



## The Influence of Big Book of Math Using Intense Structural Analytical Methods on Students' Learning Motivation

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| Article Info                                                                                                                                                                                                                                                                                                                                                                                              | Abstract                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <p><b>Article history:</b><br/>Received: March 12, 2025<br/>Accepted: May 7, 2025<br/>Published: May 31, 2025</p> <p><b>Keywords:</b><br/>Big book of math<br/>Intense structural analytical<br/>Learning motivation</p> <p>This article is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.</p> <p>© 2025 Journal of Mathematics, Science, and Computer Education</p> | <p>This study aims to analyze the effect of using mathematics ledgers applied through the synthetic structure analysis method on student learning motivation. This study applied a quantitative approach using the survey method as a data collection technique and a questionnaire as an instrument. Data analysis was conducted through a simple linear regression test. The regression analysis showed that students' learning motivation was significantly influenced by the significance of 0.000 (<math>p &lt; 0.05</math>). The R-value of 0.811 indicates a strong and positive relationship, while the <math>R^2</math> value is 0.658. The variation in student learning motivation can be explained using math ledgers with the synthetic structure analysis method. The results of this study indicate that Math Ledger is an effective learning medium in increasing students' learning motivation. Thus, the existence of a math ledger can help students and teachers in the implementation of mathematics learning.</p> |
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### INTRODUCTION

Education is essential in determining the development and progress of individuals, communities, and the nation (Bela, 2021; Kioupi & Voulvoulis, 2019). Education is a structured learning process designed to shape and guide students in attaining specific objectives, especially in creating positive changes in themselves. These expected changes are part of continuous growth throughout the student's life (Widyastuti & Putra, 2021).

Learning motivation is key in motivating students to engage in learning activities. Therefore, motivation needs to be instilled in students to encourage them to participate actively. The higher the students' motivation, the greater their motivation to participate in learning activities (Alioon & Delialioğlu, 2019; Tuwijati et al., 2021). According to Aldeerfer in Pratama et al. (2019), learning motivation can be defined as an internal drive that encourages students to carry out learning activities to achieve optimal academic success. Based on the source, learning motivation is categorized into intrinsic and extrinsic. These two forms of motivation are interconnected and increase students' interest (Morris et al., 2022; Purnawan et al., 2018; Ramalingam & Jiar, 2022).

However, not all students have a high level of motivation to learn. Some students

experience low motivation to learn; as a result, their enthusiasm for engaging diminishes. Therefore, teachers need to make various efforts to grow students' motivation. One effective strategy is using instructional media, enabling educators to design and implement media that aligns with the subject matter ([Fatmawati, 2019](#); [Smaldino et al., 2019](#)). In addition, learners' motivation is not exclusively formed during learning activities but can also be influenced by their interests and tendencies towards something. This motivation indicator can be identified through the statements delivered by students and their level of involvement in learning ([Aspikawati et al., 2021](#); [Shapiro et al., 2017](#)). Therefore, learning motivation is crucial in supporting students' academic success. In order to increase learning motivation, teachers need to choose effective learning media and methods.

This research presents a novelty in integrating Big Book media in mathematics learning, developed and analyzed using the Intense Structural Analytical Methods (ISAM) approach, which has not been widely applied in the context of basic education. By using ASIM, this research tries to overcome the limitations of previous approaches by offering a deeper, structured analysis method by the character of the learning media used. This approach provides a new contribution to the study of media and learning motivation in terms of effectiveness and the mechanism of influence that occurs during the learning process. Most previous studies only focused on using Big Book media to strengthen literacy at the early level. In contrast, this study explores its potential in the context of mathematics learning more profoundly and systematically. Thus, this study aims to analyze the influence of using mathematics big books applied through the synthetic structure analysis method on students' learning motivation. Integrating instructional media is complementary to achieving instructional goals and delivering material effectively to students ([Hartini et al., 2017](#); [Puspitarini & Hanif, 2019](#); [Zainuddin et al., 2019](#)). Implementing suitable instructional media can facilitate students' comprehension of the material and enhance their interest in learning the topics taught in more depth ([Mahyuddin et al., 2017](#); [Savitri et al., 2022](#); [Zainuddin et al., 2025](#)). In addition, the application of appropriate media also contributes to increasing learning motivation and student attention to the material taught ([Puspitarini & Hanif, 2019](#); [Yosianti & Ds, 2020](#)). In its implementation, the use of learning media needs to be supported by appropriate learning methods and its effectiveness maximally accomplished. One of the methods applied is the synthetic structural analysis method. This method begins with thoroughly understanding a concept and then identifying and analyzing certain parts and their functions in the overall structure ([Lisnawati & Muthmainah, 2018](#)). Teaching with the synthetic structural analysis method aims to simplify the learning process for students. After recognizing the multiple aspects and functionalities, learners will be able to form a more comprehensive understanding of the overall structure that resembles their initial perception ([Mardhotillah & Qura, 2023](#)).

In the preliminary study conducted, the researchers collected data from elementary school students in Kenanga Village through the distribution of questionnaires. The observations show that student learning motivation is still relatively low. Therefore, strategic initiatives are essential to enhance students' motivation and reinforce learning effectiveness. In addition, it was found that teaching and learning activities are still minimal. Teachers tend to rely only on books as the only learning medium, with the main source of information coming from the teachers themselves. This was also strengthened by the statement of one of the students, who revealed that no visual media can help understanding in learning, so they have difficulty memorizing or understanding the material presented. The teaching methods applied are still conventional and monotonous, with one-way interaction. As a result, students easily experience boredom and are less active. This condition emphasizes the need for innovation in learning strategies, including integrating

more varied learning media to increase student participation and learning motivation.

The lack of motivation to learn is attributed to the limited use of instructional media. One factor contributing to this condition was the implications of the Covid-19 pandemic three years ago. The pandemic has caused many learning activities that were originally carried out offline to switch to online systems in accordance with government policies, thus having a significant impact on the education sector, including mathematics learning. The shift from face-to-face to online learning has significantly impacted students' learning motivation. This learning transition affects the optimization of learning outcomes ([Putri & Munandar, 2021](#)). Online learning is considered less effective by students, leading to decreased learning motivation ([Yuangga & Sunarsi, 2020](#)).

Motivation and the learning process are closely related, where motivation is the main driver in achieving learning outcomes. Motivation originates from the word motive, which denotes the strength in an individual to take action to achieve a certain goal ([Istiningsih et al., 2018](#)). Motivation is a stimulus or encouragement that directs individuals to do activities in accordance with the expected goals ([Tuwijati et al., 2021](#)). Learning motivation, according to Winkel ([Permata & Amin, 2014](#)), is a psychological impulse that fosters the spirit of learning and ensures the continuity of the learning process. Harsinia in ([Purnawan et al., 2018](#)) added that learning motivation includes behaviors and factors that affect student involvement in learning. According to Hamalik ([Purnawan et al., 2018](#)), learning motivation is divided into two types: (1) intrinsic motivation, which stems from an individual's internal drive, and (2) extrinsic motivation, which is shaped by external influences. Motivation plays a crucial role in guiding students to be actively engaged, creative, and persistent, which ultimately has a beneficial effect on academic attainment ([Savitri et al., 2022](#)). Uno and Sudirman identified several indicators of learning motivation, including desire to succeed, need for learning, perseverance in facing tasks, resilience to face difficulties, and involvement in interesting learning activities, including using learning media ([Hamid, 2023](#)).

The structural-analytic method is a learning approach that starts from an overall understanding before identifying its parts and functions in a unit ([Lisnawati & Muthmainah, 2018](#)). This method is designed to encourage active student participation by combining various activities, such as listening, reading, and note-taking, as well as the use of additional learning materials ([Istining et al., 2018](#)). The principle of this method is based on the cognitive, pedagogical, and linguistic foundations, which are the basis for the learning stages, namely the presentation of the structure as a whole, the analysis of parts, and the reconstruction into a single unit ([Fatmala et al., 2018](#)). In addition, this method is systematically arranged to facilitate students' understanding of the learning process ([Eliastuti & Irwansyah, 2018](#)).

Books are a source of information or knowledge that reflects the author's thoughts, obtained through research, observation, experience, autobiography, or imagination in the form of fiction ([Susanto et al., 2023](#)). Physically, books are bound sheets of paper and can contain text and images ([Setiyadi, 2017](#)). In the context of learning, books function as teaching materials in printed form ([Yanti, 2019](#)). A big book is a type of reading book with enlarged size, text, and images to improve student readability in class, generally A3, A4, or larger ([Ramadhan & Khairunnisa, 2021](#)). According to USAID in ([Dewi & Yanti, 2021](#)) big book media combines large texts with attractive illustrations, allowing shared use in learning. Big book media has attractive visual characteristics, with color images and large-sized text to improve readability ([Jamil et al., 2020](#)). According to Lynch in ([Handayani, 2019](#)) a large book is a book with an enlarged size and font. Many children's books are designed to help children explore text and understand concepts through pictures and writing ([Yulianti, 2019](#)). According to Hall & Connor in [Wahyuningsih et al. \(2018\)](#), the big book

can be used at various levels of education because of its characteristics that support the needs of students. Teachers can adjust the content and topic of the big book to be relevant to students' interests and in accordance with the learning theme being taught.

Instructional media is important in enhancing effectiveness and efficiency, functioning as an intermediary to achieve educational goals. Broadly, media encompasses tools, methods, and techniques used to strengthen communication and interaction in the classroom. The indicators of learning media include (1) visual attractiveness, (2) its ability to stimulate student learning motivation, (3) ease of use, and (4) the use of simple and easy-to-understand language ([Jati, 2021](#)) Thus, the hypothesis of this research is defined as follows:

H1: The influence of the mathematical media big book using intensive structural analysis methods on students' learning motivation.

H2: How much influence does a mathematical media big book using the structural analysis method have on intensifying students' learning motivation?

## METHODS

This study used a quantitative research design incorporating a survey method, which involves field research to obtain data on the influence of mathematics learning media in the form of a big book through structural analysis methods on student learning motivation. The researchers collected data from the natural environment without changing existing conditions. However, in the data collection process, the researchers intervene in the form of distributing questionnaires, interviews, and observations to obtain more in-depth information related to the variables studied ([Fitri, 2020](#)).

This study used a survey design by distributing questionnaires directly to fifth-grade elementary school students in Kenanga Village. The selection of the research location was based on the formulation of the problem proposed by the researchers, namely, the students' low motivation in learning. The population used in this study amounted to 105 respondents. The sample in this study was obtained through the saturated sample technique, where the population and the sample were the same, so the sample used in this study amounted to 105 respondents.

The questionnaire was prepared in Indonesian and validated by experts. After the validation stage, it was distributed to 105 respondents, consisting of VA and VB class students. The development of the conceptual model in this study was grounded in a thorough examination of existing literature and related research. The questionnaire instrument used to measure student learning motivation was adapted and built upon existing research. Each item statement in the questionnaire was structured using a four-point Likert scale, with a rating ranging from 1 = strongly agree to 4 = strongly disagree. The instruments used in this study refer to the indicators of the mathematics ledger which consist of (1) the attractiveness of the big book of math display, (2) can stimulate student learning motivation, (3) easy to use by students, and (4) use of language that is easy for students to understand. The motivation indicator grid is shown in Table 1.

Table 1 Motivation indicator grid

| No | Aspect                        | Indicator                           |
|----|-------------------------------|-------------------------------------|
| 1  | Perseverance in learning      | Desire to succeed                   |
| 2  | Tenacious in solving problems | Facing tasks diligently             |
| 3  | High interest in learning     | Encouragement and the need to teach |
| 4  | Independent in learning       | Can solve problems                  |
| 5  | Presence of learning media    | Use of big book media in learning   |

The data in this study was analyzed using Structural Equation Modeling based on Partial Least Squares (PLS-SEM) with Smart PLS software version 4.0. In the initial stage, the measurement model (outer model) is tested to assess the validity and reliability of the construction. Furthermore, the analysis continued using SPSS version 18 software to support further data processing.

## RESULTS AND DISCUSSION

### Validity Test

The validity of a construct is evaluated based on convergent and discriminatory validity. The convergence validity is considered satisfied if the factor loading value exceeds 0.70 (Hair et al., 2019). As shown in Table 1, all measurement items in this study have outer loading values ranging from 0.702 to 0.874 ( $> 0.70$ ), indicating that the threshold requirements have been met. In addition, the AVE value for all construction variables was greater than 0.50, further strengthening this study's convergence validity. The results of the big book validity test are shown in Figure 1.

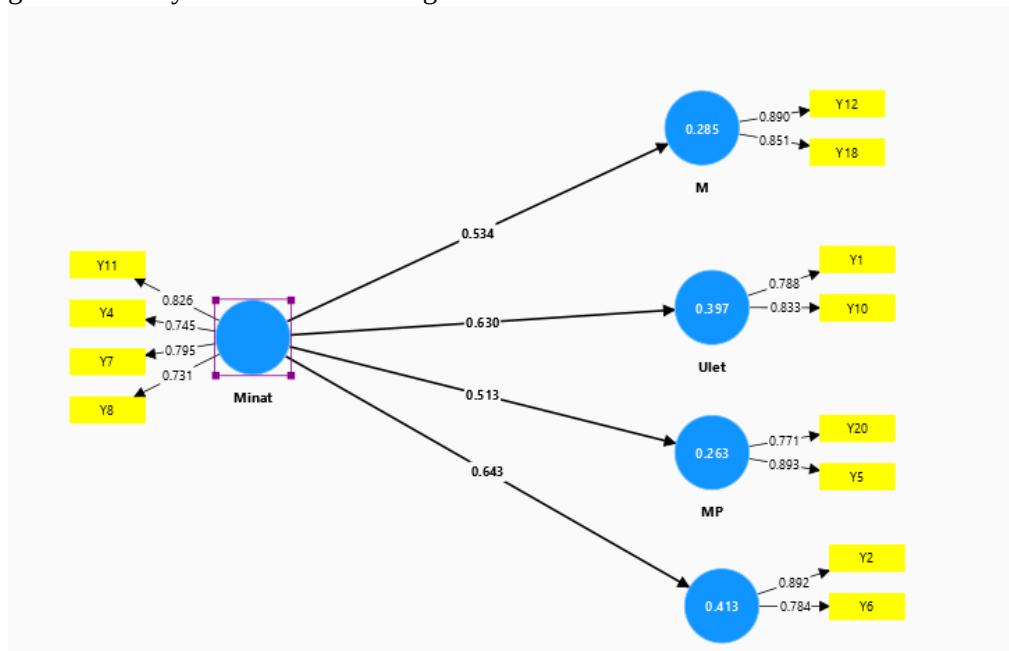


Figure 1 Big book validity test results

Several indicators have a factor loading value below 0.70. Indicators with a factor loading value of less than 0.70 were eliminated to ensure measurement reliability. The following is a recapitulation of data that meets the validity criteria: an outer loading  $\geq 0.70$  and an AVE value of  $> 0.50$ .

### Prerequisite Analysis Test

The results of the one-sample Kolmogorov-Smirnov test are shown in Table 2. The normality test results revealed a significance value in the Asymp table. Sig. (2-tailed) For the big book, the variable is 0.133, greater than 0.05 ( $0.133 > 0.05$ ). This indicates that the variable follows a normal distribution. Meanwhile, the significance value for the learning motivation variable is in the Asymp table. Sig. (2-tailed) is 0.146, also greater than 0.05 ( $0.146 > 0.05$ ). Thus, the variable (Y) data meets the normality assumption.

Table 2 One-sample Kolmogorov-Smirnov test

|                          |                | Big Book of Math | Learning Motivation |
|--------------------------|----------------|------------------|---------------------|
| N                        |                | 105              | 105                 |
| Normal Parameter a, b    | Mean           | 39.51            | 31.05               |
|                          | Std. Deviation | 5.059            | 4.340               |
| Most Extreme Differences | Absolute       | 0.117            | 0.112               |
|                          | Positive       | 0.103            | 0.091               |
|                          | Negative       | -0.117           | -0.112              |
| Kolmogorov-Smirnov Z     |                | 1.199            | 1.145               |
| Asymp. Sig. (2-tailed)   |                | 0.113            | 0.146               |

a. Test distribution is Normal.

b. Calculated from data.

The results of the homogeneity of variance test are shown in Table 3.

Table 3 Test of homogeneity of variances

| Levene Statistic | df1 | df2 | Sig.  |
|------------------|-----|-----|-------|
| 1.585            | 14  | 82  | 0.101 |

Table 3 indicated a significance value in the Variance Homogeneity Test table was 0.101, greater than 0.05 ( $0.101 > 0.05$ ). The variable of learning motivation in using mathematics big books meets the homogeneity assumption.

### Interview

Semi-structured interviews were conducted with three classroom teachers and six students directly involved in learning using the Big Book of Math media. The interviews concluded that the Big Book media increased interest and understanding and fostered confidence and enjoyment in learning mathematics. This reinforces the questionnaire's quantitative findings, showing high attention and learning satisfaction.

### Observation

Observations were conducted over four meetings using an observation sheet covering student engagement, expression of emotion while learning, interaction between students, and response to media. The observations showed that Big Book Media successfully created a positive and participatory learning climate. This indicates that learning motivation grows internally and is facilitated by supportive classroom dynamics. The results of the motivation to use Big Book Math shown in Table 4.

Table 4 Motivational results using big book math

| No | Indicator                           | Results |
|----|-------------------------------------|---------|
| 1  | Desire to succeed                   | 86      |
| 2  | Facing tasks diligently             | 82      |
| 3  | Encouragement and the need to teach | 84      |
| 4  | Can solve problems                  | 80      |
| 5  | Use of big book media in learning   | 90      |

Table 4 shows that most students show high learning motivation after participating in learning using the Big Book of Math media. The most dominant indicator is using big books in learning (90%), showing that students feel satisfied, happy, and enjoy math learning. Meanwhile, the perseverance aspect is also high (86%), which indicates that the Big Book media successfully attracted students' interest and focus during the learning process. The interest indicator at 80% shows that this media helps students feel more confident in understanding and solving math problems.

The results of the simple linear regression test are shown in Table 5.



Table 5 Simple linear regression test

| Model     | R     | R Square | Adjusted R Square | Std. Error of the Estimate |
|-----------|-------|----------|-------------------|----------------------------|
| Dimension | 0.811 | 0.658a   | 0.654             | 1.79234                    |

Table 5 summarizes the model's findings from the simple linear regression analysis conducted using SPSS version 18. The correlation value (R) of 0.811 shows a strong and positive relationship between the use of big books as a mathematics learning medium and student learning motivation as a dependent variable.

The extent of the variable's impact in this study is shown by the  $R^2$  value, or determination coefficient, which is obtained at 0.658. This indicates that the use of mathematical big books can explain 65.8% of the variation in students' learning motivation. In comparison, the remaining 34.2% is influenced by factors other than the independent variables.

The results of the simple linear regression test are shown in Table 6.

Table 6 Simple linear regression test results

| Model        | Sum of Squares | df  | Mean Square | F       | Sig.   |
|--------------|----------------|-----|-------------|---------|--------|
| 1 Regression | 635.225        | 1   | 635.225     | 197.737 | 0.000a |
| Residual     | 330.884        | 103 | 3.212       |         |        |
| Total        | 966.109        | 104 |             |         |        |

a. Predictors: (Constant), Big Book of Math

b. Dependent Variable: Learning Motivation

The ANOVA test results in Table 6 show that the F-count value was 182.406, with a significance level of 0.000, lower than 0.005 ( $0.000 < 0.005$ ). This indicates that the regression model is significant. These results confirm that the independent variable, the mathematics big book, simultaneously affects students' learning motivation. In other words, this regression model can predict or explain student learning motivation variations and be used for further analysis. The results of the model coefficient test are shown in Table 7.

Table 7 The result of the model coefficients test

| Model            | Unstandardized Coefficients |            | Standardized Coefficients |        |       |
|------------------|-----------------------------|------------|---------------------------|--------|-------|
|                  | B                           | Std. Error | Beta                      | t      | Sig.  |
| 1 (Constant)     | 11.746                      | 1.384      |                           | 8.489  | 0.000 |
| Big Book of Math | 0.488                       | 0.035      | 0.811                     | 14.062 | 0.000 |

a. Dependent Variable: Learning Motivation

The regression coefficient test results presented in Table 7 produce a simple linear regression equation as follows:

$$\hat{Y} = a + bX, \text{ maka persamaan regresinya} \quad (1)$$

$$\hat{Y} = 11.746 + 0.488X \quad (2)$$

$$\hat{Y} = 11.746 + 0.488 (0) \quad (3)$$

$$\hat{Y} = 11.746 + 0 \quad (4)$$

$$\hat{Y} = 11.746 \quad (5)$$

A regression equation with a constant value (a) of 11.746 was obtained. The use of the mathematics media big book has a value of zero or does not change, then the student's learning motivation remains valued at 11.746. In addition, the regression coefficient value (b) of 0.488 indicates a positive influence between the mathematics media big book and students' learning motivation. In other words, increasing the use of mathematics media, big books, will increase students' learning motivation by 0.488 units. In percentage terms,

increasing media use can increase student learning motivation by 48.8%. The t-count value of 14.062 exceeded the t-table value of 1.660 ( $14.062 > 1.660$ ) with a significance level of 0.000, less than 0.05. This finding suggests that the mathematics media big book variable significantly impacts students' learning motivation. Consequently, the  $H_a$  is accepted, while the  $H_o$  is rejected.

This study's results show that using the Big Book of Math, developed with the Intense Structural Analytical Methods (ASIM) approach, significantly increases students' learning motivation. This is evidenced by the increase in questionnaire scores on all learning motivation indicators (attention, need for achievement, perseverance, self-confidence, and learning satisfaction), interview results that reflect students' enthusiasm and comfort, and observations that show active involvement during learning. The use of learning media in schools has an important role in increasing student learning motivation. The utilization of engaging instructional media that is easy to use and aligned with the taught material will help students understand the lesson more effectively ([Actavera et al., 2023](#)). A teacher must have wisdom in choosing media and learning methods that suit the needs of students to increase learning motivation and outcomes and achieve the learning goals. This is in line with research conducted by [Kurniawati et al. \(2023\)](#) state that using big book media contributes to improving science learning outcomes. This increase can be observed through learning activities, such as student interaction in seeking information and question-and-answer sessions between students and teachers. In addition, students show higher motivation to learn and pay more attention to the material taught when this medium is used ([Yosianti & Ds, 2020](#)).

Theoretically, these results support Keller's view (ARCS Model), which states that attention, relevance, confidence, and satisfaction are the keys to learning motivation. The structurally designed Big Book (ASIM) helps students understand the material with a logical flow and meaningful visuals, strengthening attention and confidence. This finding is also consistent with Vygotsky's constructivist theory, where learning media is a mediated tool to build social and cognitive meaning ([Setiyaningsih & Subrata, 2023](#)). [Yosianti and Ds \(2020\)](#) highlighted the crucial role of instructional media. In addition to enhancing students' learning motivation, instructional media facilitates a better understanding of the material. Therefore, teachers are encouraged to incorporate instructional media into their teaching activities to enhance effectiveness.

One of the instructional media that serves as an effective solution for addressing students' difficulties in understanding the material is the Big Book. Its use has been proven to increase students' motivation to learn significantly. Yuni et al. 's study results revealed a significant difference in students' learning outcomes after utilizing big books, indicating that this medium positively enhances student learning achievement ([Kurniawati et al., 2023](#)). However, learning using the Big Book must be accompanied by teacher training to appropriately facilitate students' thinking structure. In addition, measuring motivation through questionnaires still has limitations in capturing emotional dynamics that may be more visible from direct observation.

## CONCLUSION

Based on the research results, which include quantitative data through questionnaires and qualitative data through interviews and observations, using the Big Book of Math media with the Intense Structural Analytical Methods approach positively influences student learning motivation. The questionnaire results show that all learning motivation indicators—attention, need for achievement, perseverance, self-confidence, and learning satisfaction—are in the high to very high category. This was reinforced by interview data, which showed that students felt more interested and confident and understood the math



material better. Observations during the learning process also show active engagement, positive expressions, and social interactions that support a pleasant learning atmosphere. Thus, the Big Book media, which is organized systematically and analytically, can increase students' cognitive, affective, and social learning motivation. This media is recommended to be integrated into mathematics learning at the basic education level to create a more interesting and meaningful learning process. This study is limited to one or several elementary schools, so the results cannot be widely generalized to the entire population of elementary school students. Big book media in the learning process is relatively short, so it cannot describe the long-term impact on learning motivation. This study implies that teachers can utilize big books as an alternative learning medium that is visually appealing and empirically proven to increase student learning motivation, especially in mathematics lessons, which are often considered difficult by children. This research also reinforces learning motivation theories that emphasize the importance of visual and contextual stimuli in influencing students' affective aspects.

### CONFLICTS OF INTEREST

There is no conflict of interest during this research.

### AUTHOR CONTRIBUTIONS STATEMENT

The first, second, and fourth authors primarily conducted the research. They were responsible for conceptualizing the research design, developing the theoretical framework, formulating the research questions, and collecting qualitative data through in-depth interviews and observations. The first author also conducted thematic analysis, coding, and interpretation of findings, as well as the initial drafting of the manuscript.

The third and fifth authors contributed to refining the methodology, provided critical feedback on data interpretation, and were involved in the review process, editing the manuscript, providing supervision and academic guidance throughout the research process, and ensuring the validity and coherence of the final version. All authors have read and approved the final manuscript.

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