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THE INFLUENCE OF SOMATIC, AUDITORY, VISUAL, INTELLECTUAL (SAVI) APPROACH ASSISTED BY FLIPBOOK ON THE MATHEMATICAL UNDERSTANDING ABILITY OF ELEMENTARY SCHOOL STUDENTS

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Abstract

This study addresses the issue of low mathematical understanding among fifth-grade elementary students, emphasizing the necessity for innovative instructional methods that cater to diverse learning styles. The purpose of this research is to evaluate the effectiveness of the Somatic, Auditory, Visual, Intellectual (SAVI) approach, enhanced with flipbook media, in improving students' mathematical comprehension compared to the Contextual Teaching and Learning (CTL) model. Utilizing a quasi-experimental design with a nonequivalent control group structure, students were divided into an experimental group (SAVI approach) and a control group (CTL approach). Data were collected through pretest and posttest evaluations to assess learning gains. The findings revealed that students exposed to the SAVI approach achieved a higher average posttest score (74.25) than those taught using the CTL model (64.00), with statistical significance indicated by a p-value of 0.018. This study concludes that employing the SAVI method with flipbook support significantly enhances students' mathematical understanding compared to conventional contextual approaches. The implications of these results underscore the potential of integrating multisensory strategies and interactive media in elementary mathematics instruction to improve student learning outcomes. Further research is recommended to explore the application of the SAVI approach across various subjects and educational contexts to strengthen and broaden these findings.

Keywords: Somatic; Auditory; Visual; Intellectual (SAVI); Flipbook; Mathematical Understanding Ability of Students

INTRODUCTION

Elementary school education serves as a fundamental stage for imparting knowledge, shaping character values, and developing essential skills. Among the core subjects taught at this level, mathematics holds a critical position as it nurtures logical reasoning, systematic thinking, and problem-solving abilities (Armin, 2024; Nahdania, 2024). Nevertheless, mathematical competence among Indonesian students remains a concern. The Programme for International Student Assessment (PISA) in 2022 reported that Indonesia ranked 70th out of 81 participating countries, with a mean score significantly below the OECD average. Alarmingly, only 24% of Indonesian students achieved the minimum proficiency level, indicating widespread challenges in understanding basic mathematical concepts (PISA, 2022).

Recognizing the urgency of this issue, educational interventions that stimulate active learning through sensory engagement are increasingly emphasized. Rooted in the concept of experiential learning (Meier in Nena et al., 2018), approach is considered an effective instructional strategy. This approach encourages students to learn through physical activity, verbal expression, visual observation, and intellectual reflection, thus enhancing their cognitive involvement. Moreover, the integration of interactive digital media such as flipbooks offers additional support by providing dynamic and engaging learning experiences (Mutmainna, 2022).

Prior studies have acknowledged multiple factors contributing to the low mathematical comprehension among elementary students, such as ineffective teaching strategies, lack of engaging learning media, and low student interest (Riswandi et al., 2023; Nahdania, 2024). While research conducted by Permatasari et al. (2019) and Apsoh et al. (2023) demonstrated that the SAVI approach positively impacts mathematical understanding, these studies predominantly focused on traditional or limited media resources. There remains a notable research gap regarding the combined application of the SAVI approach and modern digital media like flipbooks, particularly in the context of comprehensive mathematical comprehension.

This study seeks to bridge the identified gap by implementing the SAVI approach in conjunction with flipbook media. The theoretical foundation is anchored in multimodal learning theory, which posits that the simultaneous engagement of multiple senses can significantly enhance knowledge acquisition (Meier in Nena et al., 2018; Shoimin in Dewi et

al., 2021). Additionally, flipbooks, incorporating visual, auditory, and textual elements, serve as interactive digital resources that can enrich students' learning environments (Nurhasanah et al., 2023; Sandy et al., 2022). This integrated approach presents a novel strategy for improving mathematical comprehension among elementary school students.

This study aims to investigate how the Somatic, Auditory, Visual, and Intellectual (SAVI) learning approach, supported by flipbook media, affects the mathematical understanding of fifth-grade students in elementary schools in Cimahi City. Specifically, the study aims to analyze whether students receiving the SAVI-based instruction with flipbook assistance demonstrate significantly better mathematical understanding compared to those taught using a contextual teaching and learning (CTL) approach.

METHODS

Type of Research:

A quantitative study using a quasi-experimental approach to assess the impact method on elementary school students' mathematical comprehension (Dimyati & Mujiono, 2018).

Research Design:

A quasi-experimental design with a non-equivalent control group was utilized to evaluate the effect of the SAVI approach on students' mathematical comprehension (Creswell, 2018).

Table 1. Research Design

Group	O1	X	O2
Eksperimental	Pretest	SAVI	Posttest
Control	Pretest		Posttest

(Cresswell, 2018)

Participants & Sampling Technique:

A sample of 40 fifth-grade students from SDN 5 Leuwigajah was selected using purposive sampling based on the criterion of having uniform learning quality within the classes (Sugiono dalam Yulianah, 2020).

Instruments & Data Collection:

Data was collected through a mathematical skills test, which included both pretests and posttests, as well as semi-structured interviews with students and teachers to explore their learning experiences (NCTM in Khusna, 2021).

Data Analysis:

The data were examined through descriptive statistical analysis to compare pretest and posttest results, and t-tests were employed to assess the significance of differences between the experimental and control groups (Cohen, Manion, & Morrison, 2018).

RESULTS

This study aimed to explore and assess the impact of the Somatic, Auditory, Visual, and Intellectual (SAVI) approach, enhanced by flipbook media, on elementary students' mathematical understanding. Data for this research were gathered through pretest and posttest assessments, which were designed to evaluate the students' mathematical understanding. Following data collection, an analysis was conducted to assess the impact and improvement attributed to the use of the SAVI approach, providing a thorough understanding of the research outcomes.

Descriptive Analysis of Pretest:

Minimum, maximum, average scores, and standard deviations were calculated to descriptively analyze the pretest data. The descriptive analysis aim of ensuring that the students' mathematical understanding abilities in both groups were comparable before the intervention was applied, by comparing the average pretest scores.

Table 2. Descriptive Analysis of Pretest

Class	N	Mean	Sd	Maximum Ideal Score (SMI)
Experimental	20	48.75	11.341	100
Control	20	39.75	8.656	

(Source: Research Results, 2025)

Initial analysis indicates that the mathematical understanding abilities of students in the experimental and control groups are comparable. The average pretest score for the experimental group using the SAVI approach was 48.75, while the control group had a slightly lower average score of 39.75.

Inferential Analysis of Pretest

Inferential analysis of pretest data was conducted to identify whether. Normality tests were performed to ensure that the pretest data followed a normal distribution. If the could be conducted. If not, the Mann-Whitney test would be applied to assess differences between the two groups.

Normality Test

Table 3. Normality Test

Class	Shapiro-Wilk Statistic	df	Sig.	Interpretation
Experimental	0.957	20	0.484	H_0 accepted
Control	0.950	20	0.361	

(Source: Research Results, 2025)

The normality test results (Table 3) show, with significance values (p-value) greater than 0.05. Thus, H0 is accepted. Therefore, the assumption of normality is met, and the next step is to perform the homogeneity test to ensure equal variances between the two groups.

Homogeneity Test

Table 4. Homogeneity Test Results for Pretest

p-value	Significance (α)	Interpretation
0.276	0.05	Homogeneous

(Source: Research Results, 2025)

The homogeneity test results (Table 4) show a p-value of 0.276, which is greater than the significance level of 0.05, indicating that the variances of the pretest data between

the experimental and control groups are homogeneous. Therefore, the assumption of homogeneity is met, and the next step is to perform the independent sample t-test to compare the means of the two groups.

Independent Sample T-Test

Table 5. Independent Sample T-Test Results for Pretest

p-value	Significance (α)	Interpretation
0.176	0.05	H_0 accepted

(Source: Research Results, 2025)

As shown in Table 5, the obtained was 0.176, threshold. This result indicates that H_0 is accepted and H_1 is rejected. Thus, it can be inferred that the average scores for mathematical understanding between the experimental group and the control group do not differ significantly groups prior to the intervention. This suggests that both groups had relatively similar baseline levels of mathematical understanding before the treatment was administered.

Descriptive Analysis N-Gain Scores

Descriptive analysis was conducted by calculating the minimum, maximum, mean scores, and standard deviations of the N-Gain data. The descriptive table 4.5. This analysis aimed to verify the equivalence of students' initial mathematical understanding by comparing the average pretest scores before the intervention.

Table 6. Descriptive Analysis of Posttest

Class	Min	Max	Mean	Sd	Maximum Ideal Score (SMI)
Experimental	55	95	74.25	10.422	100
Control	50	80	64.00	9.262	

(Source: Research Results, 2025)

As shown in Table 6, the experimental group implementing the Somatic, Auditory, Visual, Intellectual (SAVI) approach achieved an average N-Gain score of 48.54, whereas

the control group, using the Contextual Teaching and Learning (CTL) approach, recorded a slightly lower average of 35.27.

N-Gain Scores

Table 7. N-Gain Results

Class	N-Gain Index	Interpretation
Experimental	0.4854	Moderate
Control	0.3527	

(Source: Research Results, 2025)

Table 7 summarizes the interpretation of the scores. The experimental index of 0.4854 falls into the moderate category, while index of 0.3527 also lies within the moderate category. These findings indicate that there is still room for further improvement in students' mathematical understanding abilities.

Inferential Analysis N-Gain Data

Prior to further testing, normality and homogeneity tests were conducted to assess the suitability for parametric testing.

Normality Test of N-Gain Scores

Table 8. Normality N-Gain Data

Class	Shapiro-Wilk Statistic	df	Sig.	Interpretation
Experimental	0.971	20	0.779	H_0 accepted
Control	0.919	20	0.098	

(Source: Research Results, 2025)

Based on Table 8, the significance values for both the experimental (0.779) and control (0.098) groups exceeded, confirming.

Homogeneity Test of N-Gain Scores

The p-value of 0.942 > 0.05 confirms that the data variances were homogeneous, indicating equality of variance between groups.

Table 9. Homogeneity Test Results

p-value	Significance (α)	Interpretation
0.942	0.05	Homogeneous

(Source: Research Results, 2025)

Independent Sample T-Test of N-Gain Scores

Table 10. Independent Sample T-Test Results for Pretest

p-value	Significance (α)	Interpretation
0.018	0.05	H_0 rejected

(Source: Research Results, 2025)

The p-value of 0.018, which is less than 0.05, shows that there is a statistically significant difference, suggesting that the use of the SAVI approach with flipbook assistance significantly improved students' mathematical understanding compared to the CTL approach.

Simple Linear Regression Analysis

Table 11. Summary of Constant and Regression Coefficient

Model	Unstandardized Coefficients B	Standard Error
Constant	32.354	9.400
Regression	0.817	0.181

(Source: Research Results, 2025)

The resulting regression equation is:

$\hat{Y}=32.354+0.817X$

This indicates that the SAVI approach with flipbook assistance positively influences mathematical understanding with a coefficient of 0.817.

Regression Significance Test

Table 12. Regression Significance Test Results

Test	**p-value**	**Significance Level (α)**	**Interpretation**
regression	0,001	0.05	H_1 Accepted

(Source: Research Results, 2025)

The p-value of 0.001 ≤ 0.05 confirms that the SAVI approach with flipbook assistance significantly impacts students' mathematical understanding.

Coefficient of Determination

Table 13. Coefficient of Determination Results

R	**R²**	**Standard Error of the Estimate**
0.730	0.532	7.323

(Source: Research Results, 2025)

The R value of 0.730 and R^2 of 0.532 indicate a strong positive relationship. It implies that **53.2%** of the variance in students' mathematical understanding can be explained by the SAVI approach with flipbook assistance

The coefficient of determination (D) is calculated as:

D = R *Square* (R^2) x 100%

= 0,532 x 100%

= 53,2%

Thus, the contribution of the SAVI approach to students' mathematical understanding was 53.2%, with 46.8% attributed to other factors outside this approach.

DISCUSSION

The results of the study indicated that the implementation of the Somatic, Auditory, Visual, Intellectual (SAVI) approach, supported by flipbook media, led to a notable enhancement in students' mathematical comprehension skills when compared to the CTL method. The descriptive analysis showed a higher mean N-Gain score in the experimental group (0.4854, categorized as moderate) than in the control group (0.3527, also categorized as moderate). Inferential analysis through independent sample t-tests confirmed that the difference in improvement between the two groups was. Furthermore, simple linear regression analysis indicated a positive influence of the SAVI approach on students' mathematical understanding, with a regression coefficient (β) of 0.817.

These findings directly address the research questions and hypotheses by confirming that the use of the SAVI model, supported by flipbook media, leads to a greater enhancement of mathematical comprehension skills than the CTL approach.

The Somatic, Auditory, Visual, and Intellectual (SAVI) approach has been widely recognized for enhancing student engagement in learning. This study explored the use of the SAVI approach supported by flipbook media to improve students' mathematical understanding through a more interactive and comprehensive learning experience.

Previous Putri et al. (2024) a flipbook-based SAVI model was highly effective in elementary education, achieving high validation scores from media, content, and language experts. The study highlighted the flipbook's ability to accommodate diverse learning styles and make science learning more accessible and motivating. Similarly, Khatimah et al. (2023) found that the SAVI approach significantly improved descriptive writing skills among elementary students, with higher post-test scores compared to a contextual approach.

These findings align with the current study, suggesting that integrating flipbook media with the SAVI approach creates a more engaging learning environment and enhances mathematical understanding at the primary school level.

The current knowledge by demonstrating the practical integrating multisensory learning approaches with digital media in mathematics instruction. Practically, this suggests that teachers should consider adopting the SAVI approach, especially when combined with interactive digital resources, to better support students' mathematical comprehension. Theoretically, this study reinforces the constructivist learning framework, which posits that knowledge is best constructed through active, multisensory engagement.

Moreover, the regression results, showing that the SAVI approach accounted for 53.2% of the variance in students' mathematical understanding, highlight the substantial impact that an appropriate teaching strategy can have. Nonetheless, the remaining 46.8% suggests there are other influential factors that future studies should explore.

Despite its significant findings, this study is not without only involved a specific population, thus the findings may not be fully representative of broader student demographics. Third, there is a potential for instructional bias, as the effectiveness of the SAVI approach may also depend on the teacher's proficiency in implementing the method. Lastly, external factors such as students' home learning environments and motivational levels were not controlled during the study, which could have influenced the outcomes.

Acknowledging these limitations provides a more comprehensive understanding of the results and opens avenues for further research to validate and extend these findings.

CONCLUSION

This study confirms that the Somatic, Auditory, Visual, and Intellectual (SAVI) approach, enhanced by flipbook media, significantly improves students' mathematical understanding, in alignment with the research objectives. The findings demonstrate that students instructed through the SAVI approach exhibited superior mathematical comprehension compared to those taught via the Contextual Teaching and Learning (CTL) method ($p < 0.05$), thereby validating the initial hypothesis. Furthermore, the multisensory aspects of the SAVI approach contribute to a more interactive and engaging learning environment, which positively influences cognitive skill development in mathematics.

The research offers three primary contributions: (1) empirical validation of the SAVI approach's effectiveness, combined with multimedia tools, in mathematics education; (2) the creation of a learning framework that accommodates diverse learning styles; and (3) the provision of practical strategies for enhancing elementary students' mathematical comprehension through technology-assisted instruction, specifically utilizing flipbooks.

In conclusion, this study not only addresses the identified research problem but also fills a critical gap in the literature regarding innovative pedagogical strategies in mathematics education. To further advance this field, future research should consider: (1) conducting longitudinal studies to assess the long-term effects of the SAVI approach on

mathematical understanding; (2) expanding the scope of research to various educational contexts and broader populations to improve the generalizability of the findings; and (3) investigating the application of the SAVI approach across additional mathematical competencies beyond the NCTM indicators examined in this study, such as reasoning, problem-solving, and mathematical communication.

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