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The Use of Smart Board Media and Number Windmill to Improve Students' Understanding of Addition Concepts in Madrasah Ibtidaiyah

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Abstract:
This study aims to improve the understanding of addition concepts among Madrasah Ibtidaiyah students through the use of innovative learning media in the form of a smart board and number windmill. The main issue identified at MI Bustanul Ulum 06 Gumukmas is the low arithmetic ability of students, particularly in grasping basic addition concepts. This research employs a qualitative approach using the Research and Development (R&D) method, referring to the ADDIE development model, which includes five stages: analysis, design, development, implementation, and evaluation. The media is designed to incorporate visual, auditory, and kinesthetic elements to stimulate the learning interest of students aged 7–10 years. Based on trial results, the media was found to be highly feasible, with an eligibility score of 94%. The use of this media effectively increased students' enthusiasm and active participation in learning and facilitated a better understanding of addition through a fun and concrete approach. Therefore, the use of the smart board and number windmill is effective in supporting the learning process of mathematics at the Madrasah Ibtidaiyah level.
Keywords: *Smart Board, Windmill, Addition, Madrasah Ibtidaiyah*

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INTRODUCTION

Education serves as the fundamental foundation for building civilization and advancing a nation, where every individual has the right to access education as a conscious and structured process aimed at developing potential, instilling cultural values, and preparing future generations to face the challenges of life (Yumriani, 2022). In the context of formal education, elementary school plays a strategic role in introducing basic scientific concepts, including numeracy skills, which serve as the foundation for learning mathematics.

However, in practice, the learning process at the elementary level continues to face various challenges. One such example is Madrasah Ibtidaiyah Bustanul Ulum 06 Gumukmas, where observational data shows that many students

experience difficulties with counting and are unable to fully grasp number symbols and sequences. One contributing factor is the limited use of learning media, where teachers primarily rely on number cards focused on recognizing numbers from 1 to 20. These tools fail to provide students with a concrete understanding of addition and the relationships between numbers, resulting in passive learning and a lack of student engagement.

This issue highlights the urgent need for more interactive and developmentally appropriate instructional media, particularly those that align with the cognitive stages of young learners. One such solution is the use of smart boards and number wheel games, which are designed as educational tools to foster active engagement in counting, develop motor skills, and strengthen number concept understanding in an enjoyable and meaningful way (Siswondo & Agustina, 2021).

A study by (Cornelia, 2024) demonstrated that the number wheel is effective in improving elementary students' cognitive skills in recognizing number names and symbols, while also increasing learning motivation through a play-based approach. However, the study did not integrate the use of two media simultaneously, nor did it emphasize the introduction of number symbols as a foundational aspect of early mathematics education.

Therefore, this research presents a novel approach by developing and implementing the smart board and number wheel media simultaneously in the learning process at the madrasah ibtidaiyah. The aim is to explore how these media are prepared, implemented, and followed up to improve students' understanding of addition concepts, as part of an effort to create learning that is meaningful, contextual, and enjoyable in accordance with the characteristics of elementary-age learners.

Based on the observations and research rationale outlined above, the objectives of this study are as follows:To examine the preparation process for utilizing the smart board and number wheel media in helping madrasah ibtidaiyah students understand addition concepts, To explore the implementation of these media in enhancing students' understanding of addition,To analyze the follow-up actions related to the use of smart board and number wheel media in supporting students' mastery of basic addition concepts.

METHOD

This study is a Research and Development (R&D) project aimed at producing instructional media in the form of a smart board and number wheel to enhance students' understanding of addition concepts at the Madrasah Ibtidaiyah level. The development model used is ADDIE, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation.The Analysis stage was carried out through observations and interviews with Grade I and II teachers to

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identify instructional problems. The Design stage involved planning the content of the media, visual design, and assessment instruments. During the Development stage, the media were validated by subject matter experts, media experts, and classroom teachers, then revised and pilot-tested on a small scale. The Implementation stage involved integrating the developed media into actual classroom instruction. Finally, the Evaluation stage assessed student learning outcomes and collected student feedback.

The research subjects consisted of 20 first- and second-grade students at MI Bustanul Ulum 06 Gumukmas, selected purposively based on their limited numeracy skills. The research objectives were the instructional media and students' mathematics learning outcomes. The instruments used in this study included: Expert validation questionnaires, Observation sheets, Learning outcome tests (pretest and posttest), and Student response questionnaires. The expert validation questionnaire employed a 4-point Likert scale, while the learning outcome test consisted of 15 items. The validity of the instruments was evaluated through expert judgment, and the reliability was tested using Cronbach's Alpha, yielding a reliability coefficient of 0.84. The collected data were analyzed using descriptive analysis techniques.

RESULTS AND DISCUSSION

The development of the Smart Board and Number Wheel instructional media was carried out using the ADDIE model, with the following stages:

Analysis

The analysis stage was conducted by identifying the learning difficulties experienced by students in order to determine their level of understanding and skills, particularly in basic arithmetic. This analysis aimed to uncover the root of the problem and to formulate appropriate solutions, such as addressing difficulties in number recognition and performing simple addition. Engaging teaching methods heavily depend on the selection and use of appropriate instructional media (Siregar, Karim, & Siregar, 2024). Various issues were identified, one of which was students' struggle in recognizing numbers and performing addition operations. This was likely due to the lack of teacher skills in designing engaging learning activities, which caused the learning process to become monotonous. As a result, students became easily bored, disinterested in learning, and reluctant to pay attention to the material being presented.

Design

The next step in the ADDIE model is the design phase. In this study, the design phase focused not only on the layout and visual elements of the media but also on the instructional content itself. As stated by (Geme, Dhiu, & Ita, 2024), the design stage encompasses the entire development process of educational game

tools. The initial step in the design stage involved preparing instructional materials centered on addition within the number range of 1–20. This included outlining learning objectives, defining expected learning outcomes, and developing content tailored to the developmental characteristics of lower-grade madrasah Ibtidaiyah students. Once the content was finalized, the researcher moved on to designing the Number Wheel and Smart Board media as tools to help enhance students' understanding of addition concepts. The Number Wheel was designed as a rotating game featuring numbers from 1 to 20, intended to make counting activities fun and engaging. The Smart Board was constructed using simple yet attractive materials such as styrofoam, transparent plastic sheets (mica), colorful character stickers, large markers, cutting tools, and glue. The styrofoam was shaped into a board and covered with plastic mica for durability. The surface was decorated with eye-catching stickers to attract students' attention. Large numbers were written using bold markers to make them easily visible and legible. The visually appealing and easy-to-use design of both media was intended to boost student engagement and motivation while reinforcing their understanding of basic addition through a play-based learning approach. The Number Wheel was made from: Cardboard, Number images, Popsicle sticks, Stickers, and necessary stationery items. The steps included cutting the cardboard into two triangular pieces to form a stand, creating smaller circular cardboard pieces to attach numbers 1–10 on popsicle sticks, and finally assembling a larger rotating circle that was decorated with additional stickers or pictures for added visual appeal.

The design of the Smart Board and Number Wheel instructional media is illustrated as follows:

Figure 1. Smart Board Media

Figure 2. Number Wheel Media (Initial Stage)

Figure 3. Number Wheel Media (Final Stage)

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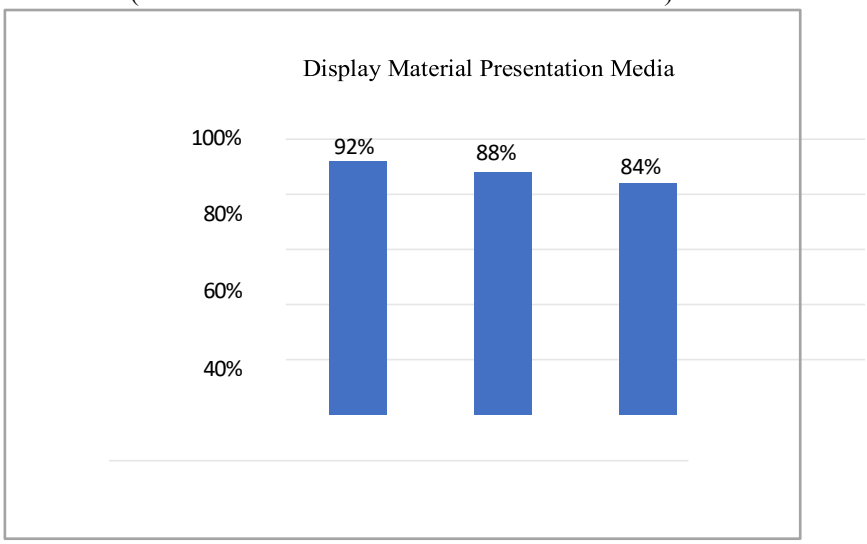
Development

At the development stage, the Smart Board and Number Wheel media were produced based on the designs that had been previously created. These media were then subjected to validation by media experts and content experts, followed by revisions according to the feedback and suggestions from both validators.As stated by (Supardi & Gumilar, 2022), the purpose of media validation is to measure the validity of the developed media before use in actual instruction, while content validation aims to evaluate the accuracy and appropriateness of the subject matter included in the instructional media.

a. Media Expert Validation

Media expert validation was conducted to assess the validity level of the Smart Board and Number Wheel learning tools. These media products were reviewed by a university media expert. The results of this evaluation are shown in Table 1 below.

Table 1. Media Expert Validation Results
(Table content should be inserted here if available)



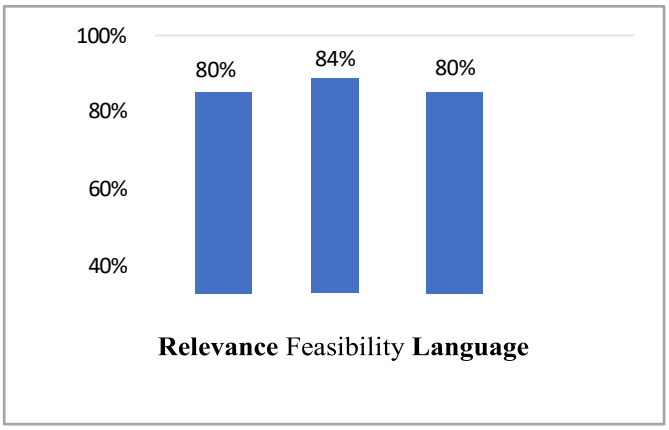
Based on Table 1, it can be seen that the appearance aspect received the highest percentage, at 94%, falling into the "very valid" category. The media presentation aspect earned 88%, while the material aspect scored 84%, both of which also fall within the "very valid" category. Overall, the average validation score from the media expert was 88%, indicating that the developed learning media are highly suitable for use in classroom settings.However, despite being categorized as "very valid," the validator offered some suggestions for improvement, such as:Making the numbers on the board more colorful and with greater contrast to make them easier for young learners to distinguish,Adding visual decorations such as cute icons or supporting illustrations to enhance visual appeal and help clarify the meaning of the numbers for early-grade students.These suggestions were then

used as the basis for revising the product before its implementation in the student trial phase.

b. Content **Expert** Validation

Content expert validation was conducted to evaluate the validity of the subject matter presented in the Smart Board and Number Wheel media. The materials included in both learning tools were reviewed by a subject matter expert (university-level mathematics education lecturer). The results of the content expert's assessment are presented in Table 2.

Table 2. Graph of Content Expert Validation Results



Based on Figure 2, it can be seen that the assessment by the content expert validator shows the following results: The relevance of the content received a score of 80%, categorized as valid, the appropriateness of the material scored 84%, categorized as very valid, the language aspect received 80%, also categorized as valid. From these three aspects, an average percentage score of 82.8% was obtained, placing the overall content validation in the "very valid" category. According to the content expert's evaluation, the instructional materials are highly valid for use but require minor revisions based on the expert's suggestions—specifically, to include sources for the images used in the Number Wheel media.

Implementation

At this stage, the Smart Board and Number Wheel Media developed by the researcher were implemented with the students. The implementation was carried out through a trial in two different classes, namely Grade 1 and Grade 2, conducted alternately.Based on the results of the trial in both classes, the following outcomes were obtained:

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Table 3. Results of Classroom Trial

NO	Statement	Response			
		Agree		Disagree	
		Number	Percentege	Number	Percentage
1	I enjoy learning mathematics using the smart board.	36	100%		
2	The number windmill makes addition lessons more enjoyable.	36	100%		
3	I find it easier to understand addition using aids like the smart board.	36	100%		
4	Playing with the number windmill helps me count faster.	32	88,89%	4	11,11%
5	I feel more enthusiastic about learning when the teacher uses instructional media.	36	100%		
6	I find it difficult to use the smart board while learning.	28	77,78%	4	19,44%
7	I understand addition better when it's explained without media.	28	77,78%	7	19,44%
8	I want the teacher to use the smart board and number windmill more often.	36	100%		
9	Learning activities using media make me bored easily	33	91,67%	3	8,33%
10	I enjoy learning through play, such as using the number windmill.	36	100%		
	Average	**33,7**	**94%**	**4,5**	**6%**
	Criteria	**Highly Appropriate**			

Based on the percentage result above 94%, the media falls into the "very feasible" category according to the assessment criteria, which are as follows: 0–52%: not feasible 53%–68%: less feasible 69%–84%: feasible 85%–100%: very feasible.

In addition, 100% of students stated that the Smart Board and Number Wheel media were attractive and motivating, making them more excited to learn mathematics. Students felt that both tools helped them understand the concept of addition and number symbols more easily. Based on the percentage scores from the APE (instructional media) trial of the Smart Board and Number Wheel, it can be concluded that these tools are highly suitable for implementation to enhance early addition skills in young learners.

Evaluation

The purpose of this evaluation stage is to ensure that the Number Wheel Media is aligned with the original vision. This evaluation serves as a means of providing feedback and assessment, which allows for improvement and refinement based on users' experiences with the media or methods applied.

Product Trial

The product trial in this study was a critical step to determine the effectiveness, efficiency, and appeal of the developed learning media namely the Smart Board and Number Wheel. The trial was carried out in two main phases: Expert validation, and Limited implementation involving Grade 1 and Grade 2 students at Madrasah Ibtidaiyah Bustanul Ulum 06 Gumukmas. This process aimed to assess how well the media were accepted and how significantly they influenced students' understanding of addition concepts. Prior to the use of the media, initial classroom observations showed that many students struggled to understand addition, particularly with numbers above 10. Students tended to memorize answers rather than understand the process and were often bored when learning was conducted through traditional methods such as lectures or written exercises. These conditions confirmed the urgent need for visually engaging and contextual interactive media to enhance student participation and comprehension. The instructional media tested included: A Smart Board made of styrofoam, covered with mica plastic, and decorated with colorful stickers and images. Students used colorful markers to write down addition results directly on the board. A Number Wheel, which functioned as a spinning game tool displaying numbers from 1 to 20, allowing students to practice addition interactively. Both tools were designed to help students grasp number concepts through fun, concrete learning experiences. The trial results showed that the media had a positive impact on the teaching and learning process. There was a significant improvement in students' understanding of addition after using the media. Students became: More familiar with number symbols, better at understanding the meaning of addition, and more independent in solving problems. Additionally, students appeared more enthusiastic, active, and focused during learning, as the media used were visual, engaging, and well-suited to their developmental stage (Harpini, 2024).

However, several obstacles were encountered during the trial, such as students with underdeveloped motor coordination who required assistance when using the media particularly in spinning the number wheel or attaching numbers to the board. Despite these challenges, the overall student response to the media was very positive. They expressed greater enjoyment in learning through this media compared to previous, more monotonous teaching methods. The media also succeeded in fostering a collaborative and communicative learning environment between teachers and students. Post-implementation evaluation indicated that the Smart Board and Number Wheel learning media fall into the very valid and feasible category. Nonetheless, suggestions from media experts were still accommodated such as enhancing the contrast of number colors and adding visual elements to attract students' attention. Based on these results, it can be concluded that the product trial ran successfully and supports the effectiveness of the media as a

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learning aid to improve the understanding of addition concepts among lower-grade students at Madrasah Ibtidaiyah (Amalina & Maharbit, 2025).

CONCLUSION

Based on the findings of the research on the use of the Smart Board and Number Wheel media to enhance students' understanding of addition concepts in Grades I and II at Madrasah Ibtidaiyah Bustanul Ulum 06 Gumukmas, it was found that this media had a significant positive impact on students' learning outcomes. Prior to its implementation, most students struggled with understanding addition operations, particularly with numbers above 10 and grasping the "+" symbol conceptually. The conventional teaching methods used previously often caused students to lose focus and become easily bored. Following the implementation of the media, there was a marked improvement in students' learning interest, conceptual understanding, and arithmetic skills. The Smart Board and Number Wheel effectively catered to various student learning styles visual, auditory, and kinesthetic while reinforcing memory through interactive and enjoyable activities. The media received a feasibility score of 94%, which falls under the category of *highly feasible* for classroom use. Although some students experienced minor difficulties due to weak motor coordination, overall, the use of the media created a more dynamic, engaging, and participatory learning environment. Therefore, the Smart Board and Number Wheel media are highly recommended as alternative instructional tools for teaching mathematics, particularly for strengthening early-grade students' understanding of addition. These findings also open up opportunities for developing similar media for other lower-grade levels and serve as a foundation for further research into the long-term effectiveness of such tools in enhancing students' numeracy skills.

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