

Enriched Virtual Blended Learning Model Assisted by Digital Comics: Its Effect on Student Learning Motivation

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ABSTRACT

The Enriched Virtual Blended Learning model, assisted by digital comics, has attracted attention in the world of education for its positive influence on student motivation. This model requires students to study material both before and after class sessions. An experimental research method was used to determine the effect of this learning model on student motivation, as defined by four key indicators: "Feelings of Joy," "Student Involvement," "Interest," and "Student Attention." This experimental study proves that a significant change occurs when using this learning model. The results show a significance value (2-tailed) of 0.000, which is less than the significance level of 0.05. Thus, it is concluded that the application of the Enriched Virtual Blended Learning model assisted by digital comics has a significant influence on student learning motivation. By incorporating various factors that can increase student motivation, this model provides a positive influence on achieving learning objectives.

Keywords: Digital comics, digital era education, enriched virtual blended learning

1. INTRODUCTION

In the ever-growing digital era, education is a domain that must seek innovative solutions to overcome emerging challenges. The success of a learning model is not only measured by the extent to which material is delivered but also by the level of student motivation throughout the learning process. According to Cholily (as cited in Julita & Purnasari, 2022), the influence of globalization and digital technologies, such as intelligent engineering and the Internet of Things, has changed people's thinking patterns and activities, including in the context of education in Indonesia.

The main challenge facing education in Indonesia lies in the integration of technology into learning, which often results in low student motivation. Motivation, which manifests as enjoyment and passion for learning, does not arise spontaneously but is cultivated through a student's involvement and experience. Research from the 2018 Programme for International Student Assessment (PISA) revealed that Indonesia was ranked 62nd out of 76 countries, indicating students' low competence in reading, mathematics, and science (Harususilo, 2019). Factors such as limited educational facilities and inadequate teacher quality also contribute to this low student motivation (Lestari, 2023).

In the learning process, an increase in student motivation can be observed through various indicators. Slameto (2013) states that the primary indicators of learning motivation consist of four aspects: "Feelings of Joy," "Student Involvement," "Interest," and "Student Attention."

One solution that can be presented to overcome this problem is the application of the Enriched Virtual Blended Learning model, as explained by Garrison (as cited in Zebua & Harefa, 2022). This model combines online and offline learning to leverage the advantages of each. In this model, technology such as video, audio, and graphic animation is used as a learning tool, with the addition of innovative elements like digital comics to increase student attraction and motivation.

The successful implementation of the Enriched Virtual Blended Learning model assisted by digital comics can not only overcome technological challenges but can also increase student learning motivation. Therefore, this study aims to explore the influence of this learning model on students' motivation by focusing on the key aspects of "Feelings of Enjoyment," "Student Involvement," "Interest," and "Student Attention."

By understanding the complexity of education in the digital era and the potential of the Enriched Virtual Blended Learning model assisted by digital comics, it is hoped that this research can make a significant contribution to our understanding of how learning innovations can shape student motivation.

2. RELATED WORK

Several studies indicate that conventional learning models tend to be less attractive in the digital era, which can cause low learning motivation and student achievement. Research by Anggraeni et al. (2021) highlights the success of interactive multimedia in increasing student motivation and understanding. The choice of learning model also significantly influences students' learning motivation, particularly a model like Enriched Virtual Blended Learning. According to Kurniati (as cited in Lukman et al., 2019), this model has advantages such as pre-learning tests, quiz management, and the utilization of internet-based learning, all of which show potential for increasing student involvement. However, shortcomings such as the need for a variety of media and a lack of supporting facilities can affect the effectiveness of its implementation.

In this context, using digital comics as a learning medium has been shown to be effective in increasing student motivation and understanding, as highlighted by Luh Putu Ari Laksmi & Wayan Suniasih (2021) and Nathasia Subroto & Qohar (2020). Although this blended learning model offers advantages in developing students' motivation, challenges such as the need for adequate facilities and varied media must be overcome for successful implementation.

In conclusion, the implementation of the Enriched Virtual Blended Learning model assisted by digital comics can make a positive contribution to student learning motivation in the digital era. Recommendations for success involve a holistic approach that considers a variety of factors, including technology requirements, media variety, and student characteristics to maximize the benefits of this learning model.

3. RESEARCH METHOD

This study uses a quantitative approach with an experimental method, defined as research that uses numerical data and statistical analysis (Triana, 2021, as cited in Hutajulu et al., 2022). The research design is detailed in Table 1.

Table 1. Research Design

Group	Pre-Test	Treatment	Post-Test
Experiment (R)	P1	X	Q1
Control (R)	P2	-	Q2

Where:

P1 = Pre-test in the experimental group

P2 = Pre-test in the control group

X = Treatment given (EVBL model assisted by digital comics)

Q1 = Post-test in the experimental group

Q2 = Post-test in the control group

R = Random Sampling

The research instruments consist of questionnaires and test questions (ability limit tests), adapted from the concept of Manullang (2022, as cited in Hutajulu et al., 2022). This experimental approach was designed to test the cause-and-effect relationship, where the experimental group received the Enriched Virtual Blended Learning model assisted by digital comics, while the control group received conventional Problem-Based Learning in the Informatics subject.

The study uses a quasi-experimental, Non-Equivalent Control Group Design, as participants were not chosen randomly. The research population consisted of students from two 10th-grade Computer Network Engineering (TKJ) classes at SMK Negeri 1 Sukoharjo, with each class containing 36 students. Using the cluster random sampling method, a sample of 72 individuals was taken from these two classes. Class X TKJ 1 was designated as the experimental group, and class X TKJ 2 served as the control group (Firmansyah et al., 2022).

Data was collected through a learning motivation questionnaire designed to measure the influence of the Enriched Virtual Blended Learning model assisted by digital comics on students' learning motivation.

$$KD = 1,36 \frac{\sqrt{n_1 + n_2}}{n_1 n_2} \quad (4)$$

Where:

KD = Number of Kolmogorov-Smirnov searched

n_1 = Number of samples obtained

n_2 = Expected Sample Number

In testing normality with the SPSS 26 application, two hypotheses are used, namely:

H₀ = Normally distributed data

H₁ = Data is not normally distributed

Normality testing criteria are:

H₀ is accepted if the significance is > 0.05 then it is normally distributed

H₁ is rejected if the significance is < 0.05 then it is not normally distributed

3.3.2. HOMOGENEITY TEST

The homogeneity test was carried out to determine if the samples came from the same population (Ranti Gusti Rahayu & Yerimadesi, 2022). This test was performed using the SPSS 26 application and Levene's test (see Formula 5) with a significance level of $\alpha = 0.05$.

$$F_{hitung} = \frac{\text{varian besar}}{\text{varian kecil}} = \frac{(\text{simpangan baku besar})^2}{(\text{simpangan baku kecil})^2} \quad (5)$$

In homogeneity testing there are hypotheses used as follows:

H₀ = Homogeneous variance, meaning variance from the same population ($v_1=v_2$)

H₁ = Variants are not homogeneous, meaning variants from different populations ($v_1 \neq v_2$)

The homogeneity testing criteria are:

H₀ is accepted if $F_{count} \leq F_{table}$

H₁ is rejected if $F_{count} > F_{table}$

3.3.3. BALANCE TEST

A pre-test was administered to both the control and experimental groups before any treatment was given. The purpose was to ensure both groups had a balanced level of understanding before the intervention. The balance test was performed using the t-test for unequal variance (Separated Variance formula, see Formula 6) with a significance level of $\sigma = 0.05$ (Riyanto, 2012).

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \quad s = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}} \quad (6)$$

Where:

n_1 = Number of experimental classes 1

S₂₂ = Experimental class variant 2

n_2 = Number of experimental classes 2

X₁ = Average value of experimental class 1

S₂₁ = Experimental class variant 1

X₂ = Average value of experimental class 2

The hypotheses used to test data in both groups are:

H₀ = Both groups have equal or equal initial abilities ($\mu_1 = \mu_2$)

H₁ = Both groups have unequal or unequal initial abilities ($\mu_1 \neq \mu_2$)

The balance test criteria used are as follows:

H₀ is accepted if significance is > 0.05

H₀ is rejected if significance < 0.05

3.4. N-GAIN TEST

To determine the increase in student motivation before and after the treatment, an N-Gain test was conducted (see Formula 7) using the SPSS 26 application at a 5% significance level. The N-Gain test score was classified into categories as shown in Table 3.

$$\text{Normalized Gain}(g) = \frac{\text{Skor Posttest} - \text{Skor Pretest}}{\text{Skor Ideal} - \text{Skor Pretest}} \quad (7)$$

Table 3. Normalized N-Gain Index (g)

Percentage (%)	Category
100 – 71%	Tall
70 – 31%	Currently
30 – 1%	Low

3.5. HYPOTHESIS TESTING

To compare student motivation before and after the treatment, an independent sample t-test was used to determine if there was a significant effect of using the Enriched Virtual Blended Learning model assisted by digital comics (Khotimah Harahap & Desviana Siregar, 2020). The test was conducted on both the experimental and control classes. The hypotheses were as follows:

- a. **H₀**: There is no significant difference in learning motivation between students taught with the Enriched Virtual Blended Learning model assisted by digital comics and those taught with conventional methods.
- b. **H₁**: There is a significant difference in learning motivation between students taught with the Enriched Virtual Blended Learning model assisted by digital comics and those taught with conventional methods.

4. RESULT AND ANALYSIS

4.1. RESULT

4.1.1. RESEARCH INSTRUMENT TEST RESULTS

Before being given to the experimental and control classes, the instrument first underwent a testing phase through a try-out. This trial involved 36 students from class XI F5 A at SMA N 3 Sukoharjo, who were not part of the main study. This class was chosen because its students had previously received material on Computer Systems in their 10th-grade Informatics subject. The validity and reliability of the questionnaire instrument were tested to ensure its quality. Detailed validity and reliability test results for the 20 questionnaire items can be found in Table 4.

Table 4. Validity and Reliability of Questionnaire Instrument Type Test Results

Type	Test result	Total	
Validity test	Valid	1,3,4,5,6,7,9,10,12,13,14,15,17,18,20	15
	Invalid	2,8,11,16,19	5
Reliability Test	0.756	20	

The validity and reliability test results for the 20-question instrument show that 15 items were declared valid. The instrument has a reliability value of 0.756. After this, the pre-test and post-test were administered to both the control class (without treatment) and the experimental class (with treatment).

4.1.2. RESULTS AND DESCRIPTION OF RESEARCH DATA

4.1.2.1. PRE-TEST STUDENT LEARNING MOTIVATION

The pre-test learning motivation data was collected from students before they received treatment with the Enriched Virtual Blended Learning model assisted by digital comics. Table 5 displays the descriptive statistics for the pre-test data from both the experimental and control classes.

Table 5. Description of Pre-test Data on Student Learning Motivation

Learning Motivation Statistics	Experimental Class	Control Class
Average	43.86	42.49
Lowest Value	36	35
The highest score	56	55
Standard Deviation	4,145	3,995
Variance	17,185	15,963

From Table 5, it can be seen that the experimental class, consisting of 35 students, had an average score of 43.86, with a low score of 36, a high score of 56, a standard deviation of 4.145, and a variance of 17.185. Meanwhile, the control class, also consisting of 35 students, had an average score of 42.49, with a low score of 35, a high score of 55, a standard deviation of 3.995, and a variance of 15.963. The frequency distribution of the pre-test data for the experimental class is shown in Table 6.

Table 6. Pre-test Frequency Distribution of Experimental Class Learning Motivation

No	Intervals	Frequency	
		Absolute	Relatively
1	35-40	8	22.9%
2	41-46	20	57.1%
3	47-52	6	17.1%
4	53-58	1	2.9%
Amount		35	100%

According to Table 6, the frequency distribution for the pre-test data on student learning motivation in the experimental class consists of 4 classes, each with an interval length of 6.

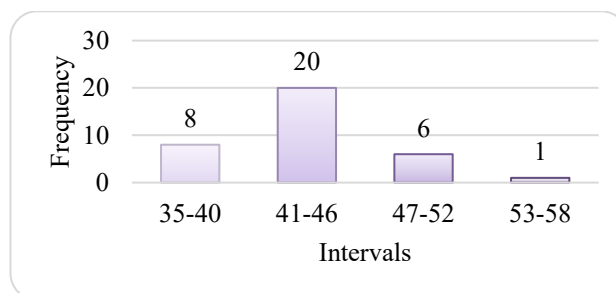


Figure 1. Pre-test Graph of Experimental Class Learning Motivation

Based on the data presented in Figure 1, the pre-test data for the experimental group shows the following frequencies: the 35-40 interval has a frequency of 8, the 41-46 interval has a frequency of 20, the 47-52 interval has a frequency of 6, and the 53-58 interval has a frequency of 1. The frequency distribution of the pre-test data for the control class is shown in Table 7.

Table 7. Pre-test Frequency Distribution of Control Class Learning Motivation

No	Intervals	Frequency	
		Absolute	Relatively
1	35-40	11	31.4%
2	41-46	20	57.1%
3	47-52	3	8.6%
4	53-58	1	2.9%
Amount		35	100%

Table 7 shows that the frequency distribution for the pre-test data on learning motivation from the control class consists of 4 classes, each with an interval length of 6.

Based on the data presented in Figure 2, the pre-test data for the control group shows the following frequencies: the 35-40 interval has a frequency of 11, the 41-46 interval has a frequency of 20, the 47-52 interval has a frequency of 3, and the 53-58 interval has a frequency of 1.

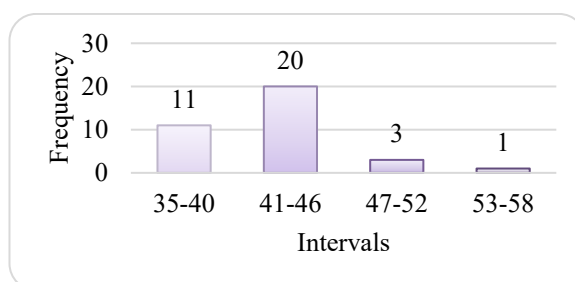


Figure 2. Pre-test Graph of Control Class Learning Motivation

4.1.2.2. POST-TEST STUDENT LEARNING MOTIVATION

The post-test learning motivation data was collected from students after they received treatment with the Enriched Virtual Blended Learning model assisted by digital comics. Table 8 displays the descriptive statistics for the post-test data from both the experimental and control classes.

Table 8. Description of Post-test Data on Student Learning Motivation

Learning Motivation Statistics	Experimental Class	Control Class
Average	51.37	44.00
Lowest Value	36	35
The highest score	60	54
Standard Deviation	6,860	5,418
Variance	47,064	29,353

From Table 8, it can be seen that the experimental class, consisting of 35 students, had an average score of 51.37, with a low score of 36, a high score of 60, a standard deviation of 6.860, and a variance of 47.064. Meanwhile, the control class, also consisting of 35 students, had an average score of 44.00, with a low score of 35, a high score of 54, a standard deviation of 5.418, and a variance of 29.353. The frequency distribution of the post-test data for the experimental class is shown in Table 9.

Table 9. Post-test Frequency Distribution of Experimental Class Learning Motivation

No	Intervals	Frequency	
		Absolute	Relatively
1	36-42	4	11.4%
2	43-48	9	25.7%
3	49-54	7	20.0%
4	55-60	15	42.9%
Amount		35	100%

Table 9 shows that the frequency distribution for the post-test data on learning motivation from the experimental class consists of 4 classes, each with an interval length of 7.

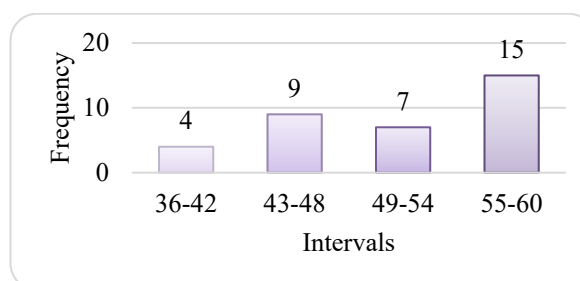


Figure 3. Post-test Graph of Experimental Class Learning Motivation

Based on the data presented in Figure 3, the post-test data for the experimental group shows the following frequencies: the 36-42 interval has a frequency of 4, the 43-48 interval has a frequency of 9, the 49-54 interval has a frequency of 7, and the 55-60 interval has a frequency of 15. The frequency distribution of the post-test data for the control class is shown in Table 10.

Table 10. Post-test Frequency Distribution of Control Class Learning Motivation

No	Intervals	Frequency	
		Absolute	Relatively
1	35-40	9	25.7%
2	41-46	15	42.9%
3	47-52	8	22.9%
4	53-58	3	8.6%
Amount		35	100%

Table 10 shows the intervals for the frequency distribution of the post-test data on learning motivation for the control class.

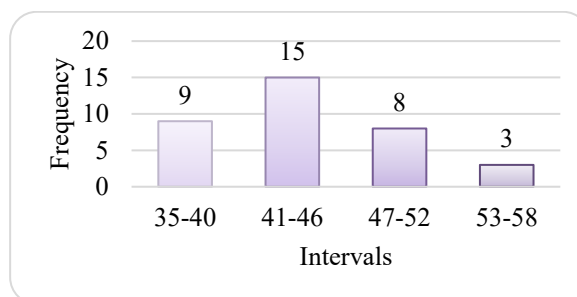


Figure 4. Post-test Graph of Control Class Learning Motivation

Based on the data presented in Figure 4, the post-test data for the control group shows the following frequencies: the 35-40 interval has a frequency of 9, the 41-46 interval has a frequency of 15, the 47-52 interval has a frequency of 8, and the 53-58 interval has a frequency of 3.

4.1.3. PREREQUISITE TEST RESULTS AND DESCRIPTION

4.1.3.1. NORMALITY TEST

The normality test in this study was conducted using the Kolmogorov-Smirnov method, with calculations assisted by the SPSS version 26 application. Data is considered normally distributed if the significance value (Sig.) is greater than the significance level of 0.05. The normality test results for the pre-test and post-test student learning motivation data for both classes are presented in Table 11.

Table 11. Normality Test Data for Student Learning Motivation

Category	Data	Sig	Significance Value	Information
Experimental Class	Pretest	0.070	0.05	Normal
	Posttest	0.142	0.05	Normal
Control Class	Pretest	0.194	0.05	Normal
	Posttest	0.200	0.05	Normal

Based on Table 11, the pre-test (0.070) and post-test (0.142) data for the experimental class show significance values greater than 0.05. Similarly, the pre-test (0.194) and post-test (0.200) data for the control class are also greater than 0.05. Therefore, it can be concluded that all pre-test and post-test data for both classes are normally distributed.

4.1.3.2. HOMOGENEITY TEST

The homogeneity test was conducted using the Levene Statistics method in the SPSS version 26 application, with a significance level of 0.05. The results of the homogeneity test are shown in Table 12.

Table 12. Homogeneity Test Data on Student Learning Motivation

Data	Sig	Significance Value	Information
Pretest	0.721	0.05	Homogeneous
Posttest	0.102	0.05	Homogeneous

As shown in Table 12, the homogeneity test for the pre-test data yielded a significance value of 0.721, which is greater than 0.05. Likewise, the post-test data yielded a significance value of 0.102, which is also greater than 0.05. Therefore, both classes can be classified as homogeneous.

4.1.3.3. BALANCE TEST

A balance test was conducted to determine if the initial abilities of the two groups were balanced before the intervention. This assessment used the t-test with an alpha (α) significance level of 0.05. Table 13 displays the results.

Table 13. Student Learning Motivation Balance Test Data

Data	Sig	Significance Value	Information
Pretest	0.163	0.05	Balanced

Table 13 shows that the significance value of the balance test on the pre-test data is 0.163, which exceeds the alpha value of 0.05. Therefore, the initial abilities of both classes can be classified as balanced.

4.1.4. N-GAIN TEST RESULTS

The N-Gain Test was used to measure the increase in student learning motivation in both the experimental and control classes. The results are shown in Table 14.

Table 14. Data from the N-Gain Test on Learning Motivation

Class	Average		N-Gain Score	Information
	Pretest	Posttest		
Experiment	43.86	51.37	0.32	Currently
Control	42.49	44.00	0.08	Low

The data in Table 14 shows that the N-Gain score in the experimental class reached 0.32 (Medium category), while the control class reached 0.08 (Low category). A comparison of the total N-Gain scores indicates that the Enriched Virtual Blended Learning model assisted by digital comics was more effective in increasing student learning motivation than the conventional learning model.

4.1.5. HYPOTHESIS TEST RESULTS

The hypotheses for this study were as follows:

- H₀**: There is no significant difference in learning motivation between students taught with the Enriched Virtual Blended Learning model assisted by digital comics and those taught with conventional methods.
- H₁**: There is a significant difference in learning motivation between students taught with the Enriched Virtual Blended Learning model assisted by digital comics and those taught with conventional methods.

An independent sample t-test was used to test the hypothesis, with calculations performed using SPSS 26 at a significance level of 0.05. The decision rule was: if the probability (Sig. 2-tailed) is less than 0.05, H₀ is rejected. If the probability is greater than 0.05, H₀ is accepted. The results of the independent sample t-test can be seen in Table 15.

Table 15. Results of the Independent Sample T-Test on Learning Motivation

Variance Equation	Levene's Test		T test	
	F	Sig	Q	Sig. (2-tailed)
Assumed	2,741	0.102	4,989	0,000
Not Assumed			4,989	0,000

Table 15 shows an F value of 2.741 with a significance of 0.102, which is greater than 0.05, indicating that the two classes have equal variance. The t-test result shows a t-value of 4.989, which is greater than the t-table value (1.995). The significance value (2-tailed) is 0.000, which is smaller than the significance level of 0.05. Therefore, H₀ is rejected and H₁ is accepted. It can be concluded that there is a significant influence of using the Enriched Virtual Blended Learning model assisted by digital comics on student learning motivation in the vocational school informatics subject.

4.2. DISCUSSION

This discussion analyzes the average indicator scores from the pre-test and post-test questionnaires. The questionnaire used a 1-4 scale for each question, resulting in a maximum possible score of 60 and a minimum of 15 for each respondent. The average score for each learning motivation indicator on this 4-point scale can be seen in Table 16.

Table 16. Average Pre-test Indicator Score

Indicator	Question Items	Average score (scale 4)	
		Control Class	Experimental Class
Feelings of Joy	1,3,4,5	3.04	2.98
Student Involvement	6,7,9,10	2.64	2.97
Interest	12,13,14,15	2.57	2.69
Student Attention	17,18,20	3.17	3.15

Based on Table 16 above, the pre-test average scores for the "Feelings of Joy" indicator (items 1, 3, 4, 5) were 3.04 for the control class and 2.98 for the experimental class. For "Student Involvement" (items 6, 7, 9, 10), the scores were 2.64 for the control class and 2.97 for the experimental class. For the "Interest" indicator (items 12, 13, 14, 15), the scores were 2.57 for the control class and 2.69 for the experimental class. Finally, for "Student Attention" (items 17, 18, 20), the scores were 3.17 for the control class and 3.15 for the experimental class. These average scores are depicted in the bar diagram in Figure 5.

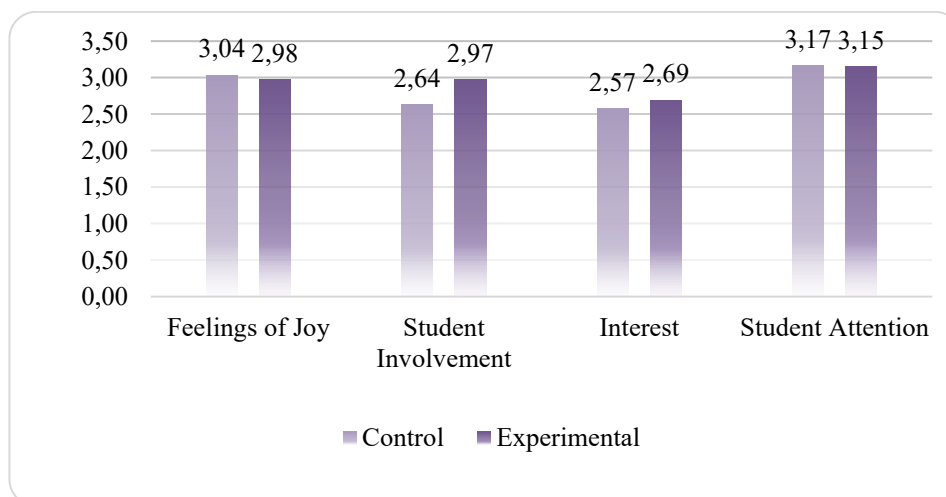


Figure 5. Average Pre-test Graph Per Indicator

Details of the post-test average scores for the learning motivation indicators in both the control and experimental classes can be seen in Table 17.

Table 17. Average Post-test Indicator Scores

Indicator	Question Items	Average score (scale 4)	
		Control Class	Experimental Class
Feelings of Joy	1,3,4,5	2.97	3.54
Student Involvement	6,7,9,10	2.83	3.31
Interest	12,13,14,15	2.86	3.29
Student Attention	17,18,20	3.13	3.63

Based on Table 17 above, the post-test average scores for the "Feelings of Joy" indicator (items 1, 3, 4, 5) were 2.97 for the control class and 3.54 for the experimental class. For "Student Involvement" (items 6, 7, 9, 10), the scores were 2.83 for the control class and 3.31 for the experimental class. For the "Interest" indicator (items 12, 13, 14, 15), the scores were 2.86 for the control class and 3.29 for the experimental class. Finally, for "Student Attention" (items 17, 18, 20), the scores were 3.13 for the control class and 3.63 for the experimental class. These average scores are depicted in the bar diagram in Figure 6.

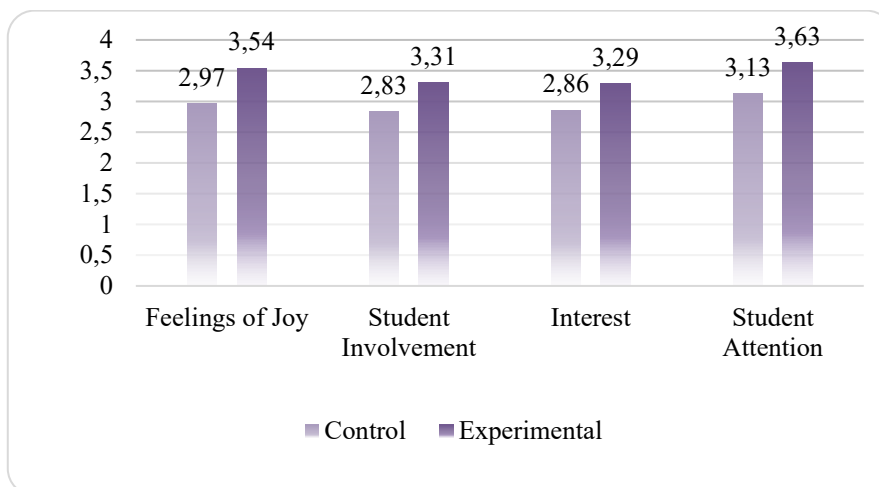


Figure 6. Average Post-test Graph Per Indicator

The results of this research show that the application of the Enriched Virtual Blended Learning model assisted by digital comics has a positive impact on student learning motivation in the Informatics subject at SMK N 1 Sukoharjo. The t-test analysis indicates a significant difference in learning motivation between students who followed this learning model and those who did not.

Furthermore, there was a significant increase in the final score (post-test) of students who applied the Enriched Virtual Blended Learning model, indicating an increase in their learning motivation. Even though the F-test showed no significant difference in variance between the two classes, the t-test results confirm that the application of this learning model has a significant positive influence on students' learning motivation.

The use of conventional Problem-Based Learning (PBL) in the digital era is often considered less engaging, whereas interactive learning multimedia is recognized as being able to increase student motivation. The Enriched Virtual Blended Learning model, which combines traditional methods with online learning, has proven effective in increasing students' learning motivation. Therefore, it is important to adopt engaging and interactive learning methods to increase student learning motivation, especially in the context of learning in the digital era (Anggraeni et al., 2021; Kurnia Prantauwati, 2021; Zebua & Harefa, 2022).

5. CONCLUSION

The conclusion of this research is that there is a significant difference in the learning motivation of students who apply the Enriched Virtual Learning model assisted by digital comics in the Informatics subject. Student learning motivation was recorded to be higher in the class that used this learning model. This conclusion is based on the results of the independent sample t-test and data analysis, which show a significant difference between the two classes. Therefore, the application of the Enriched Virtual Learning model assisted by digital comics can be recommended as it has a positive influence on student learning motivation.

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