) based on the PMRI (Indonesian Realistic Mathematics Learning) approach that is valid, practical, and effective in enhancing elementary school students' creative mathematical thinking skills, particularly in fractions. Specifically, the research objectives are: (1) to identify students' needs regarding digital learning media characteristics for fraction learning, (2) to examine teachers' readiness and perceptions toward PMRI-based E-LKPD implementation, and (3) to determine the essential features and design elements required in E-LKPD to support the development of creative mathematical thinking.

The benefits of this research include providing empirical evidence for educators and curriculum developers regarding specific needs in developing PMRI-based E-LKPD, contributing to theoretical understanding of technology integration in realistic mathematics education, offering practical guidelines for designing effective digital learning materials for fraction concepts, and serving as a foundation for subsequent development phases of comprehensive E-LKPD products. The implications extend to informing educational policy on digital resource development, supporting teacher professional growth in technology-enhanced mathematics teaching, and ultimately improving the quality of mathematics learning outcomes in Indonesian elementary schools.

## METHOD

This study constituted Research and Development (R&D) using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. The primary aim was to develop and test the validity, practicality, and effectiveness of a PMRI-based Electronic Student Worksheet (E-LKPD) designed to increase elementary school students' interest in learning fractions. The ADDIE model was chosen for its systematic structure, which aligned well with the study's development objectives.

The research focused exclusively on the Analysis phase of the ADDIE model, serving as the foundation for subsequent stages. This phase ensured that the developed E-LKPD addressed the real needs and learning contexts of the target users. A comprehensive needs assessment was conducted through data collection involving both students, as primary users of the E-LKPD, and teachers, as facilitators of its classroom application.

Within the scope of the study, only the Analysis stage was discussed. This phase involved administering questionnaires to students and teachers to identify the specific learning needs and support materials required for effective fraction instruction. The research took place at State Elementary School 4 Air Balui, Musi Banyuasin Regency, South Sumatra, Indonesia, during the 2024 academic year. The school was purposively selected based on its accessibility, administrative support, participation willingness, and suitability for studying fraction concepts within the context of available technological infrastructure and representative student demographics. Details of the data collection instruments are presented in the subsequent grid table.

**Table 1. Instruments Analysis Need Learners**

| Aspect | Statement | Yes | No |
|---|---|---|---|
| Understanding Draft | 1. I understand draft fractions in learning mathematics. | | |
| | 2. I understand the use of fractions in everyday life | | |
| | 3. I have Study fractions with approach contextual like PMRI. | | |
| Use Technology and Learning | 4. I have been using digital media in Study mathematics. | | |
| | 5. I have experience using digital- based LKPD or E-LKPD in learning. | | |
| | 6. I have trouble in using digital media to learning mathematics. | | |
| Effectiveness of Digital Media | 7. I feel the use of E-LKPD helps I understand material fractions better. | | |
| | 8. I feel more interested Study fractions with using E-LKPD compared with printed LKPD. | | |
| | 9. I am easier understand material fractions through existing visual display in E-LKPD. | | |
| Collaboration and interaction | 10. I often discuss with Friend moment using digital learning media. | | |
| | 11. I feel more motivated Study fractions when can interact with digital features in E-LKPD. | | |
| | 12. I feel that E-LKPD allows collaborative learning with friends. | | |
| Facilities and Infrastructure | 13. My school own supported devices learning digital-based. | | |
| | 14. My school owns sufficient internet access for using digital learning media. | | |
| | 15. I feel facility school (digital library, internet, laboratory computer) supports learning using E-LKPD. | | |

**Table 2. Instruments analysis Teacher Needs**

| No | Statement | Rating Scale | |
|---|---|---|---|
| | | Yes | No |
| 1. | I have attended training related to the use of technology in learning. | | |
| 2. | Training teachers in using digital media such as E-LKPD is very important. | | |
| 3. | I have used method teaching digital-based in learning. | | |
| 4. | I feel comfortable in using methods of teaching digital-based in learning. | | |
| 5. | My school own supported devices learning digital-based. | | |
| 6. | My school owns power technical that can help in overcome constraint moments using digital learning media. | | |
| 7. | My school owns stable internet access for used in learning digital-based. | | |
| 8. | I get support from party school in use device for do learning digital-based. | | |
| 9. | Whether participant educates own difficulty in connecting concepts learned with implementation in life daily? | | |
| 10. | Do you wish development of E-LKPD helps increase ability to think critical participant educate? | | |
| 11. | Have you ever used digital LKPD or based technology previously? | | |
| 12. | Do you believe in using technology for support learning? | | |
| 13. | Do you feel the appearance of the LKPD used moment This Already interesting visually for participant educate? | | |
| 14. | Do you feel E-LKPD is helpful? Participants educate in learning? | | |
| 15. | Do you use easy feedback techniques in MATH learning? | | |

The population of this study consisted of all third-grade students and teachers at SDN 4 Air Balui. The student sample comprised 100 third-grade students selected through total

sampling technique, as all third-grade students were included to ensure comprehensive representation of needs. The teacher sample included four mathematics teachers from SDN 1, SDN 2, SDN 3, and SDN 4 Air Balui, selected through purposive sampling based on their experience teaching fraction concepts and familiarity with the student population.

The research employed two distinct questionnaire instruments designed specifically for needs analysis: the Student Needs Analysis Questionnaire and the Teacher Needs Analysis Questionnaire. Both instruments were developed based on established literature on E-LKPD development, PMRI principles, and digital learning effectiveness. The student questionnaire utilized a dichotomous response scale (Yes/No) to accommodate the cognitive development level of third-grade students, ensuring ease of comprehension and response accuracy. The teacher questionnaire employed a similar format to maintain consistency in data analysis. Prior to implementation, both instruments underwent expert validation by three experts in mathematics education, instructional design, and educational technology to ensure content validity, clarity of language, and appropriateness for the target respondents.

Data collection was conducted over a two-week period in October 2024. The procedure followed these systematic steps: (1) obtaining permission from the school principal and informed consent from parents of student participants, (2) conducting orientation sessions with students and teachers to explain the purpose and procedure of the questionnaire completion, (3) administering the student questionnaire in classroom settings under researcher supervision to ensure proper understanding and completion, (4) distributing the teacher questionnaire individually with sufficient time for thoughtful responses, and (5) collecting and verifying completed questionnaires for completeness and clarity. The researcher was present throughout the student questionnaire administration to address any questions or clarifications needed.

Data analysis employed descriptive statistical methods appropriate for needs analysis research. Quantitative data from questionnaires were analyzed using frequency distributions and percentages to identify patterns and trends in student and teacher responses. The analysis process included: (1) data coding and entry into statistical software, (2) calculation of frequency distributions and percentages for each questionnaire item, (3) categorization of responses into thematic areas (conceptual understanding, technology use, media effectiveness, collaboration, and infrastructure), (4) interpretation of findings in relation to PMRI principles and E-LKPD development requirements, and (5) synthesis of results to inform design specifications for E-LKPD development. Visual representations including bar charts and pie charts were created to facilitate interpretation and presentation of findings. The analysis aimed to identify not only majority preferences but also minority perspectives that might represent important considerations for inclusive design.

## RESULT AND DISCUSSION

Needs analysis as the basis for developing E-LKPD with the PMRI approach in fraction material in elementary schools assisted by liveworksheets is the initial step in consideration in designing LKPD that will be used by students. Aspects analyzed in this study include conceptual understanding, use of technology and learning, effectiveness of digital media, collaboration and interaction, and facilities and infrastructure. Conceptual understanding is the main focus in ensuring students can understand the material well, while the use of technology and learning and the effectiveness of digital media are determinants of success in implementing

digital learning methods. In addition, collaboration and interaction between students and teachers are important factors in the learning process, supported by adequate facilities and infrastructure to support learning activities effectively. The general results of the research conducted by the researcher will be presented as follows:

**Table 3. Student Needs Analysis Results**

| Aspect | Strongly Agree | Agree | Somewhat Agree | Disagree |
|---|---|---|---|---|
| Conceptual Understanding | 59% | 41% | 0% | 0% |
| Digital Media Needs | 49% | 48% | 1% | 2% |
| Clarity & Ease of Presentation | 55% | 45% | 0% | 0% |
| Media Display & Design | 64% | 34% | 2% | 0% |
| Learning Motivation | 55% | 45% | 0% | 0% |
| Evaluation & Assessment | 40% | 60% | 0% | 0% |

The questionnaire results showed that 59% of students strongly agreed with the relevance of concepts to everyday life, while 41% of students agreed. These results indicate that the majority of students feel the importance of relating concepts to everyday life to help them understand learning concepts more easily. This finding aligns with the fundamental principle of PMRI, which emphasizes the use of realistic contexts as starting points for mathematics learning (Freudenthal, 1991). According to constructivist learning theory, students build understanding by connecting new information with their existing knowledge schemas, and real-world contexts serve as powerful anchors for this cognitive process (Piaget, 1970).

Research by Van den Heuvel-Panhuizen and Drijvers (2020) demonstrates that contextual learning in mathematics significantly improves both conceptual understanding and retention rates among elementary students. Furthermore, contextualization reduces cognitive load by providing familiar reference points that help students navigate abstract mathematical concepts (Sweller et al., 2019). Arranging information logically allows students to connect new information with prior knowledge, thereby improving their memory and understanding. This is highly relevant, especially in the context of religious education, which often involves abstract and complex concepts. In addition, relating concepts to everyday life can also reduce student confusion, increase their confidence in learning, and help them follow the learning process better. Thus, the development of PMRI-based E-LKPD learning media to meet this need is expected to facilitate a more effective and engaging learning process.

**Aspects of Digital Learning Media Needs**

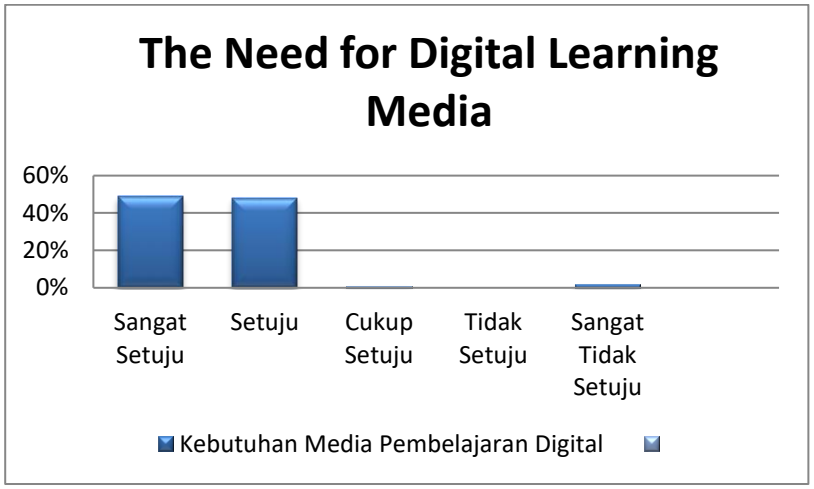


**Figure 1.** Graph of Digital Learning Media Needs

Based on the chart above, students' need for digital learning media in developing E-LKPD on fractions using the PMRI approach in elementary schools is very high. As many as 49% of students stated that they strongly agree, and 48% stated that they agree with the importance of digital learning media. Only 1% of students' sufficient education agree, and 2% disagree agree. These findings are consistent with contemporary research on digital natives and their learning preferences. Students in the 21st century, often referred to as Generation Z, have grown up immersed in digital technologies and demonstrate strong preferences for technology-enhanced learning environments (Prensky, 2001; Seemiller & Grace, 2019). The high acceptance rate (97% combined for strongly agree and agree) reflects not only familiarity with digital tools but also recognition of their potential to enhance learning experiences.

Research by Hillman and Marsden (2023) indicates that digital learning materials can accommodate diverse learning styles more effectively than traditional printed materials through multimedia integration, interactive elements, and adaptive features. Moreover, the TPACK framework (Technological Pedagogical Content Knowledge) suggests that successful integration of technology in education requires alignment among technological affordances, pedagogical approaches, and content knowledge (Koehler & Mishra, 2009), which the PMRI-based E-LKPD aims to achieve. This result shows that majority participant educates look at use of digital learning media as essential needs for support the learning process they. Their height the percentages in the "strongly agree " and " agree " categories indicate that participant educate feel digital media can help they in understand draft fractions in a way more interesting, contextual, and appropriate with style Study This is in line with the characteristics of the PMRI approach which emphasizes the use of real contexts in learning.

**Aspects of the Need for Clarity and Ease of Presentation**


**Figure 2.** Graph of the Need for Clarity and Ease of Presentation

Based on the chart above, it can be seen that students' need for clarity and ease of presentation in developing E-LKPD for fractions is very high. Fifty-five percent of students stated they strongly agree, and 45% stated they agree. No students chose the category of somewhat agree or disagree.

These results indicate that the majority of students consider clear and easy-to-understand presentation of material essential to support their understanding of fraction concepts. Systematic and communicative presentation will help students connect the concepts learned to their experiences, in accordance with the principles of horizontal and vertical mathematization in the PMRI approach.

Thus, in developing E-LKPD, it is necessary to pay attention to the aspects of clarity and ease of presentation so that the learning process becomes more effective, interesting, and able to motivate students to learn actively.

**Aspects of Media Display and Design Needs**

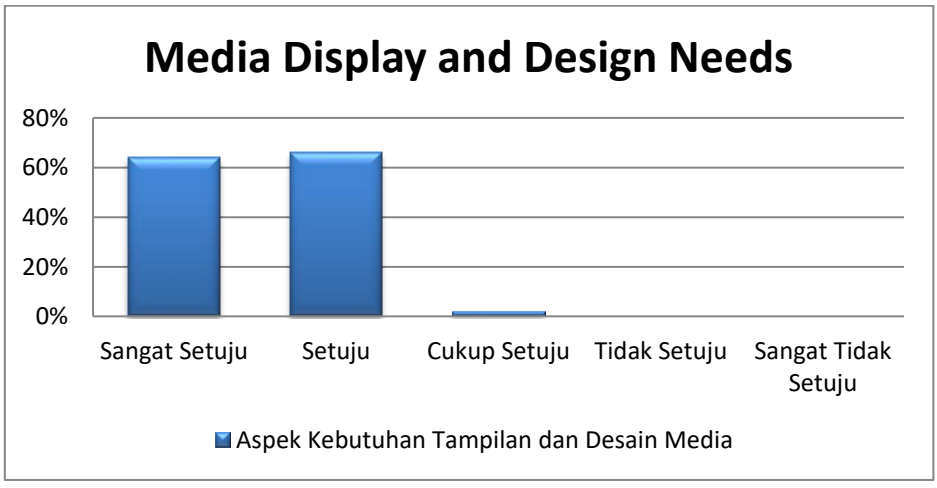


**Figure 3.** Graphic of Media Display and Design Requirements Aspects

Based on the data in the chart above, it is known that the majority of students have a high level of interest in the appearance and design of learning media. This is indicated by the very high percentage results, namely 64% of respondents stated strongly agree and 66% stated agree that the appearance and design of media play an important role in supporting their learning process. Meanwhile, only 2%

answered somewhat agree, and no respondents stated disagree or strongly disagree. These results indicate that students need learning media that is not only functional, but also visually appealing. Aesthetic design, appropriate use of color, clear layout, and graphic elements that support the content of the material are very necessary to increase student interest and concentration in learning. Therefore, in developing E-LKPD with the PMRI approach on fractions, it is important to pay attention to visual and design aspects so that the resulting media can provide a more enjoyable and effective learning experience for students.

**Media Aspects of Learning Motivation Needs**


**Figure 4.** Graph of Learning Motivation Needs Aspects

Based on the chart above, it can be seen that the majority of students feel the need for learning media that can increase their learning motivation. As many as 55% of students stated that they strongly agree, while 45% stated that they agree with the importance of the motivational aspect in learning. This data shows that the development of E-LKPD for fractions using the PMRI approach needs to pay attention to elements that can stimulate students' learning enthusiasm, such as interesting presentation of the material, the use of contextual illustrations, and the insertion of challenging and fun activities. This high need for learning motivation also indicates that students are more enthusiastic in participating in learning if the media used is able to connect the material with their real experiences and provide challenges that are appropriate to their ability level. Thus, the development of E-LKPD based on PMRI must be designed not only informative, but also inspiring to maintain and increase students' learning motivation.

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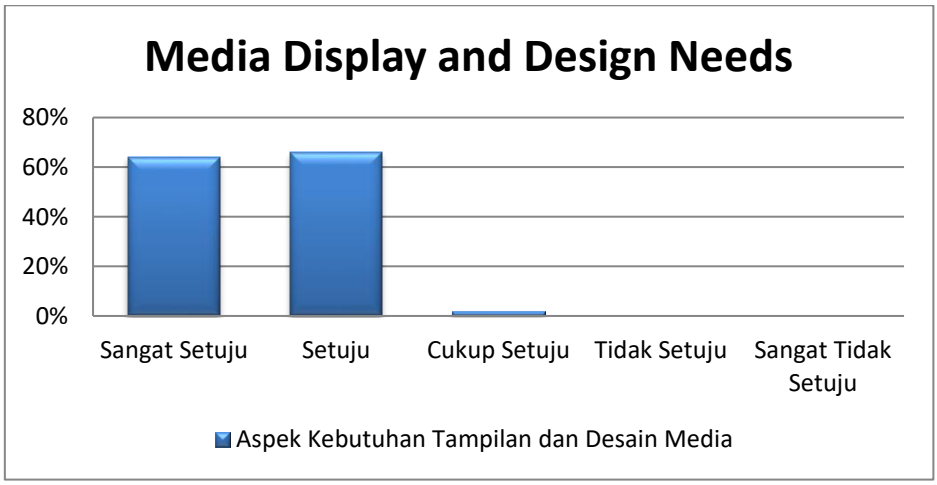


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**Aspects of Needs for Evaluation and Measurement of Understanding**

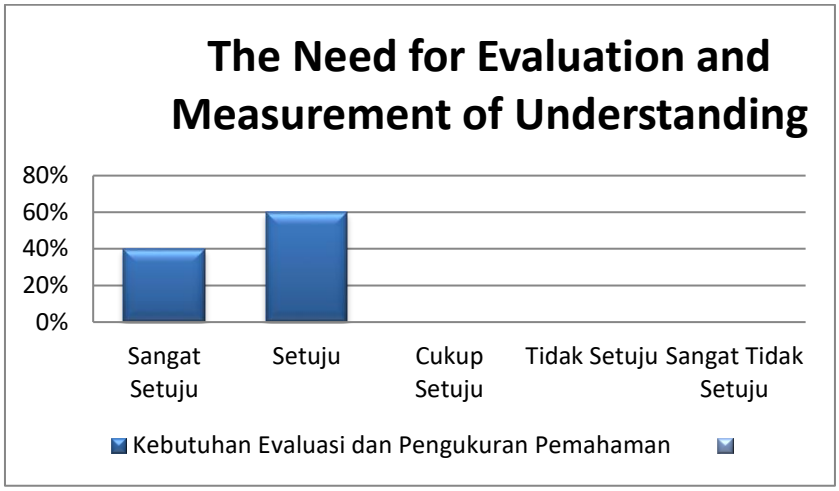


**Figure 5.** Graph of Evaluation Needs Aspects and Understanding Measurement

Based on the chart above, it can be seen that the need for evaluation and measurement of student understanding has received significant attention. As many as 40% of students stated that they strongly agreed and 60% stated that evaluation and measurement of understanding need to be considered in learning media. This data indicates that students need media that not only presents material but also provides evaluation features to measure their level of understanding. In the development of PMRI-based E-LKPD, this aspect is very important so that students can evaluate how well they understand the fraction concepts taught and can independently identify their shortcomings. Interactive and relevant evaluation can also help teachers monitor student learning progress. Thus, the development of E-LKPD needs to include a systematic and engaging evaluation component to support the success of fraction learning at the elementary school level.

**Analysis Results Needs of Educators (Teachers)**

The needs analysis for educators was conducted through the distribution of questionnaires to four third-grade teachers from SDN 1, SDN 2, SDN 3, and SDN 4 Air Balui, Musi Banyuasin Regency. The purpose of the questionnaire distribution was to identify teachers' needs, readiness, and perceptions regarding the development of an E-LKPD (Electronic Student Worksheet) on fraction materials using the PMRI (Indonesian Realistic Mathematics Education) approach. The following diagram presents a summary of the questionnaire results, showing the number of teachers across the four schools who responded "Yes" to each statement. This diagram highlights the aspects most needed and prioritized by teachers in developing PMRI-based E-LKPD for fraction lessons.

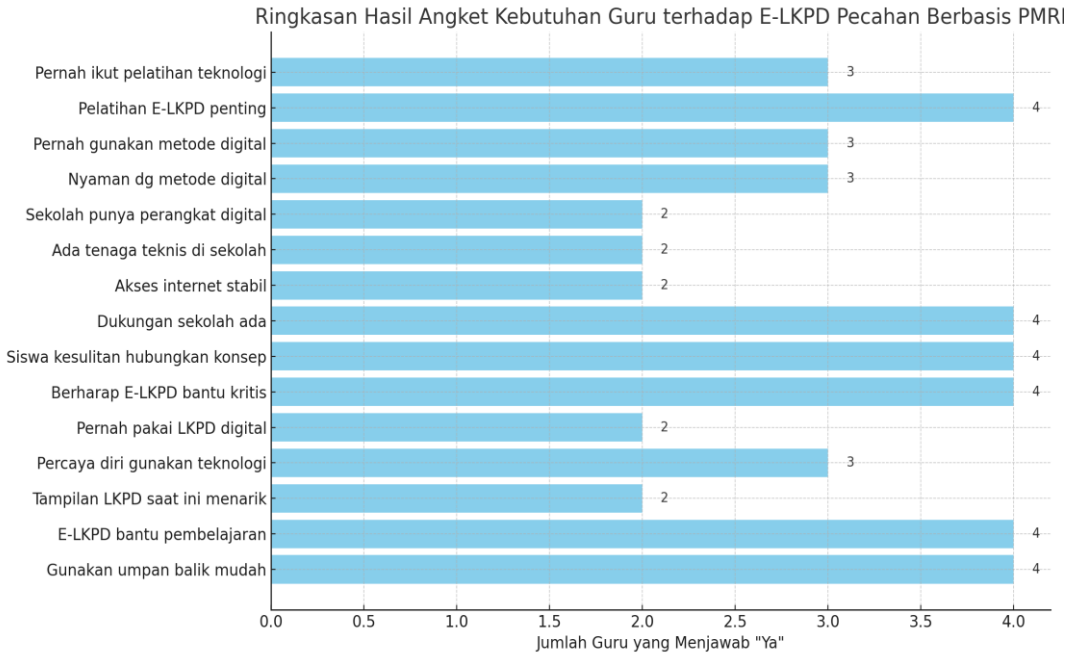


**Figure 6.** Summary of Questionnaire Results Teacher Needs

The teacher needs analysis reveals several critical insights regarding readiness and requirements for PMRI-based E-LKPD implementation. First, the unanimous recognition (100%) of the importance of digital training, the potential of E-LKPD to develop critical thinking, and students' difficulty connecting abstract concepts to daily life demonstrates teachers' awareness of both challenges and opportunities in fraction teaching. This awareness is consistent with research by Beswick and Goos (2012) on teacher beliefs and technology integration, which identifies recognition of student needs and pedagogical benefits as prerequisite conditions for successful technology adoption. Second, the modest comfort level with digital methods (50%) despite relatively higher technical access (75% device support and internet access) suggests that infrastructure alone is insufficient—professional development and ongoing support are essential for effective implementation. This aligns with findings from Ertmer and Ottenbreit-Leftwich (2010) regarding the distinction between first-order barriers (external constraints) and second-order barriers (internal beliefs and competencies) in technology integration. Third, the limited previous experience with digital LKPD (25%) indicates that PMRI-based E-LKPD development represents a significant innovation in this context, requiring careful attention to teacher preparation, support materials, and implementation guidance. Research on teacher change processes (Clarke & Hollingsworth, 2002) emphasizes the importance of addressing multiple domains—external support, personal beliefs, classroom practice, and student outcomes—to facilitate sustainable pedagogical innovation.

## CONCLUSION

This needs analysis study provides comprehensive evidence regarding the requirements for developing PMRI-based E-LKPD for fraction learning in elementary schools. From the student perspective, findings demonstrate unanimous support for key design principles: contextual relevance (100% agreement on connecting concepts to daily life), digital format

preference (97% agreement on digital media needs), presentation clarity (100% agreement on clear organization), aesthetic appeal (98% agreement on attractive design), motivational elements (100% agreement on engagement features), and embedded assessment (100% agreement on evaluation components). These preferences strongly align with PMRI pedagogical principles and contemporary understanding of effective digital learning design. From the teacher perspective, while there is universal recognition of the value of PMRI-based E-LKPD for addressing student learning challenges, the analysis reveals variability in technological readiness and previous experience, highlighting the need for comprehensive support structures including professional development, technical assistance, and pedagogical guidance. The findings underscore that effective E-LKPD development must address not only product design but also implementation conditions and teacher capacity building. Future research should proceed to the subsequent ADDIE phases to develop, validate, and evaluate the actual E-LKPD product, examining its effectiveness in improving students' conceptual understanding and creative mathematical thinking. Additionally, longitudinal studies examining sustained implementation and teacher development over time would provide valuable insights into scalability and sustainability of PMRI-based E-LKPD in diverse educational contexts.

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