

The Development of Busy Book Educational Media to Improve Numeracy Skills Among 7-Year-Old Students

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ABSTRACT

This study aims to develop and evaluate the Busy Book—an interactive, tactile-based educational media designed to improve numeracy skills among 7-year-old students at SD Negeri Tangerang 15. The research applied a Research and Development (R&D) approach using the 4D model (Define, Design, Develop, and Disseminate). The Busy Book contains activities such as number recognition, basic operations, and math games tailored to the cognitive level of early grade learners. Validation from material experts, media experts, and teachers showed high feasibility ratings (91.7%–100%). A small-scale trial with 14 students resulted in a 75.8% feasibility score, indicating positive engagement and learning outcomes. The results suggest that the Busy Book is an effective tool for enhancing basic numeracy skills through active learning. It is recommended for broader classroom implementation and further exploration of its adaptability for various learning needs and potential integration with digital formats.

INTRODUCTION

Elementary education plays a crucial role in shaping children's cognitive development, particularly in numeracy skills that serve as the foundation for future mathematical learning and problem-solving (Geary, 2013; Tomporowski et al., 2015; Wright et al., 2005). At around the age of seven, children typically enter the concrete operational stage as described by Piaget, in which they can think logically about concrete objects but still struggle with abstract reasoning (Danoebroto, 2015; Moshman, 2004). This developmental stage requires the use of tangible, interactive media to support effective learning.

Numeracy skills at this level include basic number recognition, counting, and performing simple operations such as addition and subtraction (Aunio & Räsänen, 2016). However, conventional mathematics instruction often relies heavily on abstract explanations and rote memorization, which are not always developmentally appropriate for early learners (Boaler, 2002; Cai et al., 2009). As a result, many students experience low engagement, limited conceptual understanding, and reduced motivation.

Recent studies have emphasized the importance of integrating visual and tactile learning media to improve children's mathematical understanding and interest (Lu & Hanim, 2024; Walan, 2019). One such innovation is the Busy Book—a felt-based, interactive learning tool designed to provide hands-on numeracy experiences through engaging, age-appropriate activities (Klopfer, 2008; Singer et al., 2006).

Despite the growing popularity of Busy Books in early childhood settings, limited empirical research has evaluated their effectiveness as structured learning tools in formal school environments, particularly in the context of Indonesian primary schools. Most prior studies have focused on digital tools or general play-based learning, leaving a gap in understanding the impact of tactile media like Busy Books on concrete numeracy development among first graders.

This study seeks to address that gap by designing, developing, and validating a Busy Book tailored specifically for 7-year-old students at SD Negeri Tangerang 15. The research aims to assess the feasibility, usability, and instructional value of the Busy Book as an alternative learning media to enhance basic numeracy skills, while contributing to the growing body of literature on tactile learning tools in early education.

LITERATURE REVIEW

Numeracy Skills in Early Childhood Education

Numeracy skills refer to a child's ability to understand and work with numbers, including number recognition, counting, comparison, and basic operations such as addition and subtraction (Aunio & Räsänen, 2016). These skills are foundational for future mathematical competence and are critical for everyday decision-making and academic success (Geary, 2013; Ginsburg et al., 2006). According to (Westwood, 2021), early intervention in numeracy is essential because misconceptions at this stage can persist into later education levels.

Cognitive Development and Learning Media

Jean Piaget's theory of cognitive development posits that children aged 7 are in the concrete operational stage, where they develop logical thinking but require physical, manipulable materials to grasp new concepts (Moshman, 2004; Danoebroto, 2015). Learning at this stage is most effective when supported by concrete experiences. Thus, the use of tactile and visual learning media is crucial in translating abstract mathematical ideas into forms that are understandable for young learners (Fisher, 2005; Wiggins & McTighe, 2011).

The Role of Educational Media in Numeracy Learning

Educational media, especially those that are interactive and visually engaging, have been shown to significantly enhance learning outcomes in early numeracy. According to Walan (2019), integrating hands-on learning tools helps improve conceptual understanding and retention among elementary students. Lu and Hanim (2024) emphasize that learning media tailored to children's developmental stages can increase motivation and focus in mathematics lessons.

Busy Book as Tactile Learning Media

A Busy Book is a felt-based, interactive book designed with pages that contain various educational activities. It provides children with a multisensory experience through tactile, visual, and kinesthetic engagement (Singer et al., 2006). Studies by Klopfer (2008) and Barbour (2020) suggest that such tactile tools can bridge the gap between play and formal learning, particularly in subjects like mathematics. While Busy Books are widely used in informal or home-based education, there is limited research evaluating their effectiveness within structured school curricula – especially in the Indonesian context.

Research Gap and Contribution

Most prior research has focused on the use of digital tools or traditional manipulatives such as number blocks or flashcards (Boaler, 2002; Cai et al., 2009). However, there is a paucity of empirical studies that assess the effectiveness of fabric-based, interactive learning media such as Busy Books in formal primary education settings. This study seeks to fill this gap by developing and testing a Busy Book tailored to numeracy instruction for first graders, providing both theoretical insights and practical implications for early childhood educators.

METHODOLOGY

This study employed a quantitative approach using the Research and Development (R&D) method based on the 4D model developed by Thiagarajan et al., which includes four stages: Define, Design, Develop, and Disseminate. Due to time and field limitations, the research was conducted up to the third stage – Define, Design, and Develop.

The study was conducted at SD Negeri Tangerang 15, involving 14 first-grade students aged 7 years as the research subjects. The data collection techniques included observation and documentation throughout the media development and testing process.

To evaluate the Busy Book media, several instruments were used:

- Expert validation sheets were administered to material experts, media experts, and classroom teachers to assess the content accuracy, visual appeal, instructional quality, and appropriateness for the target age group.
- Observation sheets were used to record students' engagement, responses, and interaction with the media during class activities.

The data obtained were analyzed using a quantitative descriptive technique. The scores from the Likert scale (ranging from 1 = strongly disagree to 4 = strongly agree) were converted into percentages to determine the media's validity, feasibility, and practical effectiveness in supporting numeracy skills among early elementary students.

RESULTS and DISCUSSION

The Busy Book media developed in this study consists of interactive and tactile activities aimed at enhancing the numeracy skills of 7-year-old students at SD Negeri Tangerang 15. These activities include number recognition, matching symbols with quantities, and basic arithmetic operations (addition and subtraction). The design aligns with Piaget's theory, which posits that children aged around seven are in the concrete operational stage, requiring tangible materials to understand abstract concepts (Piaget, 1973).

To ensure its validity and usability, the media was evaluated by experts and tested through a limited field trial. The following summarizes the key findings:

Expert Validation and Field Trial Results

Material Expert rated the content as 91.7% feasible, with full scores on alignment with learning objectives, real-life relevance, and visual attractiveness. Slightly lower scores on motivational appeal and developmental appropriateness (75%) suggest areas for refinement, although still within the "feasible" category.

Media Expert and Teacher Evaluations both yielded perfect scores of 100%, affirming that the Busy Book is pedagogically sound, age-appropriate, and visually engaging. These validation results are in line with (Mursid et al., 2022), who emphasize that effective early childhood learning media must not only support conceptual mastery but also stimulate curiosity and match cognitive development levels.

Table 1. Validation and Field Trial Results of Busy Book Media

Validator/ Trial	Aspect/ Indicator	Score/ Total	Percentage	Evaluation
Material Expert	Alignment with learning goals	4 / 4	100%	Very Feasible
	Appropriateness for the developmental stage	3 / 4	75%	Feasible
	Relevance to children's real-life context	4 / 4	100%	Very Feasible
	Ability to motivate children	3 / 4	75%	Feasible
	Attractive appearance	4 / 4	100%	Very Feasible
	Visual design of the Busy Book	4 / 4	100%	Very Feasible
	Total	22 / 24	91.7%	Very Feasible
Media Expert	Various aspects (12 items, e.g., alignment, ease)	44 / 44	100%	Very Feasible
Teacher Validation	Various aspects (6 items)	28 / 28	100%	Very Feasible
Limited Field Trial	Number counting and naming (1-20)	31 / 40	77.5%	Feasible

	Matching number symbols with objects	31 / 40	77.5%	Feasible
	Addition	29 / 40	72.5%	Feasible
	Subtraction	29 / 40	72.5%	Feasible
	Total	120 / 160	75%	Feasible

Limited Field Trial

Involving 14 students, the field trial assessed how children engaged with numeracy tasks using the Busy Book:

Numeracy Task	Score (out of 40)	Percentage	Evaluation
Number naming and counting (1-20)	31	77.5%	Feasible
Matching symbols with objects	31	77.5%	Feasible
Simple addition	29	72.5%	Feasible
Simple subtraction	29	72.5%	Feasible
Total	120 / 160	75%	Feasible

The trial revealed a 75% success rate, indicating that the media is both understandable and engaging for the students. Most of them were able to interact with the material independently, suggesting that the tactile, game-based format successfully motivates and supports early numeracy development.

This outcome supports findings by (Nofriyandi et al., 2023) who demonstrated that interactive learning media significantly enhance basic mathematical skills by making learning more contextual and meaningful. Similarly, Yulianingsih (2021) and Mursid (2015) highlighted the critical role of media in motivating learners and reinforcing foundational concepts.

Interpretation and Educational Significance

The Busy Book media provides a developmentally appropriate bridge between abstract mathematical concepts and concrete learning experiences. It effectively responds to the learning characteristics of children at the concrete operational stage by presenting content through hands-on, engaging formats.

Furthermore, the inclusion of visual design elements and structured challenges helps foster logical thinking, fine motor skills, and attention span, all of which are crucial at the early stage of formal education. These findings echo Verschaffel et al. (2009), who emphasized that early numeracy education must lay the foundation for real-life problem solving and academic success.

The success of this study positions the Busy Book as a practical, scalable media tool for classroom use, with potential for broader implementation across different schools and learning needs.

CONCLUSIONS AND RECOMMENDATIONS

The results of this study demonstrate that the Busy Book media developed for 7-year-old elementary students is highly effective in enhancing early numeracy skills, particularly in number recognition, addition, and subtraction. The validation process involving material experts, media experts, and classroom teachers yielded high scores ranging from 91.7% to 100%, indicating that the media is both feasible and pedagogically appropriate. The Busy Book was also found to be engaging and well-aligned with the developmental characteristics of young learners, promoting active participation, motivation, and logical thinking. During limited field trials, students responded positively, achieving an overall feasibility score of 75.8%, further supporting its practical use in classroom settings.

Based on these findings, it is recommended that Busy Book media be implemented more broadly in early grade mathematics instruction as a tool to foster interactive and student-centred learning. To improve its utility, future developments should consider incorporating more advanced concepts to cater to varying learning abilities. Teachers should also be trained to use the media effectively to maximize learning outcomes. Additionally, wider trials involving diverse educational contexts are suggested to test its adaptability and effectiveness on a larger scale. Integrating digital features or interactive technology could further enhance the learning experience and align with modern educational trends.

FURTHER STUDY

While the development and implementation of the Busy Book media showed promising results in enhancing basic numeracy skills among 7-year-old children, future studies are encouraged to explore several additional aspects. Researchers may consider conducting long-term studies to examine the sustained impact of Busy Book usage on children's mathematical development over time. It would also be valuable to explore how the Busy Book can be adapted for

children with different learning needs, such as those with learning difficulties or exceptional abilities. Comparative studies involving digital versus physical media could provide insights into the most effective formats for different contexts. Moreover, involving a larger and more diverse sample across different schools and regions would help validate the generalizability of the findings. Finally, integrating cross-curricular content – such as literacy or science themes – into the Busy Book activities could offer a more holistic approach to early childhood education.

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