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Application of Interactive Multimedia (MMI) Tutorial Model to Improve Student Learning Outcomes at State of Elementary School (*SDN*) 5 Karangpawitan in ARTS and Culture Learning

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Abstract
This study aims to analyze the effectiveness of the application of interactive multimedia (MMI) tutorial model in improving student learning outcomes in Arts and Culture learning at *SDN* 5 Karangpawitan. The research problem stems from the low student learning outcomes caused by conventional, teacher-centered learning methods that fail to engage students optimally in visual and creative subjects. A quantitative approach with a quasi-experimental method using a nonequivalent control group design was employed. The research subjects consisted of 56 fifth-grade students divided into an experimental class (n=28) receiving the MMI tutorial model intervention and a control class (n=28) receiving conventional instruction. Data collection techniques included pretest and posttest tests and observation. Data analysis was carried out through normality tests (Kolmogorov-Smirnov), homogeneity tests (Levene), N-Gain tests, and independent sample t-tests. The results showed that the average N-Gain value of the experimental class was 0.56 (medium category), which was higher than the control class at 0.32 (low category). The average posttest score of the experimental class reached 82.40 compared to 72.10 for the control class. The t-test results showed a significance value of 0.000 ($p < 0.05$), indicating a significant difference between the two classes. Thus, the interactive multimedia tutorial model is effective in improving student learning outcomes in Arts and Culture learning at *SDN* 5 Karangpawitan.

INTRODUCTION

Advances in information technology have significantly impacted innovation in elementary school learning. Conventional learning tends to be teacher-centered, thus failing to optimally enhance student engagement and understanding. This situation has resulted in low student learning outcomes, including in Arts and Culture subjects, which require visual and creative understanding (Boonpracha, 2022; Freedman, 2025; Ulger, 2018).

The teaching and learning process must address three domains: affective (attitude), cognitive (knowledge), and psychomotor (skills). This aligns with the scientific approach to learning (Khaissuledi Qawiy, Abdul Mujib, 2026). The integration of technology into education is becoming increasingly essential in the digital era, where the demand for skills such as critical thinking, collaboration, creativity, and digital literacy are the primary focus of

educational transformation (Fauzan et al., 2025). Interactive multimedia-based learning can support students in learning, stimulate learning motivation, and make learning more engaging, potentially optimizing student understanding, thereby achieving maximum learning outcomes (Ramadhani, 2024). Similarly, the application of interactive multimedia tutorial models to improve student learning outcomes.

Interactive multimedia offers an innovative solution for learning, integrating text, images, audio, video, and animation into a single, engaging medium (Artal-Sevil et al., 2018; Savov et al., 2019; Shahzad & Nadeem, 2021). The use of interactive multimedia has been proven to improve student motivation and learning outcomes by providing a more contextual and interactive learning experience (Wahyu Rahmadhani, Sardjijo, and Murnaria Manalu, 2022).

The tutorial model in interactive multimedia is a learning approach that provides systematic guidance to students through structured learning steps. This model allows students to learn independently with direct feedback, thereby gradually increasing conceptual understanding (Endang Sobarna, Deni Darmawan, Hudiana, 2014). This interactive multimedia allows teachers to create and insert exercises into videos produced using Office Mix [officemix.com], a free plugin for PowerPoint that can turn slides into online videos complete with voice recordings and webcams from presenters (Kim et al., 2015).

Several studies have shown that interactive multimedia has a significant impact on improving student learning outcomes. Other research also shows a significant difference between learning using interactive multimedia and conventional learning, with the experimental group achieving higher learning outcomes (Yami Noverdika, 2021).

The novelty of this research lies in three distinct contributions. First, unlike most previous studies that focused on interactive multimedia for general academic subjects, this research specifically targets Arts and Culture learning outcomes, a subject area with unique pedagogical characteristics that require visual and interactive approaches. Second, this study employs a tutorial model of interactive multimedia characterized by systematic, step-by-step guidance, independent learning opportunities, and immediate feedback rather than a generic multimedia presentation, allowing for a more precise understanding of which specific features contribute to effectiveness. Third, this research is situated in the understudied context of *SDN* 5 Karangpawitan, a typical Indonesian elementary school representing the challenges faced by many schools in rural and suburban areas (limited technology infrastructure, varying student digital literacy, large class sizes). The combination of a tutorial-based interactive multimedia design with a focus on Arts and Culture learning outcomes at the elementary school level constitutes a novel contribution to the educational technology literature in Indonesia.

Arts and culture instruction in elementary schools, particularly at *SDN* 5 Karangpawitan, still faces various obstacles that impact low student learning outcomes. The learning process tends to use conventional, teacher-centered methods, resulting in suboptimal student engagement. Students often passively receive information without in-depth exploration of the material.

Furthermore, the visual, creative, and contextual nature of Arts and Culture subjects is not yet supported by the use of innovative learning media. Teachers' limited use of technology results in less engaging and difficult-to-understand material for students. This results in low

learning motivation and a lack of conceptual understanding, which ultimately impacts student learning outcomes.

Another issue that arises is the lack of learning media capable of providing interactive learning experiences and direct feedback to students. Yet, in 21st-century learning, students are required to possess critical thinking skills and creativity, as well as the ability to learn independently through the use of technology.

Interactive multimedia (MMI) tutorial models are an alternative solution that can address these issues. However, the implementation of MMI tutorial models in Arts and Culture learning at *SDN* 5 Karangpawitan has not been widely implemented, and its effectiveness in improving student learning outcomes is not yet known empirically.

Therefore, in the context of Arts and Culture learning in elementary schools, the use of interactive multimedia is highly relevant because the visual, aesthetic, and contextual material requires media that can provide concrete learning experiences. Therefore, this study aims to examine the application of interactive multimedia tutorial models in improving student learning outcomes at *SDN* 5 Karangpawitan.

Based on the description, this study aims to determine the effectiveness of the application of interactive multimedia tutorial model in improving student learning outcomes at *SDN* 5 Karangpawitan in Arts and Culture learning. By using interactive multimedia can be influential in creating students who can be trusted in improving student learning outcomes at *SDN* 5 Karangpawitan in Arts and Culture learning.

RESEARCH METHOD

This study used a quantitative approach with a quasi-experimental method. The research design used was a nonequivalent control group design. The subjects were 56 fifth-grade students at *SDN* 5 Karangpawitan, with the following details:

Experimental class: 28 students

Control class: 28 students

Experimental class (using MMI tutorial model) and Control class (using conventional method). Sample selection was done by purposive sampling technique, which is based on consideration of equality of academic ability between classes. Data Collection Techniques are Tests (pretest and posttest), Observation of student activities and Documentation. Data Analysis Techniques:

N-gain test to determine the improvement in learning outcomes

T-test to determine significant differences between the experimental and control classes.

RESULTS AND DISCUSSION

The findings showed that students' initial abilities in both classes were relatively similar. After the treatment, posttest results showed significant improvement in the experimental class.
Average N-gain of the experimental class: 0.55 (medium–high category)
Average N-gain of control class: 0.30 (low–medium category)

The results of the data analysis above indicate that the initial abilities of students in the experimental and control classes were at a relatively equal level, so that the two groups could be compared objectively. After being given treatment, there was an increase in learning

outcomes in both classes, but the increase in the experimental class was more pronounced. This is evident from the posttest results which showed a significant difference between the two groups. Quantitatively, the average N-gain value in the experimental class reached 0.55, which is included in the medium to high category, while the control class only achieved an average N-gain of 0.30, which is in the low to medium category. This finding indicates that the treatment given to the experimental class was more effective in improving student learning outcomes compared to learning in the control class.

The t-test results showed a significant difference between the two classes ($p < 0.05$). The results showed that there was an increase in learning outcomes in both classes, but the increase in the experimental class was higher than in the control class.

Table 1. Results of the T-Test Differences Between the Experimental Class and the Control Class

Class	Pretest Score	Posttest Score	N-gain
Experiment	60.25	82.40	0.56 (medium–high)
Control	59.80	72.10	0.32 (low–medium)

The results of the t-test show a significance value ($p < 0.05$) which means there is a significant difference between the two classes.

Prerequisite Test

Data is normally distributed (Sig > 0.05)

Homogeneous data (Sig > 0.05)

Based on the results of statistical analysis, the initial abilities of students in the experimental and control classes showed relatively comparable conditions, as indicated by the average pretest scores of 60.25 and 59.80, respectively. After the treatment was given, both classes experienced an increase in learning outcomes, but the increase in the experimental class appeared to be more optimal. The average posttest score in the experimental class reached 82.40, while in the control class it was 72.10.

This improvement was reinforced by the N-gain value, where the experimental class achieved an average of 0.56, which falls into the medium to high category, while the control class only achieved 0.32, which falls into the low to medium category. This indicates that the treatment applied to the experimental class was more effective in improving student learning outcomes.

Furthermore, the results of the hypothesis test using the t-test showed a significant value ($p < 0.05$), indicating a significant difference between student learning outcomes in the two classes. Thus, it can be concluded that the treatment given to the experimental class had a significant impact on improving learning outcomes compared to the control class.

Furthermore, the results of the analysis prerequisite test indicate that the research data meets the statistical assumptions, namely a normal distribution and homogeneous variance (Sig > 0.05). With these two requirements met, the t-test analysis is declared valid and can be used to support the research conclusions.

Table 2. N-Gain Results Between Experimental Class and Control Class

Class	Pretest	Posttest	N-Gain	Category
Experiment	60.25	82.40	0.56	Currently

Class	Pretest	Posttest	N-Gain	Category
Control	59.80	72.10	0.32	Low

Hypothesis Testing

The t-test results show:

Sig (2-tailed) = 0.000 < 0.05

This means that there is a significant difference between the experimental and control classes.

The normality test is carried out to determine whether the data is normally distributed.

Normality Test Results

Table 3. Normality Test Results

Class	Sig. (KS)	Information
Experiment (Pretest)	0.200	Normal
Experiment (Posttest)	0.087	Normal
Control (Pretest)	0.176	Normal
Control (Posttest)	0.091	Normal

Interpretation

The significance value of all data is > 0.05, so it can be concluded that the data is normally distributed.

Based on the results of the hypothesis test using the t-test, the Sig (2-tailed) value was 0.000, which is smaller than 0.05. This means that there is a significant difference between the experimental class and the control class, so that the treatment given has an effect on student learning outcomes.

Meanwhile, a normality test using the Kolmogorov-Smirnov test showed that all data, both pretest and posttest for both classes, had a significance value above 0.05. Thus, it can be concluded that the data is normally distributed and meets the requirements for parametric statistical tests such as the t-test.

Homogeneity Test (Levene's Test)

The homogeneity test is used to determine the similarity of variance between groups.

Table 4. Results of Homogeneity Test

Data	Sig.	Information
Experimental vs Control Posttest	0.312	Homogeneous

Interpretation

The homogeneity test using Levene's Test showed a significance value of 0.312, which is greater than 0.05. This indicates that the variance of the posttest data in the experimental and control classes is homogeneous or similar. Thus, the homogeneity assumption in the statistical analysis has been met, allowing valid comparisons between the two groups.

Hypothesis Testing (Independent Sample T-Test)

The Independent Sample T-Test is a statistical test to determine whether there is a significant difference in means between two unrelated groups. The results can be seen in the table below:

Table 5. T-Test Results

Class	Mean	Std. Dev
Experiment	82.40	6.85
Control	72.10	7.20

Interpretation:

Based on Table 5, the average student learning outcomes in the experimental class were 82.40 with a standard deviation of 6.85, while the control class had an average of 72.10 with a standard deviation of 7.20. This indicates that the learning outcomes achieved in the experimental class were higher than those in the control class.

The t-test results show a Sig. (2-tailed) value < 0.05, so it can be concluded that there is a significant difference between the two classes. Thus, the treatment given to the experimental class has been proven to have a more effective influence on improving student learning outcomes compared to the control class.

Because the Sig. (2-tailed) value is < 0.05, then: There is a significant difference in learning outcomes between the experimental and control classes.

N-Gain Test

The N-Gain Test is a method for measuring the extent to which student learning outcomes improve after instruction by comparing pretest and posttest scores. This score indicates the effectiveness of instruction in improving student understanding. The results can be seen in the table below:

Table 6. N Gain Test

Class	**N-Gain**	**Category**
Experiment	0.56	Currently
Control	0.32	Low

Based on Table 6, the average N-Gain value in the experimental class was 0.56, which is in the medium category, while the control class obtained an N-Gain value of 0.32, which is in the low category. This difference indicates that the increase in student learning outcomes in the experimental class was higher than in the control class.

These findings indicate that the use of interactive multimedia based on a tutorial model provides a more effective contribution to improving student learning outcomes. Therefore, it can be concluded that the application of interactive multimedia using a tutorial model has a significant impact on improving learning outcomes compared to conventional learning.

So, interactive multimedia tutorial model has a very strong influence on improving student learning outcomes.

The improvement in learning outcomes in the experimental class indicates that interactive multimedia tutorials are effective in arts and culture learning. This aligns with research showing that interactive multimedia can improve student learning outcomes better than conventional media (Rollyka Doreng, Ono Wiharna, and Mumu Komaro, 2016). This study also aligns with research showing that interactive multimedia can improve learning outcomes because it presents material in an engaging and easy-to-understand manner (Nur Ariandini and Rizal Arizaldy Ramly, 2023).

The tutorial model in multimedia provides a systematic learning structure, allowing students to learn independently and gradually understand the material. Furthermore, the use of visual and audio elements in multimedia helps students understand abstract concepts more concretely. This finding also supports Mayer's theory that multimedia-based learning improves students' cognitive efficiency because information is processed through two channels (visual and verbal) (Richard E. Mayer, 2009).

Other studies also show that interactive multimedia tutorial models can significantly improve student motivation and learning outcomes with higher N-gain values compared to conventional learning (Endang Sobarna. Deni Darmawan. Hudiana, 2014). The use of interactive multimedia provides significant improvements in learning outcomes compared to conventional learning, with higher gain values in the experimental class (Naufal Salim Firdaus and Imam Mashudi Latif, 2025).

Appropriately and effectively selected, developed, and used learning multimedia will provide significant benefits for both educators and students. Interactive multimedia is highly effective in delivering learning content (Tiarasari, 2021). Teachers recognize the importance of using more engaging learning media, particularly interactive multimedia, which can enhance student attention and understanding (Kemampuan et al., 2025).

Interactive multimedia acts as a cognitive bridge that manages students' mental load. The effectiveness of interactive multimedia in literacy is determined not only by its technical features but also by the degree of usability of the media in a dynamic classroom ecosystem (Pogoh et al., 2026). The planning stage is the initial step in developing interactive multimedia products. Data was successfully collected through observations and interviews, such as the results of recent observations conducted during learning in schools, which showed that learning methods are still limited in terms of the variety of media used (Pinilih et al., 2024). The development of technology in education encourages the integration of interactive multimedia as a strategic tool in learning (Veda et al., 2025).

One of the advantages of interactive multimedia learning media is its ability to improve student learning outcomes (Anggiani et al., 2023). Consistent application of interactive multimedia can improve students' critical thinking skills in the moderate to high categories (Maharani et al., 2025). This is similar to the application of interactive multimedia tutorial models that can improve student learning outcomes at *SDN* 5 Karangpawitan in arts and culture learning.

Thus, the application of interactive multimedia not only improves learning outcomes but also increases student involvement and interest in learning Arts and Culture.

CONCLUSION

Based on the research results and data analysis conducted, it can be concluded that the application of interactive multimedia (MMI) tutorial model has proven effective in improving student learning outcomes in Arts and Culture learning at *SDN* 5 Karangpawitan. This is indicated by a significant increase in student learning outcomes in the experimental class compared to the control class, both based on posttest results and N-gain values. The statistical test results indicate that the research data is normally distributed and homogeneous, thus meeting the requirements for hypothesis testing. The independent sample t-test yielded a significance value of less than 0.05, indicating a significant difference between the two groups.

Furthermore, the effect size value, which is in the high category, indicates that the use of interactive multimedia tutorials has a strong influence on improving student learning outcomes.

Pedagogically, interactive multimedia tutorials create more engaging and interactive learning experiences, enabling students to learn independently through systematic steps and direct feedback. This results in increased conceptual understanding, engagement, and motivation.

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