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The Effectiveness of Implementing the Interactive Multimedia Based Quantum Learning Model on the Short Story Writing Skills

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ABSTRACT
The problems in learning in class IX of SMPN 40 Surabaya, which is still teacher-centered and dependent on textbooks, prompted this study. This condition makes students passive, easily bored, and unable to write short stories optimally. Interviews with Indonesian language teachers reinforced these findings, confirming that the Quantum Learning model and interactive multimedia had never been implemented. This situation highlights the need for attractive, interactive, and experience-oriented learning innovations. The purpose of this study was to describe the short story writing skills of ninth-grade students at SMPN 40 Surabaya before and after the implementation of the interactive multimedia-based Quantum Learning model and the improvements achieved. The method used was quantitative with a one-group pre-test post-test pre-experimental design. The research population was all ninth-grade students at SMPN 40 Surabaya in the 2025/2026 academic year, while the sample was class IX-I consisting of 27 students selected through cluster random sampling. The data collection technique used a pre-test and post-test. Meanwhile, the analysis technique used descriptive statistics, Shapiro-Wilk normality test, hypothesis testing in the form of paired t-tests, and N-Gain. The results of the study showed an increase in students' short story writing skills from a pre-test average score of 68.33 to 82.59 on the post-test. The normality test showed that the data was normally distributed, while the t-test produced a Sig. (2-tailed) score of 0.000 < 0.05 and a t-count > t-table, indicating a significant difference between the two values. The N-Gain value of 0.4425 falls into the moderate category, indicating that the interactive multimedia-based Quantum Learning model is effective in improving the short story writing skills of ninth-grade students at SMPN 40 Surabaya.

Keywords: interactive multimedia, quantum learning, short story, writing skills

Keefektifan Penerapan Model *Quantum Learning* Berbasis Multimedia Interaktif terhadap Keketerampilan Menulis Cerpen

ABSTRAK
Permasalahan dalam pembelajaran di kelas IX SMPN 40 Surabaya yang masih *teacher-centered* dan bergantung pada buku ajar menjadi pendorong dilaksanakannya penelitian ini. Kondisi tersebut membuat siswa pasif, cepat bosan, serta belum bisa menulis cerpen secara optimal. Hasil wawancara dengan guru mata pelajaran Bahasa Indonesia memperkuat temuan tersebut, bahwa model *Quantum Learning* dan multimedia interaktif belum pernah diterapkan. Situasi ini menunjukkan perlunya inovasi pembelajaran yang menarik, interaktif, dan berorientasi pada pengalaman. Tujuan penelitian ini adalah untuk mendeskripsikan kemampuan menulis cerpen siswa kelas IX SMPN 40 Surabaya pra dan pasca diterapkan model *Quantum Learning* berbasis multimedia interaktif serta peningkatannya. Metode yang digunakan adalah kuantitatif dengan desain pre-eksperimental jenis *one group pre-test post-test*. Populasi penelitian adalah seluruh siswa kelas IX SMPN 40 Surabaya tahun ajaran 2025/2026, sementara sampelnya adalah kelas IX-I sejumlah 27 siswa yang dipilih melalui *cluster random sampling*. Teknik pengumpulan data menggunakan tes berupa *pre-test* dan *post-test*. Sementara, teknik analisis dengan menggunakan statistik deskriptif, uji normalitas dengan *Shapiro-Wilk*, uji hipotesis berupa uji-t berpasangan, dan *N-Gain.* Hasil penelitian menunjukkan adanya peningkatan kemampuan menulis cerpen siswa dari nilai rata-rata *pre-test* 68,33 menjadi 82,59 pada *post-test*. Uji normalitas menunjukkan data berdistribusi secara normal, sementara uji-t menghasilkan skor Sig. (2-tailed) 0,000 < 0,05 dan t-hitung > t-tabel sehingga terdapat perbedaan signifikan antara kedua nilai tersebut. Nilai *N-Gain* sebesar 0,4425 termasuk kategori sedang yang menandakan bahwa model *Quantum Learning* berbasis multimedia interaktif efektif meningkatkan kemampuan menulis cerpen siswa kelas IX SMPN 40 Surabaya.

Kata kunci: quantum learning, multimedia interaktif, kemampuan menulis, cerpen

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INTRODUCTION

Education plays a crucial role in developing students' mindsets and character. Therefore, the implementation of education needs to be optimized to produce students who excel cognitively and affectively. To achieve optimal education, synergy is required across various elements: teachers, students, facilities and infrastructure, curriculum, and the environment (Mustoip et al., 2018:35). Teachers are expected to be able to manage learning optimally, from planning, implementation, and evaluation, including using supporting tools to ensure effective learning. However, learning success does not solely depend on the teacher; students must also actively participate throughout the learning process.

Effective learning is characterized by interactions between teachers and students (Choiri et al., 2023:63). Learning effectiveness is measured in terms of process and product (achievement of learning objectives) (Sutikno, 2019:58; Adelia et al., 2025:650). Teachers no longer play the primary role as sources of information, but rather as facilitators who facilitate students' thinking, expressing opinions, and expressing themselves. This learning pattern creates a lively and meaningful classroom atmosphere, potentially contributing to the achievement of learning objectives. To achieve this, proper planning is required, from selecting a learning model to supporting media.

The pattern or design that serves as a guideline when implementing learning is called a learning model (Tyasmaning, 2022:1; Dewi & Damayanti, 2025). The implementation of a learning model plays a central role in achieving learning objectives, so its determination must be carried out carefully, taking into account student characteristics, learning needs, and environmental conditions (Elmustian & Setiawati, 2025:9; Damayanti et al., 2022:99;). This aligns with Government Regulation of the Republic of Indonesia No. 19 of 2005 concerning National Education Standards, Chapter IV.

In addition to the learning model, teaching media also plays a crucial role. Teaching media serve as tools that facilitate teachers in delivering material. To create learning materials that are in line with current developments, educational institutions need to innovate (Hasani et al., 2025). Ideal teaching media can increase enthusiasm and motivation, and facilitate student understanding, especially if it is interactive, minimizing verbalism by the teacher.

In the context of Indonesian language learning, there are four language skills that students must master: listening, reading and viewing, speaking and presenting, and writing (Tarigan et al., 2023:830; Razak, 2018:35). Short stories are one of the compulsory subjects taught in this subject. Short stories are concise prose works, can be read in a single sitting, and focus on a single problem (Amidong, 2018; Nuryatin & Irawati, 2026:60). Their concise and simple nature makes them suitable for teaching at the junior high school level. However, writing short stories also requires adequate understanding and skills in imagination, structural comprehension, mastery of intrinsic elements, and language skills.

Based on pre-research observations conducted at SMPN 40 Surabaya, specifically in grade IX, it was found that short story writing instruction was still teacher-centered and dependent on textbooks. As a result, students appeared passive, easily bored, and unable to optimally apply short story writing skills. Meanwhile, pre-research interviews with Indonesian language teachers indicated that the Quantum Learning model and interactive multimedia had never been implemented. Teachers only used story cards, but this had not yet yielded a significant impact. In addition, the limited background of teachers in the field of Indonesian language also causes limited time and energy to maximize learning.

Based on these conditions, the Quantum Learning model was chosen, deemed suitable for teaching short story writing in ninth-grade students at SMPN 40 Surabaya. Quantum Learning offers a fun learning style, making it easier for students to receive, understand, and process the material. This model combines Suggestology, Accelerated

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Learning, and Neurolinguistic Programming (NLP). Techniques used include creating a comfortable atmosphere, using music or informative posters, increasing student engagement, and employing trained teachers (DePorter & Hernacki, 2013:14). Thus, the learning process is not only fast but also enjoyable.

DePorter et al. (2010:36-39) state that, "Quantum Learning has a design framework acronymed as TANDUR (Grow, Experience, Name, Demonstrate, Repeat, and Celebrate). The implementation of this framework is based on the principles of Quantum Learning: everything speaks, everything has a purpose, experience comes before naming, acknowledge every effort, and if it's worth learning, it's worth celebrating."

To support the Quantum Learning model, interactive multimedia is used in the form of interactive PowerPoint presentations containing animations, text, videos, games, and music. Interactive multimedia is a technology-based learning medium that encompasses several types of media and emphasizes interactivity (Batubara, 2021: 205; Hutabri, 2022:297). This multimedia enables two-way communication, encourages student participation, and provides an engaging learning experience so students don't get bored easily.

Writing short stories requires mastery of at least two aspects: structure and intrinsic elements. Short story structure is divided into four parts: orientation, complication, resolution, and coda (Pratiwi et al., 2023:221). Meanwhile, Sumiati (2020:10-11) states, "The intrinsic elements of a short story are divided into seven, namely theme, characters and characterization, setting, point of view, plot, style, and moral."

Based on the explanation above, a study entitled "The Effectiveness of Implementing the Interactive Multimedia-Based Quantum Learning Model" is necessary. This study has three research questions, which can be explained as follows:

1) How are the short story writing skills of ninth-grade students at SMPN 40 Surabaya improved before the implementation of the interactive multimedia-based Quantum Learning model?
2) How are the short story writing skills of ninth-grade students at SMPN 40 Surabaya improved after the implementation of the interactive multimedia-based Quantum Learning model?
3) How has the short story writing skills of ninth-grade students at SMPN 40 Surabaya improved after the implementation of the interactive multimedia-based Quantum Learning model?

Meanwhile, the objectives of this study are to describe three things:

1) the short story writing skills of ninth-grade students at SMPN 40 Surabaya improved before the implementation of the interactive multimedia-based Quantum Learning model;
2) the short story writing skills of ninth-grade students at SMPN 40 Surabaya improved after the implementation of the interactive multimedia-based Quantum Learning model; and
3) the improvement in the short story writing skills of ninth-grade students at SMPN 40 Surabaya improved after the implementation of the interactive multimedia-based Quantum Learning model.

This research is theoretically useful in strengthening the theory of Quantum Learning as an innovative learning model for short story writing, particularly through the integration of interactive multimedia. Practically, this research can improve the quality of Indonesian language teaching, benefiting educational institutions through the implementation of a student-centered model. This study can be used as a reference by teachers in selecting engaging and interactive learning strategies. For students, the interactive multimedia-based Quantum Learning model helps create enjoyable learning, facilitates comprehension, and fosters a creative and dynamic learning environment, thus influencing their short story writing skills. Finally, the findings of this study can be used as a reference by other researchers to conduct relevant follow-up research.

To support this research, several relevant studies are presented below, including:

1) Primarani et al. (2025) entitled "The Effectiveness of the Quantum Learning Method in Learning Arabic for Grade VII at MTs Najahiyah Palembang." Al-Mudabbib: Journal of Educational Studies.
2) Misbah et al. (2025) entitled "The Effect of the Quantum Teaching Learning Model on Learning Outcomes for Grade III at SD Negeri 2 Bungu." ALFABETA: Journal of Language, Literature, and Learning.
3) Hutagalung (2025) entitled "The Effect of Using the Quantum Learning Method on Short Story Writing Skills of Grade X Students of SMA Budi Murni 3 Medan." Journal of Educational Differentiation.

The Quantum Learning model has successfully improved learning outcomes in various subjects, according to three previous studies. However, gaps remain because the majority of studies did not focus on short story writing skills at the junior high school level, did not integrate interactive multimedia, and were not implemented at SMPN 40 Surabaya. The novelty of this study lies in the integration of the TANDUR-based Quantum Learning model with interactive multimedia in the form of interactive PowerPoint. This study is the first to test the effectiveness of this combination on the short story writing skills of grade nine students at SMPN 40 Surabaya.

METHOD

This research uses a descriptive quantitative method. Through this method, the research data is described using the results of descriptive statistical calculations and parametric inferential statistics.

The research was conducted at SMP Negeri 40 Surabaya, Jalan Bangkingan VIII No. 8, Lakarsantri District, Surabaya City, East Java. The study period was the odd semester of the 2025/2026 academic year.

The population of this study was 9th-1st grade students of SMPN 40 Surabaya in the 2025/2026 academic year who participated in the pre-test, short story writing learning using quantum learning, and the post-test. There were 29 students.

The sample size was 27 students based on Slavin's formula (Amin et al., 2023:20; Santoso, 2023:31). Each member of the sample was selected using simple random sampling without replacement.

This research was an experimental study categorized as a pre-experimental design with a one-group pre-test post-test model (Sugiyono, 2023: 112). Experimental research is used to determine whether a treatment (independent variable) can influence the dependent variable. The technique involves administering the treatment to one group and then measuring it with a test (Craswell, 2014: Sugiono, 2023:110). This design uses a single group that represents the research population. Because the data collected consisted of pre-test and post-test findings, the methodology was quantitative (Craswell, 2014). The data were then analyzed statistically to determine whether there were significant differences between the two.

Pre-tests and post-tests were used as data collection methods. The research procedure involved administering a pre-test to assess students' initial abilities in writing short stories. Afterward, learning activities were implemented using the interactive multimedia-based Quantum Learning model. After the intervention was completed, students were given a post-test to assess their final abilities. Pre-test and post-test data were then processed to determine the effectiveness of the interactive multimedia-based Quantum Learning model on the short story writing skills of ninth-grade students at SMPN 40 Surabaya.

The research instrument consisted of a descriptive test sheet systematically designed to facilitate students' short story writing. SPSS version 25 was used for both descriptive and inferential data analysis. In quantitative research, there are two forms of data analysis: descriptive and inferential statistical analysis (Sugiyono, 2023:206;

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Razak, 2005:61). Descriptive statistical analysis includes calculating the mean, median, mode, minimum, and maximum values.

The analysis continued by calculating the percentage of learning completion. Learning is considered complete if it exceeds the classical completion indicator, which is =75% (Zulfahita et al., 2019:36). The school's Minimum Completion Criteria (KKM) for Indonesian is 76. Because the sample size was less than 50, inferential statistical analysis included a normality test using the Shapiro-Wilk test and a hypothesis test using a paired sample t-test. Additionally, an N-Gain test was conducted to determine the effectiveness of the interactive multimedia-based Quantum Learning model on students' short story writing skills. The N-Gain indicators refer to the following table.

Table 1
N-Gain Test Categories

Criteria	Value Category
g < 0.3	Low Effectiveness
0.7 > g = 0.3	Moderate Effectiveness
g = 0.7	High Effectiveness

(Febrianti, 2021:108)

RESULT

1. Students' Short Story Writing Skills Before Implementing the Interactive Multimedia-Based Quantum Learning Model

Students' initial short story writing skills were measured through a pre-test. Twenty-seven ninth-grade students were instructed to write a short story on the theme of "Indonesian Food" based on a question that included basic steps such as determining the title, characters and characterization, setting, and plot design to ensure the short story remained systematic despite the lack of treatment. At this stage, the interactive multimedia-based Quantum Learning model had not yet been implemented, so the results obtained represent the original skills. The pre-test data were then analyzed using descriptive statistics, as shown in the figure below.

Statistics

Pre_test

N	Valid	27
	Missing	0
Mean		68,3333
Std. Error of Mean		2,55983
Median		70,0000
Mode		65,00
Std. Deviation		13,30124
Variance		176,923
Range		55,00
Minimum		35,00
Maximum		90,00
Sum		1845,00

Figure 1
SPSS Screenshot of Pre-test Descriptive Statistics Data

Based on the pre-test results, the valid sample size was 27, meaning all ninth-first grade students participated. The average pre-test score was 68.33, indicating that students' initial abilities did not meet competency standards. The median was 70, while the mode was 65, indicating that the majority of students scored relatively low. A minimum score of 35 indicates that some students still had significant difficulties, while a maximum score of 90 indicates that a small percentage of students were already able to write short stories well. Overall, students' initial abilities were still considered low.

Table 2
Description of Pre-test Completion

Standard Score	Criteria	Frequency	Percentage
<76	not mastery	21	77,78
≥76	mastery	6	22,22

Based on the classical learning completion indicator, at least 75% of students must achieve a score above the Minimum Competency (KKM) (76) for Indonesian Language at SMPN 40 Surabaya (Zulfahita, et al., 2019:36). In the pre-test, 77.78% (21 students) scored below the KKM

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and therefore failed to complete the course, while only 22.22% (6 students) were declared to have completed the course. This finding indicates that their initial short story writing skills still do not meet the classical completion standard.

2. Students' Short Story Writing Skills After Implementing the Interactive Multimedia-Based Quantum Learning Model

Following the pre-test, ninth-grade students at SMPN 40 Surabaya were given a short story writing treatment using the interactive multimedia-based Quantum Learning model. A post-test was then administered to measure their improvement. The learning model and media helped students understand the structure, building blocks, and steps of short story writing systematically. The post-test was in the form of a descriptive text with instructions to write a short story on the theme "Activity." The post-test scores were then processed through descriptive statistical analysis, the results of which can be seen in the following figure.

Statistics

Post_test

N	Valid	27
	Missing	0
Mean		82,5926
Std. Error of Mean		1,56462
Median		80,0000
Mode		80,00
Std. Deviation		8,13000
Variance		66,097
Range		30,00
Minimum		65,00
Maximum		95,00
Sum		2230,00

Figure 2
SPSS Screenshot of Post-test Descriptive Statistics Data

Based on the results above, the valid sample size was 27, so all students took the post-test. The average post-test score was 82.59, indicating an improvement compared to the pre-test. The median score was 80, while the mode was 80, indicating that the majority of students achieved relatively good scores. A minimum score of 65 indicates that a small number of students still had difficulties, while a maximum score of 95 indicates that some students were able to write a complete and systematic short story.

Table 3
Description of Post-Test Completion

Standard Score	Criteria	Frequency	Percentage
<76	not mastery	5	18,52
≥76	mastery	22	81,48

Based on the classical learning completion indicator, at least 75% of students must achieve a score equal to or higher than the Minimum Competency (KKM), which is 76 (Zulfahita et al., 2019: 36). The post-test results showed that 18.52% (5 students) did not achieve the KKM, and 81.48% (22 students) achieved or exceeded the KKM. This percentage indicates an improvement compared to the pre-test, with more than 75% of students achieving the completion category after the treatment.

3. Improving Students' Short Story Writing Skills with the Application of the Interactive Multimedia-Based Quantum Learning Model

After conducting descriptive statistical analysis on the pre-test and post-test data, inferential statistical analysis was conducted to observe the improvement in the short story writing skills of ninth-grade students at SMPN 40 Surabaya. This analysis will involve normality tests, hypothesis tests, and an N-Gain test.

Before conducting hypothesis testing, it is important to ensure the normality of the pre-test and post-test data. The results of the normality test serve to determine whether parametric or non-parametric tests will be performed. Normality is determined by the Sig. value, where data is considered normal if the value exceeds 0.05. In this study, the Shapiro-Wilk test was used because the total sam-

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ple size did not exceed 50. The results of the normality test are presented in the following figure.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_test	,179	27	,027	,938	27	,109
Post_test	,190	27	,014	,928	27	,061

Figure 3
SPSS Screenshot of Normality Test

The significance value for the pre-test was 0.109 and for the post-test, 0.061, according to the normality test. Therefore, both data points are normally distributed, as both are greater than 0.05. Therefore, a parametric test can be performed.

Because the pre-test and post-test data were normally distributed, the hypothesis testing was continued with a paired sample t-test.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre_test - Post_test	-14,25926	8,401 43	1,61686	-17,58275	-10,93576	-8,819	26	,000

Figure 4
SPSS Screenshot of Paired Sample t-test Hypothesis Testing

The paired t-test results showed a p-value of 0.000 and a calculated t-value of 8.819. The calculated t-value was greater than the t-table value, and the p-value was less than 0.05, with a t-table value of 2.052 at an alpha of 0.05 and 26 degrees of freedom. This indicates that students' short story writing abilities differed significantly before and after the treatment.

To determine the effectiveness of the interactive multimedia-based Quantum Learning model in improving the short story writing abilities of ninth-grade students at SMPN 40 Surabaya, an N-Gain test was conducted. This test measures the extent of improvement in students' abilities from baseline to post-treatment. The results of the N-Gain test are presented in the figure below.

Statistics

		Gain	NGain
N	Valid	27	27
	Missing	0	0
Mean		14,2593	,4425
Std. Deviation		8,40143	,16123
Minimum		5,00	,20
Maximum		35,00	,80

Figure 5
SPSS Screenshot of the N-Gain Test

Based on calculations, the average N-Gain score of 0.4425 falls into the moderate effectiveness category ($0.7 > g = 0.3$). Thus, the interactive multimedia-based Quantum Learning model effectively delivered positive changes to the learning outcomes of ninth-grade students at SMPN 40 Surabaya, although the improvement was in the moderate category.

DISCUSSION

The purpose of this study was to test the effectiveness of the interactive multimedia-based Quantum Learning model in improving the short story writing skills of ninth-grade students at SMPN 40 Surabaya. This study was conducted over two meetings, or 4 Learning Hours (JP). In the first meeting, a pre-test and treatment were administered, while in the second meeting, treatment and post-test were administered.

Student learning outcomes before and after the treatment were compared to determine whether there were any differences between the two. The pre-test was given at the initial stage in the form of a short story writing assignment on the theme "Indonesian Food." After the implementation of the interactive multimedia-based Quantum Learning model, students completed an interactive PowerPoint presentation containing animation, text, video, games, and music. Subsequently, students completed the post-test by writing a short story on the theme "Activities." The pre-test and post-test used different themes, but with equal

weighting, to avoid repetition and ensure more objective results.

The application of the Quantum Learning model is not without reason. According to DePorter & Hernacki (2013:13), the Quantum Learning model is beneficial for fostering positive student attitudes toward learning, increasing student motivation, developing lifelong learning skills, fostering student self-confidence through appreciation, and promoting success in learning. Meanwhile, the use of interactive multimedia encourages student participation in learning through its interactive features (Batubara, 2021: 206). Therefore, combining the Quantum Learning model and interactive multimedia will help students become more proficient in short story writing.

Descriptive and inferential statistical analyses were then conducted on the collected data. Descriptive statistical analysis was used to provide an overview of the research findings as they are. Meanwhile, inferential statistical analysis was used to examine data from the sample, and the results were applied to the entire study population (Sugiyono, 2023:206-207).

All data processing was performed using SPSS version 25. Descriptive statistics showed an average pre-test score of 68.33, increasing to 82.59 in the post-test. In the pre-test, 21 students (77.78%) failed, and 6 students (22.22%) completed the test. Meanwhile, in the post-test, 5 students (18.52%) failed, and 22 students (81.48%) completed the test. These results generally indicate an increase in student scores before and after treatment. This improvement also demonstrates the benefits of the Quantum Learning model, namely its ability to promote successful learning (DePorter & Hernacki, 2013: 13).

If the descriptive statistical analysis shows a general picture of student score improvement, inferential statistical analysis will be conducted using prerequisite analysis tests, namely the normality test to determine whether the data is normally distributed and the hypothesis test. The Shapiro-Wilk test was used because the sample size was less than 50 (Sholihah et al., 2023:206). The pre-test data showed a value of 0.109 and a post-test value of 0.061, indicating that both data were normally distributed (Sig. > 0.05). Because all data were normally distributed, a hypothesis test was conducted using a paired sample t-test (parametric test).

The results of the paired sample t-test showed a Sig. (2-tailed) value of 0.000 < 0.05 and an absolute t-count of 8.819 > t-table of 2.052. Therefore, Ha was accepted because there was a significant difference between the pre-test and post-test. This means that the interactive multimedia-based Quantum Learning model effectively improves students' short story writing skills. The use of a paired sample t-test was appropriate because this research design measured two averages from the same group under different conditions to determine whether there was a change (Sugiyono, 2023: 211).

After the hypothesis test, the next step was to test for normality gain (N-Gain). This test was conducted to determine the effectiveness of the Quantum Learning model and interactive multimedia (Alman & Nugrahaeni, 2022:153). This effectiveness level is divided into three levels: high, medium, and low. In this study, the average N-Gain value, based on calculations, was 0.4425, which falls into the medium category (0.7 > g = 0.3), indicating that the applied learning model and media were able to provide improvement, although not yet reaching the high category. These results indirectly indicate that the majority of students experienced a relatively stable improvement in their grades.

This study has several advantages. First, it integrates the Quantum Learning model with interactive multimedia, which is a new innovation in short story writing learning. Second, it uses rich learning media by integrating animation, materials, videos, games, and audio into one device. Third, it uses complete and comprehensive analysis in accordance with the systematic analysis of experimental research, namely descriptive and inferential statistics, so that the research results have

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a strong methodological foundation (Sugiyono, 2023: 206).

When interpreting the research findings, it is important to consider several limitations of this study. First, the One Group Pre-test Post-test design did not involve a control group, so it cannot be fully ascertained whether the improvement in students' short story writing skills was a result of the implementation of the interactive multimedia-based Quantum Learning model. Because the dependent variable is still potentially influenced by external factors, pre-experimental research is not considered a true experiment (Sugiyono, 2023: 112; Kartika et al., 2025:998;

Second, the short story writing research instrument used only assessed certain aspects and potentially contained assessor subjectivity, given that written work assessment is interpretive. Therefore, even though the assessment referred to a rubric, assessment bias could still occur and influence the scoring process.

Third, this study did not fully control for external variables such as motivation and learning environment (Sugiyono, 2023:112; Rachmi et al., 2025; Arifah & Suciptaningsih, 2023). To increase the validity of the results, it is recommended that future research use a more robust experimental design.

Fourth, the interactive multimedia used has not undergone in-depth testing, so its quality and contribution to learning outcomes cannot be confirmed. Given the limitations of the study above, further research with a more robust experimental design is needed, for example, by integrating a control group as a comparison if the aim of future research is to more comprehensively determine the effects of an intervention.

CONCLUSION

Based on the research results, the implementation of the interactive multimedia-based Quantum Learning model effectively improved the short story writing skills of ninth-grade students at SMPN 40 Surabaya. This is evidenced by an increase in the average score from 68.33 in the pre-test to 82.59 in the post-test. Inferential statistical analysis showed that both data were normally distributed, while the results of the paired sample t-test hypothesis test showed a Sig. 0.000 < 0.05, and the calculated t-test was greater than the t-table, indicating a significant difference between the pre-test and post-test. Thus, Ha was accepted. The N-Gain test yielded a score of 0.4425, categorized as moderately effective.

The results of this study imply that improving students' short story writing skills comes not only from the use of interactive multimedia but also from learning experiences through the Quantum Learning model. Learning that is enjoyable, meaningful, active, stimulating, interactive, and facilitates creative thinking can help students develop short story writing skills. The success of this study demonstrates that learning designs that are suited to students' learning styles can improve short story writing skills. Thus, the effectiveness of the interactive multimedia-based Quantum Learning model indicates that learning quality plays a crucial role in the development of students' language skills, particularly writing.

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