Proceedings Series on Social Sciences & Humanities, Volume 25
Proceedings of International Conference on Social Science (ICONESS)
ISSN: 2808-103X

The Effectiveness of Interactive Multimedia on Collaboration Skills and Science Learning Outcomes of Fifth-Grade Students at SDN 1 Kalibombong

Merry Metrika[1], Ristiana Dyah Purwandari[2]
[1]SD Negeri 1 Kalibombong, Kalibening, Banjarnegara
[2]Magister Pendidikan Dasar, Universitas Muhammadiyah Purwokerto

ARTICLE INFO

Article history:

DOI:
10.30595/pssh.v25i.1671

Submited:
July 22, 2025

Accepted:
August 11, 2025

Published:
August 24, 2025

Keywords:

Collaboration Skills; Interactive Multimedia; Natural Science

ABSTRACT

This mini research aimed to examine the effectiveness of interactive multimedia on collaboration skills and science learning outcomes concerning the human respiratory system among fifth-grade students at SDN 1 Kalibombong. Interactive multimedia on the respiratory system was directly utilized during the learning sessions for fifth graders. This study adopted an experimental research design with a quasi-experimental setup. The research procedure included a preparatory phase with initial observations and the development of research instruments, the implementation phase, and the conclusion phase. The subjects of this study were fifth-grade students at SDN 1 Kalibombong, Banjarnegara district. Data collection techniques used were observations, document analysis, surveys, and tests. Based on the t-test results for the collaboration skills variable, a tvalue of 2.125 was obtained, which is greater than the t-table value of 2.048, thus H1 was accepted. Similarly, the t-test results for the learning outcomes variable showed a tvalue of 3.112, exceeding the t-table value of 2.048, leading to the acceptance of H1. This mini research concludes that interactive multimedia is effective in enhancing collaboration skills and science learning outcomes related to the human respiratory system.

Corresponding Author:
Merry Metrika
SD Negeri 1 Kalibombong, Kalibening, Banjarnegara
Kalibombong, Kec. Kalibening, Kab. Banjarnegara, Jawa Tengah 53458
Email: metrikamerry04@gmail.com

1. INTRODUCTION

Every citizen in Indonesia has the right to education as stipulated in Article 31, Paragraph 1 of the 1945 Constitution. Education significantly influences the quality of human resources. The National Education System Law No. 20 of 2003, Article 1, Paragraph (1), defines education as a conscious and planned effort aimed at creating a learning environment and processes so that students actively explore their potential to possess spiritual strength, self-control, personality, intelligence, noble character, and skills necessary for themselves, the community, the nation, and the country. According to this law, education is fundamentally an endeavor to humanize, culturalizing, and civilize human beings, entrusted as leaders on Earth. For the Indonesian nation, this effort is anchored in the philosophy of Pancasila and the objectives of National Education (Semadi, 2019).

Education is a conscious and planned effort to develop individuals of character. The learning process is designed to assist students in developing their potential, skills, spiritual attitudes, intelligence, self-control, noble character, confidence, responsibility, and skills beneficial to themselves, their religion, community, nation, and country (Arwanda et al., 2020).

Learning activities are crucial in the educational process. The success of achieving learning objectives depends on teachers, as they not only deliver lessons but also guide students in developing their attitudes, physical, and psychological growth (Wulandari et al., 2023). This aligns with the goals of 21st-century learning, which focuses on students developing critical thinking, creativity, communication, and collaboration skills (Jannah & Atmojo, 2022; Rahayu et al., 2022). The aim of 21st-century learning is to develop students' capabilities not only in mastering knowledge but also in solving real-life problems. Thus, in 21st-century learning, students learn through experiences, applications, and real-world examples both inside and outside the school. Students need to possess collaboration skills to support their learning activities. Through collaboration skills, it is hoped that students can play an active role in solving problems.

However, in reality, collaboration skills are among several capabilities that are relatively underdeveloped in Indonesia. Initial observations conducted by the researcher in the fifth grade at SD Negeri 1 Kalibombong revealed several issues during classroom learning related to students' collaboration skills. The low level of collaboration skills is evident from the lack of active participation when working in groups, unfair task distribution, hesitation to express opinions within the group, and reliance on peers. If these issues are not addressed, they could significantly impact the quality of education. One noticeable problem is the impact on the students' learning outcomes, particularly in science subjects, which remain low.

Natural Science (IPA) or Science involves the systematic study of natural phenomena based on human experiments and observations (Samatoa, 2016:1). Understanding natural science can benefit human life, as humans coexist with nature. Therefore, science education is introduced early, starting at the elementary school level. The purpose of teaching science in schools is for students to gain mastery over knowledge, scientific attitudes, and process skills (Kumala, 2016: 10).

Science teaching in elementary schools needs to evolve with the times because a good education is one that develops in response to changes in the era. The science learning process should utilize concrete objects so that students can develop a solid understanding of natural phenomena (Chan, 2017). Access to concrete objects is not always easy, necessitating teacher creativity in managing appropriate and efficient learning media to achieve science learning objectives. Learning media are tools to convey messages that can stimulate thoughts, feelings, attention, interest, and the will of students toward achieving effective learning objectives. Issues in science education related to the use of learning media must be promptly addressed to effectively achieve the objectives of science education in developing students' capabilities in cognitive, affective, and psychomotor aspects.

Besides collaboration skills as essential for students in community life, in an era of globalization and modernization like today, humans increasingly rely on and require technological advancements. This reliance underscores that technology is one of the basic needs and desires of humans. From parents to young people, from experts to laypeople, technology is used in various aspects of life. Technology can enhance quality and reach if used wisely for education and training, and it plays a significant role in improving human economic welfare (Khotimah, 2019). The rapid development of science and technology further pushes for innovative uses of technological outcomes in the learning process. However, it is regrettable if this technology is not utilized effectively and maximally, such as for learning media in the classroom.

In 21st-century education, digital media emerges as a viable tool for teachers to provide meaningful and enjoyable learning experiences for students. Digital learning media are defined as learning media that produce a digital image, which can be processed, accessed, and distributed using digital devices (Batubara, 2021: 327). Digital media can be particularly useful in teaching abstract or intangible content more concretely and directly.

Given this context, digital technology-based media can be considered as an alternative solution to address the issues of low collaboration skills and science learning outcomes in the fifth grade at SD Negeri 1 Kalibombong. Building on the background provided, the researcher will conduct a study titled "The Effectiveness of Interactive Multimedia on Collaboration Skills and Science Learning Outcomes of Fifth-Grade Students at SDN 1 Kalibombong."

2. METHOD OF THE RESEARCH

The type of research conducted was experimental. "Experimental research is used to determine the effects of a specific treatment on another within controlled conditions" (Sugiyono, 2016). This study was classified as a Quasi-Experimental Design. This design includes a control group, but it does not fully function to control external variables affecting the execution of the experiment.

The research design utilized was the Nonequivalent Control Group Design. This design involved two classes: the experimental class and the control class. The control class did not receive the treatment, meaning multimedia was not used. In contrast, the experimental class was treated with interactive multimedia.

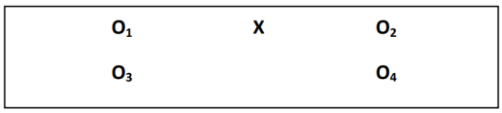

Figure 1. Nonequivalent Control Group Design

The independent variable in this study was interactive multimedia. The dependent variables were the collaboration skills of the students and their science learning outcomes. Testing techniques in this study included pretests and posttests administered to students. Non-test techniques consisted of observation, questionnaires, and documentation. Data analysis techniques used were end data analysis with a t-test.

3. RESULTS AND DISCUSSION

Validity Test

Validity refers to the ability of a measurement tool to accurately measure what it is intended to measure. This test is aimed at determining the validity of each question or statement in the instrument used during the research. In this study, the researcher conducted a trial with 16 fifth-grade students to assess the effectiveness of interactive multimedia in enhancing collaboration skills. The questionnaire instrument contained 16 statements covering 5 indicators of collaboration skills. The results showed that the calculated r_{value} for all items was greater than the r_{value} from the table, therefore, all questionnaire items were declared valid. Subsequently, all questionnaire items were tested on both the experimental and control classes. The validity of the questionnaire instrument was analyzed using SPSS software.

Reliability Test

The reliability test of an instrument is conducted to determine whether data can be considered dependable and trustworthy. The procedure for the reliability test involves comparing the significance level used with Cronbach's Alpha value.

In this study, the reliability test for the questionnaire instrument was conducted using SPSS. The results of the reliability test are as follows:

Table 1. Reliability Test of Questionnaire Instrument (Cronbach's Alpha)

Reliability Statistics

Cronbach's Alpha	N of Items
.935	16

Based on the SPSS output table above, the reliability test result for the questionnaire instrument shows a Cronbach's Alpha of 0.935, which is greater than 0.6. This indicates that, according to the criteria, the instrument is considered reliable.

Normality Test

The normality test in this study used the Kolmogorov-Smirnov statistical test, with the criteria being that if the significance value is greater than 0.05, the data are normally distributed, and if it is less than 0.05, the data are not normally distributed. The results of the normality test for the questionnaire instrument are presented below:

Table 2. Normality Test of Questionnaire Instrument (Kolmogorov-Smirnov)

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Collaboration Skills	1	.203	16	.076	.764	16	.001
	2	.207	15	.085	.875	15	.039

a. Lilliefors Significance Correction

Based on the SPSS output table above, the normality test of the questionnaire instrument shows significance values greater than 0.05, suggesting that the data are normally distributed. The significant values for

the experimental class are 0.203 and for the control class 0.207. Therefore, it can be concluded that H_0 is rejected, and H_1 is accepted. The following are the results of the normality test of the test instrument:

Table 3. Normality Test of Test Instrument (Kolmogorov-Smirnov)

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Learning Outcomes	1	.222	16	.034	.894	16	.064
	2	.269	15	.005	.922	15	.206

a. Lilliefors Significance Correction

According to the SPSS output table above, the normality test of the test instruments, both descriptive tests in the experimental and control classes, show significant values that are inconsistent with the normal distribution criteria for the Kolmogorov-Smirnov test. However, according to the Shapiro-Wilk test, they are normally distributed with significant values for the experimental class at 0.222 and for the control class at 0.269. Therefore, the conclusion drawn is that H_0 is rejected and H_1 is accepted.

Homogeneity Test

A homogeneity test is conducted once the normality of data has been established. Like the normality test, the homogeneity test is a prerequisite for determining whether further parametric or non-parametric t-tests are appropriate for analyzing the final research findings. Additionally, this test helps verify whether the variances across sampled populations are equal.

Table 4. Homogeneity Test of Questionnaire Instrument

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Collaboration Skills	Based on Mean	1.870	1	29	.182
	Based on Median	1.022	1	29	.320
	Based on the Median and with adjusted df	1.022	1	24.786	.322
	Based on trimmed mean	1.443	1	29	.239

Based on the SPSS output table above, the significant values for the 'Based on Mean' exceed 0.05, indicating homogeneity according to the test criteria with a significance value of 0.182. Therefore, it can be concluded that H_0 is rejected and H_1 is accepted. The following is the homogeneity test for the test instrument:

Table 5. Homogeneity Test of Test Instrument

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Learning Outcomes	Based on Mean	.046	1	29	.831
	Based on Median	.134	1	29	.717
	Based on the Median and with adjusted df	.134	1	28.949	.717
	Based on trimmed mean	.102	1	29	.752

According to the SPSS output table above for the test instruments used in the experimental and control classes, significant values for the 'Based on Mean' exceed 0.05, indicating homogeneity with a significant value of 0.831. Thus, it can be concluded that H_0 is rejected and H_1 is accepted.

Hypothesis Testing

Enhancement of Students' Collaboration Skills

The improvement in collaboration skills among students was evaluated using the Independent T-test. This test was employed to determine the effectiveness of interactive multimedia in enhancing the students' collaboration skills. Here are the results:

Table 6. Hypothesis Testing of Questionnaire Instrument (Independent T-Test)
Output First

Group Statistics

	Class	N	Mean	Std. Deviation	Std. Error Mean
Collaboration Skills	1	16	60.00	4.817	1.204
	2	15	55.47	6.937	1.791

From the "Group Statistics" table above, it is evident that the sample size consists of 16 students for the experimental class and 15 students for the control class. The mean scores are 60.00 for the experimental class and 55.47 for the control class. Descriptively, these mean values suggest a notable difference between the two classes. A subsequent table provides insights into whether these differences are statistically significant.

Table 7. Hypothesis Testing of Questionnaire Instrument (Independent T-Test)
Output Second

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Collaboration Skills	Equal variances assumed	1.870	.182	2.125	29	.042	4.533	2.133	.170	8.896
	Equal variances are not assumed.			2.100	24.789	.046	4.533	2.158	.086	8.980

The results show a mean difference of 4.533 between the two classes. The t_{value} of 2.125 has the t_{table} of 2.048, leading to the rejection of the null hypothesis (H_0) and acceptance of the alternative hypothesis (H_1). This outcome supports the conclusion that the use of interactive multimedia is effective in enhancing the collaboration skills of fifth-grade students.

Improvement in Students' Learning Outcomes

The learning outcomes from the descriptive test instrument for the experimental and control classes were evaluated using the Independent T-Test. This test aimed to determine the effectiveness of interactive multimedia in improving the science learning outcomes of fifth graders on the topic of the human respiratory system. The test was conducted using the SPSS software. Here are the results:

Table 8. Hypothesis Testing of Test Instrument (Independent T-Test)
Output First

Group Statistics

	Kelas	N	Mean	Std. Deviation	Std. Error Mean
Learning Outcomes	1	16	54.38	7.274	1.819
	2	15	46.67	6.455	1.667

From the "Group Statistics" table above, it can be noted that the sample consisted of 16 students in the experimental class and 15 in the control class. The mean score for the experimental class was 54.38, and for the control class, it was 46.67. This suggests that the experimental class, which used interactive multimedia, achieved higher scores than the control class. This descriptive statistic indicates a significant difference in outcomes between the two classes.

Table 9. Hypothesis Testing of Test Instrument (Independent T-Test)
Output Second

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Learning Outcomes	Equal variances assumed	.046	.831	3.112	29	.004	7.708	2.477	2.643	12.774
	Equal variances are not assumed.			3.125	28.920	.004	7.708	2.467	2.663	12.754

The mean difference between the two classes is 7.708. The calculated t_{value} of 3.112 exceeds the t_{table} of 2.048, leading to the rejection of the null hypothesis (H_0) and acceptance of the alternative hypothesis (H_1). These results indicate that the use of interactive multimedia is effective in enhancing the science learning outcomes of fifth-grade students studying the human respiratory system.

4. CONCLUSION

Based on the findings from the mini research study "The Effectiveness of Interactive Multimedia on Collaboration Skills and Science Learning Outcomes of Fifth Grade Students at SDN 1 Kalibombong," the following conclusions can be drawn:

1. The mini research efeutilized interactive multimedia that could be directly accessed by students using laptops in the classroom. The research procedures encompassed preparation, implementation, and completion stages.
2. The t-test results for collaboration skills yielded a calculated t_{value} of 2.125, which is greater than the t_{table} of 2.048, thus accepting H_1. Based on these findings, it can be concluded that interactive multimedia effectively enhances collaboration skills among Grade 5 students at SDN 1 Kalibombong in the subject of Science, specifically on the topic of the human respiratory system.
3. The t-test results for students' learning outcomes yielded a calculated t_{value} of 3.112, which is greater than the t_{table} of 2.048, thus accepting H_1. Based on these findings, it can be concluded that interactive multimedia effectively improves the learning outcomes of Grade 5 students at SDN 1 Kalibombong in the subject of Science, particularly on the topic of the human respiratory system.

REFERENCES

Anugerahwati, M. (2019). Integrating the 6Cs of the 21st century education into the English lesson and the school literacy movement in secondary schools. *ISoLEC: International Seminar on Language, Education, and Culture. Kne Social sciences*. Page 165-171.

Arsyad, Azhar. 2013. *Media Pembelajaran*. Jakarta: Raja Grafindo Persabda.

Astuti, Fiki Kusuma., Edy Cahyono., & Supartono. (2018). *Effectiveness Of Elements Periodic Table Interactive Multimedia In Nguyen Tat Thanh High School. International Journal of Indonesian Education and Teaching.* 2(1):1-10

Asyhar, Rayandra. 2012. *Kreatif Mengembangkan Media Pembelajran*. Jakarta: Referensi Jakarta.

Aqib, Zaenal. 2017. *Model-Model, Media, dan Strategi Pembelajaran Kontekstual (Inovatif)*. Bandung: Yrama Media.

Batubara, H. H. (2021). *Media Pembelajaran Digital*. Bandung: Remaja Rosdakarya

Daryanto. 2013. *Media Pembelajaran.* Yogyakarta: Gava Media.

Kumala, F. N. (2016). *Pembelajaran IPA Sekolah Dasar*. Malang: Ediide Infografika.

Hamdani. 2011. *Strategi Belajar Mengajar*. Bandung: Pustaka Setya

Husein, Sadam., Lovy Heryanti., & Gunawan. (2015). Pengaruh Penggunaan Multimedia Interaktif Terhadap Penguasaan Konsep Dan Keterampilan Berpikir Kritis Siswa Pada Materi Suhu Dan Kalor. *Jurnal Pendidikan Fisika dan Teknologi.* 1(3): 221-225

Khoiriah, Tri Jalmo., dan Abdurrahman. (2016). *The Effect Of Multimedia-Based Teaching Materials In Science Toward Students' Cognitive Improvement. Jurnal Pendidikan IPA Indonesia:* 5(1):75-82

Kustiono. 2010. *Media Pembelajaran.* Semarang: Unnes Press

Octafiana, Windha., Madyo Ekosusilo., & Singgih Subiyantoro. (2018). Pengembangan Multimedia Interaktif Pada Materi Pesawat Sederhana Untuk Siswa Sekolah Dasar. *Jurnal Komunikasi Pendidikan.* 2(2): 168-175

Rifa'I, Achmad dan Cathrina Tri Anni. 2012. *Psikologi Pendidikan.* Semarang: Unnes Press

Rohman, Atika Nur. (2015). Peningkatan Kualitas Pembelajaran IPS Melalui Model *Team Assisted Individualization* Berbantuan Multimedia. *Jouful Learning Journal.* 4(2): 1-7

Samatoa, U. (2016). *Pembelajaran IPA di Sekolah Dasar*. Jakarta Barat: Indeks

Sugiyono. 2015. *Metode Penelitian Pendidikan.* Bandung: Alfabeta.

Susanto, Ahmad. 2016. *Teori Belajar dan Pembelajaran di Sekolah Dasar.* Jakarta: Prenadamedia Group.

Suyono dan Hariyanto. 2014. *Belajar dan Pembelajaran.* Bandung: Remaja Rosdakarya.

Wiana. (2018). *Interactive Multimedia-Based Animation: A Study of Effectiveness on Fashion Design Technology Learning. Journal of Physics: Conference Series:* Conf. Series 953 (2018) 012024