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The Impact of the SAVI Approach Assisted by Macromedia Flash on Geometry Learning Outcomes of Students with Different Motivation Levels

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ABSTRACT

The rapid development of science and technology necessitates fundamental transformations in education, particularly through learning innovations that accommodate diverse learning styles, enhance active student engagement, and stimulate intrinsic motivation in mathematics learning. This study aims to examine the effectiveness of the SAVI (Somatic, Auditory, Visual, Intellectual) learning model assisted by Macromedia Flash in improving geometry learning outcomes among eighth-grade students. The research employed a quasi-experimental pretest-posttest design with a control group. A total of 55 students were selected through cluster random sampling and divided into an experimental group (SAVI + Macromedia Flash) and a control group (conventional learning). Learning motivation was measured using a validated questionnaire and categorized into high, medium, and low levels. Macromedia Flash was chosen as a digital medium for its ability to visualize abstract geometric concepts interactively and attractively, thereby facilitating students' understanding of complex material. Data were analyzed using two-way ANOVA to assess the effects of the learning model, motivation level, and their interaction on geometry learning outcomes. The results showed that the SAVI model assisted by Macromedia Flash was significantly more effective in improving geometry learning outcomes than conventional methods ($p < 0.05$). However, no significant effects were found for motivation level or its interaction with the learning model on learning outcomes. These findings confirm that SAVI-based learning innovations integrated with digital multimedia can optimize geometry learning outcomes evenly, regardless of students' initial motivation levels. This study highlights the practical value of interactive, technology-based approaches in advancing mathematics education.

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INTRODUCTION

The rapid advancement of science and technology has driven fundamental transformations in education, particularly in the realm of mathematics learning at the junior high school level (Hoyles, 2018). Mathematics not only emphasizes understanding concepts and procedures, but also plays a crucial role in developing critical and logical thinking skills, as well as problem-solving abilities that are essential in the modern era (Cresswell & Speelman, 2020; Mingla, 2020; Sachdeva, 2021). However, Indonesian students' mathematics learning outcomes, especially in geometry topics such as cubes and cuboids, remain relatively low (Kusuma, 2023; Retnawati, 2020; Sulistiowati, 2019), even from the beginning of plane geometry instruction in elementary school (Triyono, et al., 2024a). Therefore, geometry learning presents a serious challenge in achieving national education standards. This situation is further exacerbated by the dominance of conventional learning models that position teachers as the center of information and do not actively involve students in the learning process. As a result, students' motivation for learning mathematics tends to be low, which ultimately negatively impacts learning outcomes.

The urgency to reform mathematics learning is growing, especially considering the central role of geometry in building the foundation of students' reasoning and spatial skills (Winarti, 2018; Novita, 2018; Wardhani, 2023). Failure to understand basic geometry concepts not only hinders the mastery of advanced mathematics but can also reduce students' interest in science and technology (Ibáñez, 2020). Therefore, learning innovations are needed that can accommodate differences in learning styles, increase students' active engagement, and stimulate intrinsic motivation in learning mathematics. One approach that is currently widely studied is the SAVI (Somatic, Auditory, Visual, Intellectual) learning model, which simultaneously integrates physical activity, hearing, visualization, and intellectual reasoning. The SAVI model is believed to create an interactive, contextual, and enjoyable learning environment, encouraging students to actively participate and construct their own understanding (Triyono, 2025; Indriansyah, 2025; Kusrini, 2025; Fajriah, 2020).

The implementation of the SAVI learning model is highly relevant to the demands of education in the digital era, which emphasizes the importance of technology integration in the learning process. Twenty-first century education requires students not only to master basic knowledge, but also to be able to adapt to technological advances, think critically, creatively, and collaboratively (Ben-David Kolikant, 2019; Kalyani, 2024). The SAVI model, which highlights multisensory engagement, closely aligns with the concept of digital learning that demands synergy between innovative pedagogical strategies and technology utilization. In this context, the use of digital technology is no longer just a complement, but serves as a catalyst that enriches the teaching and learning process and expands students' access to diverse and interactive learning resources.

In the development of educational technology, the integration of multimedia tools such as Macromedia Flash has become an important innovation that supports the effectiveness of mathematics learning (Fadillah, 2023). Although a variety of new interactive digital media have now emerged, Macromedia Flash is still widely used because of its advantages in flexibility, ease of animation creation, and the ability to produce smooth and lightweight visual simulations. Compared to other digital media such as HTML5-based applications or more recent animation software, Macromedia Flash excels in its simple authoring process, cross-platform compatibility (especially in local/offline school environments), and can run optimally on mid- to low-specification computers, which are still widely used in Indonesian schools. Another advantage of Macromedia Flash is its ability to display complex and interactive mathematical animations with relatively small file sizes, making it very effective for geometry material that requires concrete visualization, such as the concepts of cubes and cuboids (Liberna & Nusantari, 2018; Yunus, et al., 2022). Macromedia Flash enables the visualization of abstract geometry concepts to become more concrete through animations, simulations, and engaging digital interactions (Yunus, et al., 2022). The use of Macromedia Flash in mathematics learning can clarify concepts, increase student engagement, and stimulate various senses (Liberna & Nusantari, 2018), in accordance with the SAVI principle. However, comprehensive studies examining the effectiveness of the collaboration between the SAVI learning model and the use of Macromedia Flash on cubes and cuboids are still very limited. Fajriah, et al. (2020) demonstrate the superiority of the SAVI model in improving mathematics learning outcomes, but have not specifically linked its effectiveness when integrated with digital media such as Macromedia Flash. On the other hand, studies by Yunus, et al. (2022) and Liberna & Nusantari (2018) show that Macromedia Flash is effective in enhancing mathematical reasoning and conceptual understanding, but its implementation within the SAVI model framework has not been extensively explored. Thus, there is a research gap regarding the strategic synergy between the SAVI learning model and the use of Macromedia Flash in improving mathematics learning outcomes, especially in geometry material at the junior high school level.

The novelty and originality of this research are reflected in two main aspects. First, this study strategically integrates the SAVI learning model with the use of Macromedia Flash as a mathematics learning aid to optimize the advantages of SAVI through multimedia utilization, while filling the gap in collaborative research that has rarely been conducted previously (Fajriah, et al., 2020; Yunus, et al., 2022; Liberna & Nusantari, 2018). Second, this study specifically categorizes the sample based on learning motivation levels—high, medium, and low—thus allowing for an in-depth analysis of the contribution and interaction between the learning model and students' motivation levels on mathematics learning outcomes. Thus, a more comprehensive understanding is obtained regarding the factors that influence the effectiveness of innovative learning.

The main objective of this study is to examine the effectiveness of the SAVI learning model assisted by Macromedia Flash compared to conventional learning models on the subject of cubes and cuboids, as well as to analyze the influence of students' learning motivation levels (high, medium, low) and their interaction on mathematics learning outcomes. By grouping the sample based on motivation levels, this study is able to provide new insights into the effectiveness of learning interventions tailored to students' psychological characteristics.

Previous studies generally only examined one aspect, such as the effectiveness of the SAVI model or the use of multimedia separately, without holistically examining the relationship between learning models, learning motivation, Macromedia Flash utilization, and student learning outcomes (Fajriah, et al., 2020). In addition, research that explicitly categorizes samples based on learning motivation categories is still very rarely found in the literature, especially in the context of technology-based mathematics learning. Therefore, this study is expected to fill the gap in the literature and broaden understanding of the synergy between pedagogical innovation, digital technology integration, and students' psychological characteristics in improving the quality of mathematics learning.

METHOD

This study uses a quantitative approach with a quasi-experimental design to test the effectiveness of the SAVI (Somatic, Auditory, Visual, Intellectual) learning model assisted by Macromedia Flash in terms of students' motivation levels and mathematics learning outcomes on cube and cuboid geometry material. The study population consisted of all 158 eighth-grade students of a junior high school in Purworejo, Indonesia. The research sample was selected using a cluster random sampling technique to obtain two classes, with a total of 55 students, each of which was used as an experimental group and a control group. The experimental class received learning with the SAVI model assisted by Macromedia Flash, while the control class followed conventional learning.

Prior to the treatment, all sampled students were assessed for their learning motivation using a motivation questionnaire that had been validated by mathematics education experts. The motivation questionnaire was constructed based on eight indicators according to Uno (2023), namely: (1) persistence in facing tasks, (2) diligence in overcoming difficulties, (3) interest and attention to tasks, (4) aspirations and future goals, (5) appreciation of achievement results, (6) interest in learning activities, (7) desire for independence, and (8) ability to maintain opinions and not give up easily. Based on the questionnaire scores, students were categorized into three motivation levels: high, medium, and low. These motivation level categories served as the basis for grouping subjects in the analysis of the interaction between learning models and learning motivation on mathematics learning outcomes.

The research instruments consisted of a multiple-choice mathematics achievement test developed based on learning outcome indicators for cubes and cuboids. The learning outcome indicators included: (1) describing the properties of cubes and cuboids, (2) calculating the surface area of cubes and cuboids, (3) calculating the volume of cubes and cuboids, (4) identifying the elements of cubes and cuboids, (5) solving contextual problems related to cubes and cuboids, and (6) applying the concepts of cubes and cuboids in everyday life. All research instruments, including the learning motivation questionnaire and mathematics achievement test, had undergone validation by mathematics education experts and had been tested for reliability, thus ensuring their appropriateness for data collection in this study.

The data collection procedure began with administering a pretest to both groups to measure students' initial abilities, followed by implementing instruction according to the respective treatment in each class over four meetings, and concluded with a posttest and the refilling of the motivation questionnaire referring to the eight motivation indicators from Uno (2023). All student achievement and motivation data were then analyzed using a two-way ANOVA test to determine the effect of the learning model, motivation level (high, medium, low), and their interaction on students' mathematics learning outcomes.

All stages of the research were conducted in accordance with ethical principles, including obtaining official permission from the school, maintaining student confidentiality, and ensuring that the data were used solely for academic purposes. The research design and procedures were arranged to be transparently replicable by other researchers and to provide an empirical contribution to the development of innovative, technology-based learning models.

The following is a flowchart of the research process used in this study:

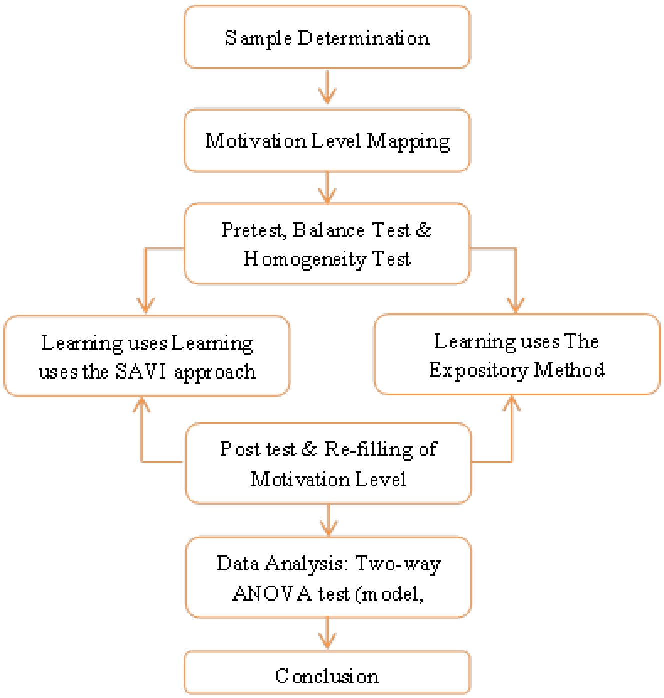

Figure 1. Stages of Quasi Experiment Research (adapted from Triyono, 2024b)

With these systematic stages and flows, research can be carried out transparently, validly, and can be replicated by other researchers.

RESULTS AND DISCUSSION

RESULTS

1. Initial Motivation Measurement: Questionnaire Completion and Categorization

Before the learning intervention, all sample students participated in the measurement of their mathematics learning motivation by completing a questionnaire validated by a mathematics education expert. This questionnaire was designed to objectively capture students' motivation levels across cognitive, affective, and conative aspects.

The measurement of learning motivation in this study uses a number of indicators which include: (1) Academic Goal Orientation; (2) Persistence and Perseverance; (3) Interest in Mathematics; (4) Self-Regulation, and (5) Response to Reinforcement. Each indicator is measured through statements on a questionnaire with a Likert scale of 1–5 (strongly disagree – strongly agree). The total questionnaire score determines the category of student learning motivation as follows (Arikunto, 2021): High: Score > X + 1SD; Medium: X – 1SD ≤ Score ≤ X + 1SD, and Low: Score < X – 1SD, where X = the average score of all students, and SD = standard deviation). Based on the measurement results, the distribution of students according to motivation category is as follows:

Table 1. Distribution of Students Based on Group and Level of Learning Motivation

Group	High	Currently	Low	Amount
Test	9	15	7	31
Control	6	8	10	24
Total	**15**	**23**	**17**	**55**

2. Pretest of Mathematics Learning Outcomes

After the motivational grouping, all students were given a multiple-choice pretest on cubes and cuboids to measure their initial abilities before the treatment. The pretest results showed a difference in average scores between the two groups.

Table 2. Mean and Standard Deviation of Pretest Learning Outcomes

Group	Tariffs	Standard Deviation
Experiment	63,45	16.53
Control	53,58	15,15

The average pretest score for the experimental group was higher (63.45) than the control group (53.58), with a larger data distribution in the experimental group (SD = 16.53) than in the control group (SD = 15.15). This indicates that before the treatment, there was a difference in initial ability between the two groups, but both were still within the moderate score range.

Normality, homogeneity, and balance tests were then conducted as prerequisite tests. The Shapiro-Wilk normality test produced significance values: experimental group: Sig. = 0.203 > α = 0.05, and Control group: Sig. = 0.988 > α = 0.05, indicating that the pretest score data in both groups were normally distributed. The Bartlett homogeneity test yielded Sig. = 0.073 > α = 0.05, indicating that the variance of pretest data between groups was homogeneous. The balance test using the Independent Sample t-Test produced Sig. (2-tailed) = 0.083 > 0.05, indicating no significant difference in initial ability between the groups. Thus, the experimental design was valid for objectively measuring the effectiveness of the intervention in the next stage.

3. Learning Behavior

Over four meetings, the two sample groups received different learning treatments according to the research design. In the experimental class, the SAVI (Somatic, Auditory, Visual, Intellectual) learning model was implemented, integrating physical activity, auditory engagement, visualization, and intellectual reasoning systematically. Each session began with motivation and apperception, linking the material to students' daily experiences and clearly communicating learning objectives.

In the somatic phase, students actively constructed models of cubes and cuboids using popsicle sticks or folded paper in groups. Through these activities, students observed and identified the properties of geometric shapes from concrete models they created themselves. In the auditory phase, the teacher facilitated group discussions, students verbally shared their observations, listened to additional explanations, and followed instructions. The teacher also played short audio explanations on the characteristics of cubes and cuboids to reinforce understanding. In the visual phase, learning was supported by interactive animations using Macromedia Flash. The teacher displayed simulations showing transformations, nets, and dimensional comparisons of cubes and cuboids. Students observed these simulations, redrew nets in their workbooks, and paid attention to visual examples highlighted with different colors or icons.

Figure 2. Macromedia Flash Interactive Animation Display: Students can rotate the cube model, display the net, and change the color of the plane to clarify the concepts of volume and surface area.

In the intellectual phase, the teacher provided problem-solving tasks to be completed by students individually or in groups in the form of small projects or case studies. Students were encouraged to make predictions, draw conclusions, and present solutions to the class. The teacher also guided students in reflecting and summarizing learning outcomes at the end of each meeting.

All stages of the SAVI model were designed to optimally integrate physical, auditory, visual, and intellectual activities within the learning process. The learning process was interactive, contextual, and enjoyable, supported by Macromedia Flash digital media which clarified abstract concepts through dynamic visualizations and simulations.

In the control class, learning was conducted conventionally with a teacher-centered approach. The teacher opened lessons with greetings, took attendance, and communicated objectives orally. Apperception was conducted by asking about previous material, without visual or contextual hooks. In the main activity, the teacher explained cubes and cuboids verbally, wrote formulas, and drew shapes manually on the board. Students took notes, listened to explanations, and worked on exercises individually. Interaction in the control class was one-way and lecture-dominated, with limited question-and-answer sessions. In the closing phase, the teacher reviewed the material briefly, assigned homework, and ended the lesson. Conventional learning in the control group did not use modern visual or multimedia aids, and student engagement was more passive compared to the experimental group.

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4. Posttest of Learning Outcomes and Re-Completion of Motivation Questionnaire

After the entire series of learning treatments, all students in both groups took a posttest with questions equivalent to the pretest to measure final learning outcomes on cubes and cuboids. Additionally, students completed the learning motivation questionnaire again to identify potential changes in motivation after learning.

Table 3. Mean and Standard Deviation of Posttest Learning Outcomes

Group	Pretest (Rate-rate ± SD)	Post-test (Mean ± SD)
SAVI	63,45 ± 16,53	77,58 ± 9,175
Control	53,58 ± 15,15	75,50 ± 13,208

From the table above, the mean posttest score of the experimental group was 77.58 with a standard deviation of 9.175, while the control group had a mean of 75.50 with a standard deviation of 13.208. The mean posttest scores of both groups were higher than the pretest means, indicating improved learning outcomes after treatment in each group.

In addition to the test results, the repeated learning motivation questionnaire indicated a tendency for increased student motivation, especially in the experimental group, who found the learning more engaging and interactive.

5. Data Analysis: Two-Way ANOVA Test

Before the main hypothesis test with two-way ANOVA for unequal cells, prerequisite tests were conducted, namely the normality test and homogeneity test. The Shapiro-Wilk normality test on the posttest data showed that the experimental group had a significance value (Sig.) of 0.059 and the control group 0.55. Both were greater than $\alpha = 0.05$, so the data in both groups were normally distributed. The Bartlett homogeneity test resulted in Sig. 0.660 (> 0.05), indicating that the posttest variances were homogeneous. With these prerequisites fulfilled, hypothesis analysis could proceed using a two-way ANOVA with unequal cells.

Table 4. Summary of Hypothesis Test Results (Tests of Between-Subjects Effects)

Source	Type III Sum of Squares	f	Mean Square	F	Say.	Test Decision
Method	1686.558	1	1686.558	6.742	,012	H_0 rejected
Motivation	821.861	2	410.931	1.643	,204	H_0 accepted
Method * Motivation	333.750	2	166.875	0,667	,518	H_0 accepted

Based on Table 4, the following results were obtained:

First hypothesis test (influence of learning method): H_0 is rejected (Sig. 0.012 < 0.05), meaning there is a significant difference in the average geometry learning outcomes between students who use the SAVI method and those who use the conventional method.

Second hypothesis test (motivation influence): H_0 is accepted (Sig. 0.204 > 0.05), meaning that there is no significant difference in the average geometry learning outcomes between students with high, medium, and low levels of motivation.

Third hypothesis test (interaction between method and motivation): H_0 is accepted (Sig. 0.518 > 0.05), meaning that there is no significant difference in the average geometry learning outcomes due to the interaction between learning methods and students' level of learning motivation.

Because there are significant differences in the use of learning methods, further testing was conducted to determine which method is more effective for students' geometry learning outcomes. The further test used is the Scheffé Test (multiple comparisons). The Scheffé Test will produce 3 comparisons of the average geometry learning outcomes of students based on: (1) the use of learning methods; (2) the level of motivation; (3) the interaction between the use of methods and the level of motivation; and; (4) motivation levels with different categories.

The results of the Scheffe' Test regarding comparisons based on learning methods are explained in Table 5.

Table 5. Average Comparison Results Based on Method

Method	Means	Standard Error	95% Confidence Interval
SAVI	77.58	2.985	58.154 – 70.153
Conventional	75.50	3.300	45.969 – 59.231

The average difference in geometry learning outcomes between the SAVI and conventional methods was 2.08, with the SAVI group's average being higher. This indicates that learning with the SAVI method produces better geometry learning outcomes. Results of the Scheffe' Test regarding comparison based on motivation level.

Table 6. Average Comparison Results Based on Motivation Level

Motivation	Means	Standard Error	95% Confidence Interval
High	57.694	4.168	49.318 – 66.070
Currently	54.000	3.462	47.042 – 60.958
Low	63.436	3.897	55.604 – 71.268

Students with low motivation actually achieved the highest average score (63.436), followed by those with high motivation (57.694) and those with moderate motivation (54.000). However, this difference was not statistically significant.

The results of the Scheffe' Test regarding the comparison based on the interaction of method and motivation, as presented in Table 7.

Table 7. Results of Comparison of Average Values Based on the Interaction of Method and Motivation

Method	Method	Motivation	Means	95% Confidence Interval
CLAY	high	65.889	5.272	55.294 – 76.484
	currently	61.000	4.084	52.793 – 69.207
	low	65.571	5.978	53.558 – 77.585
Conventional	high	49.500	6.457	36.524 – 62.476
	currently	47.000	5.592	35.762 – 58.238
	low	61.300	5.002	51.249 – 71.351

In both the SAVI and conventional methods, low motivation produced the highest mean scores, but the differences between the groups were also not significant.

The results of the Scheffe' Test further compare the levels of motivation with different categories, as presented in Table 8.

Table 8. Results of Multiple Comparisons (Scheffé Test)

(I) Motivation	(J) Motivatio n	Mean Difference (I-J)	Standard Error	Say.	95% Confidence Interval
High	currently	3.2029	5.24925	,831	-10.049 – 16.455
	low	-3.7255	5.60300	,802	-17.870 – 10.419
Currently	high	-3,2029	5.24925	,831	-16.455 – 10.049
	low	-6.9284	5.05891	,398	-19.700 – 5.843
Low	high	3.7255	5.60300	,802	-10.419 – 17.870
	currently	6.9284	5.05891	,398	-5.843 – 19.700

All significance values in the table above are greater than 0.05, so there is no significant difference between students with high, medium, or low motivation.

Based on the results of the hypothesis test above, it can be said that: (1) There is a significant difference in geometry learning outcomes between students who follow SAVI learning and students who follow conventional learning. The SAVI method is proven to be more effective; (2) There is no significant difference in geometry learning outcomes between students with high, medium, and low motivation levels; (3) There is no significant interaction between learning methods and motivation levels in influencing students' geometry learning outcomes, and; (4) The results of further tests also confirm that differences in motivation levels do not have a significant impact on learning outcomes, either in general or in interaction with learning methods. Thus, the SAVI learning model consistently provides better learning outcomes, without being influenced by variations in students' learning motivation levels.

DISCUSSION

The results of this study clearly demonstrate that the application of the SAVI (Somatic, Auditory, Visual, Intellectual) learning model supported by Macromedia Flash has a significant impact on improving students' mathematics learning outcomes, particularly on the topics of cubes and cuboids, compared to conventional instruction. Quantitative data from a two-way ANOVA test of unequal cells show that the learning method variable is significant ($p = 0.012 < 0.05$), indicating a real difference in learning outcomes between the SAVI and conventional groups. The average learning outcome in the SAVI group (64.153) is also much higher than that of the conventional group (52.600), indicating the effectiveness of this approach in promoting a deeper understanding of geometric concepts. However, the variable of student learning motivation—whether high, medium, or low—does not show a significant effect on mathematics learning outcomes ($p = 0.204 > 0.05$), nor does the interaction between learning method and motivation level ($p = 0.518 > 0.05$), which is also not significant.

Consistent with previous literature, these findings reinforce empirical evidence from Kusrini, et al. (2025), Fajriah, et al. (2020), Widyawati, et al. (2018), and Sahara, et al. (2018) which emphasize the superiority of the SAVI model, especially when combined with digital technology, in improving mathematics learning outcomes and student engagement. Multimedia support such as Macromedia Flash has been proven effective in concretizing abstract concepts and enhancing motivation and understanding, as reported by Nelwati, et al. (2019) and Nurjanah, et al. (2021), in both offline and online learning. Thus, the integration of the SAVI model and interactive media not only overcomes the limitations of conventional approaches but also encourages more inclusive and meaningful mathematics learning.

Specifically in geometry learning, the SAVI model is highly effective because it bridges students' difficulties in understanding spatial and visual concepts that are inherently abstract. Somatic activities such as constructing models of cubes and cuboids, visual exploration through Macromedia Flash animations, auditory discussions, and intellectual problem-solving provide concrete learning experiences that are crucial in geometry. Thus, students not only understand the properties of geometric solids theoretically but are also able to visualize, manipulate, and apply them in real-world contexts. This is in line with the findings of Widyawati, et al. (2018) and Sahara, et al. (2018), who demonstrated significant improvements in geometry learning outcomes and increased student enthusiasm when the SAVI-based approach was implemented.

The significance of this research lies in the evidence that SAVI-based learning innovations and digital multimedia significantly enhance mathematics learning outcomes in geometry. In addition to confirming previous findings, this study provides an important contribution by offering practical solutions for mathematics learning, which has long been considered abstract and difficult. Theoretically, this study expands the understanding of the advantages of collaborative and contextual SAVI strategies, while practically providing references for teachers and educational policymakers to implement multimedia-assisted SAVI models as a leading approach in the digital era.

The role of the SAVI model in geometry learning is also supported by constructivist learning theory and multimodality theory. Students construct their geometric knowledge through direct experience—for example, designing and manipulating geometric solid models—which aligns with the principles of active learning. By engaging multiple senses simultaneously, SAVI ensures that each student, regardless of their learning style, has an optimal opportunity to fully understand and apply geometric concepts.

The finding of no significant effect of learning motivation or its interaction with the learning model can be explained by highlighting the characteristics of SAVI, which can stimulate various aspects of motivation as described by Uno (2023). The SAVI model, with its somatic, auditory, visual, and intellectual activities designed interactively and contextually, is able to foster students' persistence in facing tasks, develop diligence in overcoming difficulties, and enhance interest and attention to tasks. The learning experiences provided can also inspire students' aspirations and future goals, promote appreciation of achievement, foster interest in learning activities, cultivate independence in the learning process, and train students' ability to maintain their opinions and not give up easily. Therefore, all students—regardless of their initial motivation—receive strong learning stimuli, so that optimal engagement and achievement can be reached. This shows that innovative learning models such as SAVI can function as effective equalizers, balancing the chances of success among students with different motivational characteristics.

Practically, this research emphasizes the importance for mathematics teachers to adopt the SAVI model assisted by Macromedia Flash to enhance the effectiveness of geometry learning and overcome the limitations of conventional instruction. However, this study still has limitations in terms of sample scope, material focus only on cubes and cuboids, and has not explored long-term effects or external factors such as technological readiness and learning environment. Therefore, further research is recommended to expand the scope of materials and samples, test the effectiveness of SAVI at various levels, and conduct longitudinal and qualitative studies to better understand the impact of innovative technology-based learning on students' mathematics learning outcomes and experiences.

Overall, this research makes a significant contribution to the development of mathematics education practices and literature in the digital era. The integration of SAVI and digital media has been proven to significantly improve geometry learning outcomes without being affected by variations in motivation, and it reinforces the urgency of mathematics learning reform based on pedagogical innovation and digital technology that is responsive to the needs and characteristics of 21st-century students. The main recommendation for education practitioners is the importance of adopting interactive, contextual, and technology-based learning approaches to make the learning experience more enjoyable, effective, and relevant to future challenges.

CONCLUSION

The application of the SAVI learning model assisted by Macromedia Flash is significantly more effective in improving mathematics learning outcomes on cube and block material compared to conventional learning. This is proven by the results of the two-way ANOVA test which shows a significance value of $0.012 < 0.05$, with the average learning outcomes of the SAVI group being 64.153 and the conventional group being 52.600, so there is a difference in the average of 11.553 points. Furthermore, the level of student learning motivation (high, medium, low) does not have a significant effect on learning outcomes, as indicated by a significance value of $0.204 > 0.05$, where the average learning outcomes of each motivation group are 57.694 (high), 54.000 (medium), and 63.436 (low). In addition, no significant interaction was found between the learning model and the level of motivation on student learning outcomes (significance value of $0.518 > 0.05$). Thus, the use of the SAVI model assisted by digital multimedia can improve mathematics learning outcomes evenly without being influenced by differences in student motivation levels. This study emphasizes the urgency of technology-based pedagogical innovation in mathematics learning, and recommends the application of the SAVI model assisted by multimedia in various materials and educational levels, as well as the need for further longitudinal research and qualitative analysis to enrich understanding of the effectiveness of this model

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