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Analysis of The Need for Development of Fractions and Decimals Assessment Instruments Based on Wordwall for Upper Primary School Students

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Abstract

Upper-grade primary school students are required to master fractions and decimals as foundational knowledge for higher-level mathematics. Despite their importance, traditional assessment instruments often fail to capture students' conceptual understanding and real-world application skills in this topic. This study aims to explore the necessity of developing an interactive assessment instrument based on Wordwall to evaluate students' comprehension of fractions and decimals in alignment with the Merdeka Curriculum and the cognitive characteristics of Phase C learners. A descriptive qualitative approach was employed, involving eight grade 5 and 6 teachers from Ciputih Village, Salem District, Brebes Regency, selected through purposive sampling. Data were gathered using questionnaires, semi-structured interviews, and curriculum document analysis, then analyzed using Miles, Huberman, and Saldaña's interactive model. The results revealed a strong need for assessment tools that are not only engaging and student-centered but also capable of measuring higher-order mathematical thinking. Teachers emphasized the relevance of digital game-based platforms like Wordwall in improving student motivation, facilitating contextual learning, and supporting meaningful assessment practices. These findings underscore the importance of developing reliable and enjoyable digital assessment instruments for fractions and decimals, supported by clear implementation guidelines and technopedagogical training for educators..

Keywords: *fractions, decimals, digital assessment, wordwall, interactive learning, merdeka curriculum*

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INTRODUCTION

Fractions and decimals are essential mathematical concepts for upper primary students, forming the basis for advanced mathematical operations such as ratio, percentage, and proportional reasoning in secondary school. According to Bruner's (1966) cognitive development theory, learners transition from enactive to iconic and then symbolic stages, which implies that abstract mathematical ideas like fractions and decimals must still be grounded in concrete and contextual experiences[1, p. 446]. In the Merdeka Curriculum Phase C, students in grades 5 and 6 are expected to "represent, compare, and operate fractions and decimals in contextual problems"[2, p. 42]. Thus, a strong conceptual understanding of these topics is critical to achieving mathematical literacy and problem-solving competence at this level.

Research has shown that students often face persistent misconceptions about fractions and decimals due to overly procedural teaching and the lack of conceptual engagement. Traditional instruction tends to emphasize algorithmic manipulation (e.g., finding common denominators) without ensuring that students fully understand the meaning behind these operations [3]. These misconceptions can hinder future success in mathematics, especially when students are required to integrate knowledge across topics. As a result, building robust and meaningful understanding of fractions and decimals in the upper grades is not only necessary but urgent.

Despite the growing recognition of the importance of conceptual understanding, many existing assessment tools still focus on procedural fluency and correct answers rather than on reasoning or contextual application. According to Kaiser et al. (2018), as cited in [4, p. 556] assessments that emphasize only calculation "fail to capture deeper mathematical understanding and students' ability to reason." Multiple-choice tests often lead to speculative answers and do not reflect true mastery. In [5, p. 49] also emphasize that such objective tests can "fail to prevent guessing," compromising the validity of results. Furthermore, traditional assessments such as observation checklists or student worksheets are often inconsistent and susceptible to subjectivity [6, p. 2]. Therefore, more authentic, engaging, and context-rich assessment tools are urgently needed, particularly for abstract yet essential topics like fractions and decimals.

Digital game-based assessment is emerging as a promising alternative to address these challenges. Platforms like Wordwall offer a variety of customizable, interactive games that can serve as both learning tools and formative assessments [7, p. 487]. According to research, interactive digital tools can support students in bridging abstract mathematical concepts with real-life applications [8, p. 10]. Furthermore, educational games are shown to enhance motivation, retention, and learner autonomy. Research conducted by [9] found that Wordwall can "stimulate students' enthusiasm and memory" while providing a creative space for learning and assessment.

However, most existing studies on Wordwall emphasize its use for vocabulary building or general motivation, with limited focus on developing valid and reliable instruments for mathematical assessment—especially for complex topics like fractions and decimals. There remains a gap in the development of assessment instruments specifically designed to measure conceptual understanding of fractions and decimals using a game-based digital platform like Wordwall.

Therefore, this study aims to analyze the need for developing a Wordwall-based assessment tool to evaluate students' understanding of fractions and decimals in grade 5 and 6, in alignment with the Merdeka Curriculum and the pedagogical principles of meaningful, contextual learning. The results of this needs analysis are expected to provide a strong foundation for the design of practical, effective, and student-friendly digital assessment instruments for upper primary mathematics.

RESEARCH METHOD

This research adopted a descriptive qualitative approach to explore the need for developing digital assessment instruments focused on fractions and

decimals for upper primary school students. The choice of this method was grounded in its ability to provide rich, in-depth descriptions of educational phenomena, particularly in understanding teachers' perspectives regarding assessment practices. Descriptive qualitative research is especially suitable for identifying user needs in the development of educational tools, as it allows researchers to examine contextual and subjective experiences [10]. In instructional design, this preliminary investigation is often referred to as a front-end analysis, which is essential to ensure that learning instruments meet curricular demands and user expectations [11, p. 38].

The participants of this study consisted of eight elementary school teachers teaching mathematics to grades 5 and 6 in Ciputih Village, Salem Sub-district, Brebes Regency. These participants were selected using purposive sampling, based on the criteria of having direct experience in teaching upper-grade students and being involved in the assessment of students' understanding of fractions and decimals. As noted by [12], purposive sampling is effective when researchers need to obtain insights from informants who are most knowledgeable and experienced regarding the issues under investigation.

Data collection was carried out through three complementary techniques to ensure triangulation and increase the credibility of the findings. First, a needs questionnaire was distributed to all participating teachers to identify which aspects of assessment for fractions and decimals were still lacking in their current classroom practices. Second, semi-structured interviews were conducted to gain deeper insights into the teachers' perceptions of the relevance, practicality, and feasibility of using digital game-based tools—specifically Wordwall—for assessing mathematical concepts. Third, a document analysis was performed by reviewing the Merdeka Curriculum documents relevant to Phase C, especially those related to the learning outcomes, indicators, and content standards on fractions and decimals. This step was essential to ensure that the development of the assessment tool would be aligned with national curricular goals [13].

The data obtained from the questionnaires, interviews, and documents were analyzed using the interactive model of Miles, Huberman, and Saldaña (2019). This analysis consisted of three stages: data reduction, categorization, and interpretation. During data reduction, irrelevant or redundant information was filtered out, allowing the researchers to focus only on data that directly addressed the research objectives. The remaining data were then organized into thematic categories, such as the need for engaging assessment tools, current challenges in evaluating fractions and decimals, and expectations toward digital platforms like Wordwall. In the interpretation phase, all findings were synthesized with reference to both empirical evidence and theoretical frameworks, providing a coherent foundation for the proposed design of the assessment instrument.

Throughout the analytical process, the researchers employed methodological triangulation and reflective interpretation to ensure the validity and trustworthiness of the study. By integrating insights from field data and pedagogical theory, the research aimed to construct a solid knowledge base for the development of a Wordwall-based digital assessment instrument. This tool is envisioned to support the meaningful evaluation of fraction and decimal understanding among

upper primary students, while aligning with the principles of the Merdeka Curriculum and the cognitive characteristics of Phase C learners.

RESEARCH RESULTS AND DISCUSSION

The results of the teacher needs analysis showed that most upper-grade elementary teachers expressed a strong desire for interactive assessment media using Wordwall, particularly for teaching fractions and decimals. Out of eight participating teachers, two (25%) assessed the need for interactive media at a "Very High" level, four (50%) at a "High" level, and two (25%) at a "Moderate" level. None of the respondents indicated a low or very low need. This illustrates a significant perception among teachers regarding the necessity of more innovative and enjoyable approaches to assessing students' understanding of mathematical concepts at the upper primary level.

Table 1: Media Interactivity Requirements (Wordwall) Based on the Teachers

Category	Frequency	Percentage (%)
Very high	2	25.0
High	4	50.0
Moderate	2	25.0
Low	0	0.0
Very low	0	0.0
Total	8	100%

The data in Table 1 supports the notion that upper primary school educators believe digital game-based tools like Wordwall have great potential for assessing complex topics such as fractions and decimals. During interviews, several teachers acknowledged that their current assessment methods—such as paper-based written tests and observational scoring—were insufficient for evaluating conceptual understanding. One teacher stated, *"Students can often compute fractions correctly, but they do not always understand why a result is larger or smaller. We need tools that help us assess that."* Another added, *"Wordwall is promising because it turns assessments into games. It keeps students interested and motivated, especially with abstract topics like decimals."*

However, teachers also acknowledged several challenges. The most commonly cited obstacles included limited access to devices, unstable internet connections, and a lack of training in using digital learning tools. Despite these constraints, educators viewed these barriers as manageable with appropriate support. One teacher expressed, *"If we had a simple guide and some practice, I believe Wordwall could be easily integrated into our assessments."* This aligns with the findings of Pebriana and Rosidah (2025, p. 143), who noted that digital literacy and infrastructure play a critical role in determining the successful adoption of technology in classroom settings.

These findings are in line with the literature emphasizing the effectiveness of game-based learning in mathematics education. According to Mahmud Muhammad Sofwan (2023), digital platforms such as Wordwall can support students in transitioning from procedural to conceptual understanding by offering interactive and visual experiences. This is particularly useful for abstract

topics like equivalent fractions, decimal place value, and fraction-decimal conversion, which are commonly misunderstood by students in upper primary levels. Games that involve matching equivalent values, ordering numbers, or solving story-based problems provide a more engaging alternative to traditional multiple-choice tests.

Moreover, the Merdeka Curriculum itself supports the use of innovative and contextual learning tools. As noted by[14, p. 23930], students are expected to learn mathematics through real-world problems, active participation, and the integration of technology. Wordwall aligns with these principles by enabling contextualized, student-centered assessment experiences. Additionally, the constructivist framework underpins this approach, wherein students actively build understanding through exploration and interaction, ideally suited to the dynamic format of Wordwall games.

Based on the interview and questionnaire data, three major themes emerged:

1. Teachers' need for engaging, valid assessments for fractions and decimals.
2. Positive perception of Wordwall's potential as both a learning and assessment tool.
3. Existing technical limitations that require structured training and support systems.

These results suggest that Wordwall-based assessment instruments should be designed with interactive features, contextualized mathematical content, and alignment with curriculum standards. The instrument should also include practical user manuals and be supported with training workshops to ensure sustainability. This is consistent with the findings of [15], who emphasized that effective digital tools require not only innovative design but also proper teacher preparation and curriculum integration.

CONCLUSION

The results of this study conducted in Ciputih Village, Salem Subdistrict, Brebes Regency, reveal a significant need among grade 5 and 6 elementary school teachers for the development of interactive digital assessment instruments to evaluate students' understanding of fractions and decimals. Most teachers perceived traditional assessment tools as inadequate for capturing the depth of students' conceptual knowledge and contextual problem-solving abilities in these mathematical topics. They emphasized the importance of assessment methods that are not only accurate and relevant but also engaging and aligned with students' cognitive development in Phase C.

Wordwall emerged as a promising digital platform to fulfill these needs. Teachers responded positively to its interactive, game-based format, highlighting its potential to increase student motivation, participation, and retention of mathematical concepts. Despite facing challenges such as limited devices, internet connectivity, and digital literacy, educators expressed willingness to adopt such tools, provided that proper training and implementation support are available. These findings indicate that the integration of Wordwall into assessment practices aligns well with the principles of the Merdeka Curriculum, which emphasizes contextualized, student-centered, and meaningful learning experiences.

Therefore, this research supports the urgent recommendation to design and develop a Wordwall-based assessment instrument specifically tailored to fractions and decimals for upper primary school students. The tool should incorporate engaging game elements, real-world contexts, and a user-friendly interface supported by clear implementation guidelines. Teacher training in technopedagogy is also essential to maximize the effective and sustainable use of such digital instruments in classroom assessment.

For future studies, it is recommended that the development of this tool proceed through systematic stages, including validity and reliability testing, as well as limited-scale trials to gather initial feedback from users. Additionally, further research should examine the impact of Wordwall-based assessment on students' learning outcomes, conceptual understanding, and motivation in mathematics. Such studies will enrich both the theoretical and empirical foundations of digital assessment practices in elementary education and support innovation in the evaluation of mathematical literacy among Indonesian students.

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