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Enhancing High School Student Engagement and Academic Achievement: A Comparative Analysis of the JIA Application

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ABSTRACT

This study compares the effectiveness of the JIA application in enhancing student engagement and learning outcomes in Pancasila Education for Class X students at SMA Methodist 02 Palembang. The study employed a quasi-experimental design with a 2x2 format, using non-equivalent groups. Data were collected through observation and multiple-choice tests administered as pretests and posttests. Research sampling was carried out. Participants were selected using purposive sampling, purposive sampling type. Data collection was carried out using observation sheets on learning activities and multiple choice formative test questions such as pretest and posttest. The JIA application significantly improved student engagement and learning outcomes. The N-Gain Score for learning activities was 46.8%, and for learning results, it was 52.5%. Learning activity increased by 12.70%, from 59.54% to 72.29%. The average learning outcome score improved by 31.02 points, from a pretest score of 47.95 to a posttest score of 78.97. The findings underscore the significant impact of the JIA application in enhancing both student engagement and learning outcomes in Pancasila Education for Class X students at SMA Methodist 02 Palembang. The study's results suggest that integrating technology, such as the JIA application, into educational curricula can substantially elevate student participation and achievement. These findings advocate for the broader implementation of digital tools in educational settings to foster more interactive and effective learning experiences, potentially guiding future policy and curriculum development in schools.

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1. INTRODUCTION

The swift evolution of technology in the contemporary era has profoundly transformed various facets of human life, with education experiencing notable changes. The integration of Information and Communication Technology (ICT) holds considerable potential to enhance educational quality across all levels, from primary schooling to higher education. As highlighted by Yati (2022), education in the 21st century is deeply intertwined with the Fourth Industrial Revolution, characterized by global interconnectedness. This technological integration in education, encapsulated by the concept of Technological Pedagogical Content Knowledge (TPACK), has proven particularly essential during the

COVID-19 pandemic. In Indonesia, this approach has ensured the continuity of educational opportunities, aligning with the objectives of the Indonesian Constitution. The effectiveness of such integration relies heavily on teachers' competence in utilizing technological tools, with applications like "Jelajah Ilmu Anak" (JIA) playing a critical role in facilitating anytime, anywhere learning, fostering student engagement, and enabling parental involvement in monitoring their children's academic progress (Hennilawati & Hartini, 2020).

Teachers' ability to use technology for teaching activities is crucial. One technology-based learning tool that teachers can utilize is the "Jelajah Ilmu Anak" (JIA) application. JIA is designed to facilitate learning anytime and anywhere. The various features available on the application intrigue students to explore and enhance their technological skills. Moreover, the application supports parental involvement, allowing parents to access and monitor their children's learning activities at school (Warsita, 2016).

According to (Anwar et al., 2023) It is stated that educational media functions to achieve pre-established learning objectives, implying that educational media serves various purposes, including enhancing student engagement and learning outcomes. This is consistent with the views expressed by (Rosniati et al., 2022) who state that technology-integrated learning can have a positive impact on the teaching process. (Firman & Rahayu, 2020) also argue that online learning media significantly influence students' learning interest, thereby contributing to improved academic performance.

In Methodist 02 High School Palembang, there is an issue regarding the lack of student engagement leading to poor academic performance. One of the contributing factors is the limited utilization of learning media by teachers. Teachers tend to rely on lecture methods using conventional learning media such as printed books during teaching and learning processes (PBM). One of the learning media provided by the school is the Jelajah Ilmu Anak (JIA) application.

Based on a preliminary study involving observation and unstructured interviews, it was found that, on average, students enjoy learning using the JIA application. However, some students tend to focus solely on their laptops and disregard instructions from teachers, indicating a lack of student engagement in class, resulting in inequality between active and inactive students. Observations and interviews also reveal that teachers have not fully optimized the use of the JIA application, leading to occasional conventional teaching methods. Inactive students show indifferent attitudes and lack of interest in learning materials, with some observed using social media platforms like Instagram, WhatsApp, and Facebook during lessons.

The decline in student engagement also affects their academic performance, as their learning outcomes are reportedly lower compared to previous years. This is suggested to be due to the suboptimal use of learning media, specifically the JIA application, at Methodist 02 High School Palembang. This aligns with research findings by Nirmala et al. (2023), indicating that challenges in teachers' use of computers as learning media can diminish the quality of education, especially in the modern era.

The theoretical framework of effectiveness utilized in this research, as outlined by Daheri et al. (2020), posits that effectiveness can be measured by the degree to which predefined goals are met, including the successful achievement of all planned objectives and necessary adaptations. In this context, the JIA application is deemed effective if it demonstrates a significant improvement in student engagement and learning outcomes compared to pre-implementation levels. However, while previous studies have explored the general impact of technological tools on education, there remains a gap in the literature regarding the specific effects of the JIA application on high school students' engagement and academic performance, particularly in the Indonesian context.

This study seeks to address this gap by focusing on Methodist 02 High School Palembang, with the primary research question being: How effective is the JIA application in enhancing student engagement and academic achievement? The research objectives are twofold: first, to analyze the levels of student engagement before and after the implementation of the JIA application; and second, to assess the effectiveness of the JIA application in improving both student engagement and learning outcomes.

The significance of this research lies in its potential to provide empirical evidence on the effectiveness of the JIA application as a tool for enhancing educational outcomes. The findings could offer valuable insights for educators and policymakers seeking to leverage technology to improve student engagement and achievement, particularly in the context of Indonesian high schools.

2. METHODS

This study employs a quasi-experimental design is a research method similar to an experiment, but it does not fully meet all the criteria for a randomized experiment, particularly in terms of creating fully randomized control and experimental groups. In this design, researchers cannot randomly assign participants to treatment or control groups but can observe and compare pre-existing groups before and after the treatment. This study aims to compare the impact of using the JIA application on student engagement and academic achievement without randomly assigning students to treatment and control groups.. For this study, 52 participants were selected based on several key criteria: students who had used the JIA application for at least one semester, had well-documented records of engagement and academic performance, and were willing to fully participate and provide the necessary data. Student engagement was previously measured through attendance, active participation in class, and involvement in assignments and school projects, with data obtained from attendance records, teacher reports, and classroom observations. Academic performance was measured by exam scores, assignment grades, and average report card grades. This data was then compared with data after using the JIA application to assess changes and improvements in student engagement and academic achievement, with 26 students in the control group and 26 students in the experimental group. In this study, descriptive statistics will include mean and standard deviation. The mean will represent the central value of student engagement and academic achievement before and after the use of the JIA application, while the standard deviation will indicate the spread or variability of the data around the mean. These statistics will provide an overview of the initial conditions and changes occurring in the group of students using the JIA application. The t-test used will be the paired t-test because this study compares the same group of students' results before and after using the JIA application, allowing for a direct comparison between two different conditions in the same group and effectively assessing the impact of the JIA application (Rasyid, 2022; Rukminingsih et al., 2020). N-Gain Score analysis will be used to assess improvement in student learning outcomes, calculated using the formula:

$$N - Gain = \frac{Post - Test\ Score - Pre - Test\ Score}{Maximum\ Score - Pre - Test\ Score}$$

Where "Post-Test Score" is the students' score after using the JIA application, "Pre-Test Score" is the students' score before using the application, and "Maximum Score" is the highest possible score. The N-Gain Score indicates the extent to which students' academic achievement has improved as a result of using the JIA application.

3. FINDINGS AND DISCUSSION

3.1 Result

The Jelajah Ilmu Anak (JIA) application is employed as a learning tool for teaching Pancasila Education to 10th-grade students at Methodist 02 High School Palembang. This application represents a significant step towards the school's digital learning transformation, transitioning from traditional printed materials to digital-based resources. In this new approach, all aspects of the learning process—such as textbooks, exams, assignments, and activity tracking—are fully digitized, creating a paperless educational environment. A key advantage of the JIA application is its ability to actively involve parents in their children's learning process, setting it apart from other educational tools. The interface of the JIA application is as follows:

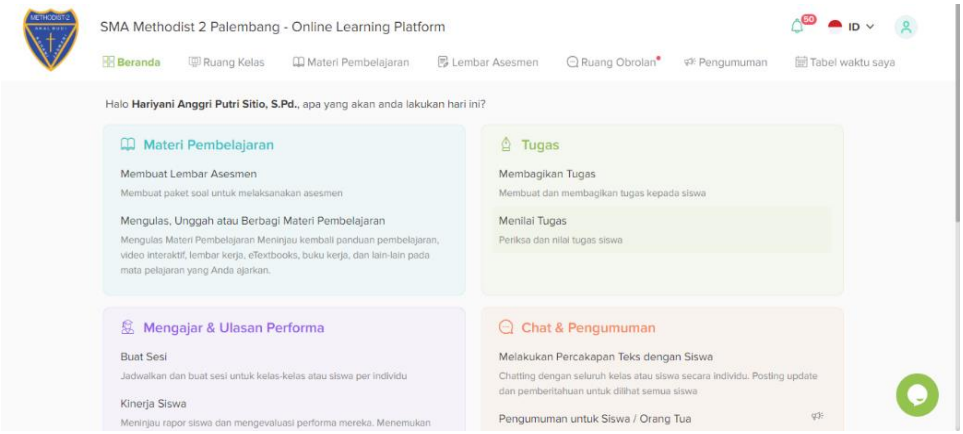

Figure 1. Front Interface of the JIA Application

On the front page of the JIA application are features for learning materials, assignments, teaching, performance reviews, chat, and announcements. Researchers use the chat column to divide groups, discuss, and check student attendance, as shown in the image below:

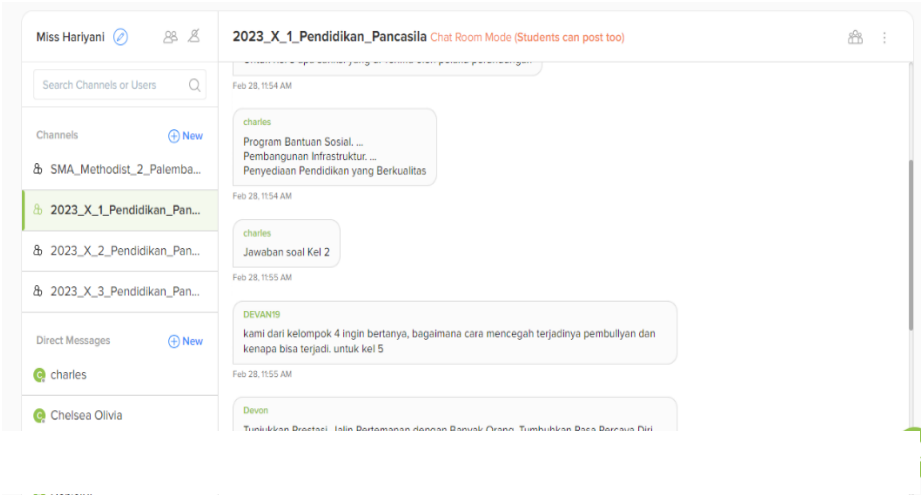

Figure 2. Chat Room Feature

Based on the image above, it can be seen that students from various groups are discussing and exchanging arguments on the predetermined topics. Next, students are asked to deepen their knowledge through learning materials and textbooks available in the learning materials feature, as shown in the image below:

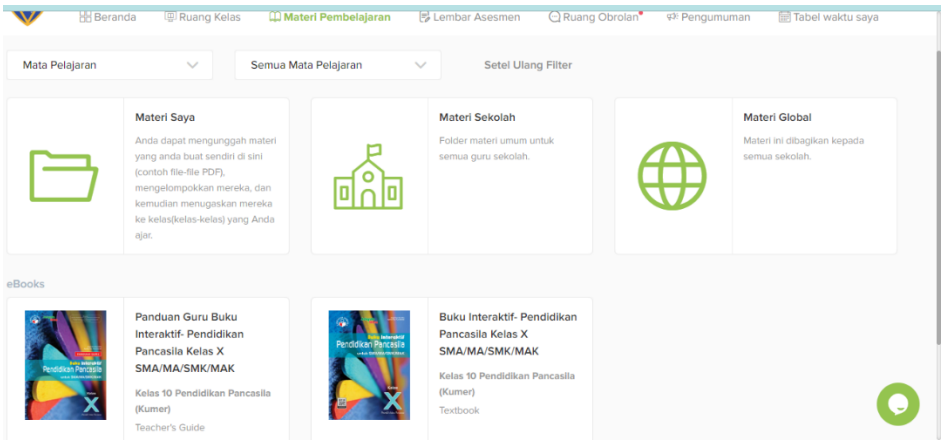

Figure 3. Learning Material Feature

Based on the image above, it is evident that there are learning materials accessible to students. The learning materials are provided by the researcher, while textbooks and other reading materials are globally available on the JIA application. The next feature is the assessment sheet used by the researcher to conduct multiple-choice formative tests as a posttest.

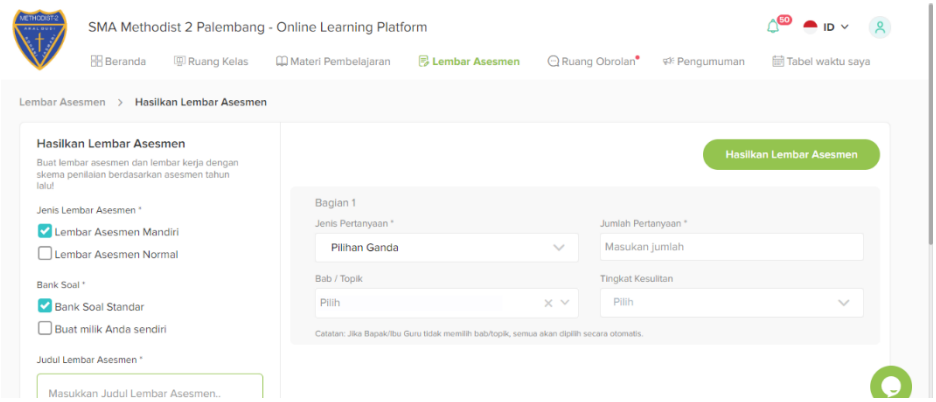

Figure 4. Assessment Sheet

Based on the image above, it is apparent that the teacher or researcher uses the assessment sheet for conducting multiple-choice formative tests as a posttest. The last feature used is assignments, as shown in the image below:

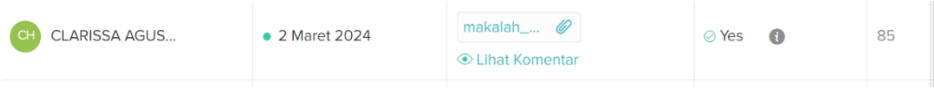

Figure 5. Assignment Page

In the image above, you can see the assignments collected by the students, and then they can be assessed directly by the teacher or in this case the researcher. This process allows for immediate feedback, enabling the researcher to analyze the quality and consistency of the students' work in real-time. Additionally, the visual representation of the collected assignments facilitates a systematic review, ensuring that each submission is evaluated thoroughly and fairly.

Based on the results of the research that has been carried out by the researcher, the following results are obtained:

Table 1. Number of active students before treatment

Control Class (X.1)			Experimental Class (X.2)		
Criterion	**n**	**(%)**	**Criterion**	**n**	**(%)**
Highly Active	0	0,00	Highly Active	0	0,00
Active	5	19,23	Active	3	11,54
Quite Active	16	61,54	Quite Active	20	76,92
Less Active	5	19,23	Less Active	3	11,54
Very Inactive	0	0,00	Very Inactive	0	0
Total	**26**	**100,00**	**Total**	**26**	**100,00**

Based on Table 1 above, it was found that in the control class, there were no students classified as very active (0.00%). In both classes, 5 students (19.23%) were classified as active, 16 students (61.54%) as fairly active, 5 students (19.23%) as less active, and no students categorized as very inactive (0.00%). These results are not significantly different from the initial engagement levels in the experimental class, where no students were categorized as very active (0.00%), 3 students (11.54%) were active, 20 students (76.92%) were fairly active, 3 students (11.54%) were less active, and no students were very inactive (0.00%).

This study also examines the effectiveness of the JIA application on students' learning outcomes. Therefore, initial data on students' cognitive abilities are needed. The learning outcomes of students before treatment (pretest) are as follows:

Table 2. Student pretest

Number	Control Classes Pretest Results	Experimental Classes Pretest Results
1	73	47
2	67	40
3	33	53
4	73	40
5	33	40
6	40	73
7	60	27
8	60	33
9	53	47
10	47	73
11	33	67
12	87	27
13	27	73
14	33	40
15	47	27
16	40	60
17	53	27
18	33	33
19	33	60
20	47	60
21	73	53
22	67	47
23	60	27
24	33	87
25	27	33
26	40	53
Avarage	**48,97**	**47,95**

Based on Table 2 above, the average score for the control class is 48.97, while for the experimental class it is 47.95. This indicates a slight difference in cognitive abilities between the control and experimental classes, amounting to 1.02. With the control class showing slightly higher cognitive abilities, it is expected that after using the JIA application, there will be an improvement in students' learning outcomes in the experimental class.

After obtaining initial engagement and cognitive ability results, the next step is to obtain results after the treatment. The results after the treatment using the JIA application are as follows:

Table 3. Observation Results of Meeting 1

Control Classes			Experimental Classes		
Criterion	**n**	**(%)**	**Criterion**	**n**	**(%)**
Highly Active	0	0,00	Highly Active	0	0,00
Active	0	0,00	Active	16	61,54
Quite Active	24	92,31	Quite Active	10	38,46
Less Active	2	7,69	Less Active	0	0,00
Very Inactive	0	0,00	Very Inactive	0	0,00

As shown in Table 3, a significant difference is observed between the control class and the experimental class. In the control class, there were no students categorized as very active or active. Out of the 26 students in the control class, 24 (92.31%) were categorized as moderately active, and 2 (7.69%) were categorized as less active. In contrast, in the experimental class, 16 students (61.54%) were categorized as active, and 10 students (38.46%) were categorized as moderately active. The initial observation after using the JIA application revealed that the number of active students in the experimental class (JIA use) was higher compared to the control class (conventional learning).

Table 4. Meeting Observation Results 2

Control Classes			**Examination Classes**		
Criterion	**n**	**(%)**	**Criterion**	**n**	**(%)**
Highly Active	0	0,00	Highly Active	0	0,00
Active	8	30,77	Active	26	100,00
Quite Active	13	50,00	Quite Active	0	0,00
Less Active	5	19,23	Less Active	0	0,00
Very Inactive	0	0,00	Very Inactive	0	0,00

Based on Table 4 above, it is known that in this second meeting, all students in the experimental class (100%) were categorized as active, whereas in the control class, 8 students (30.77%) were active, 13 students (50.00%) were moderately active, and 5 students (19.23%) were less active.

The results regarding students' cognitive abilities after the treatment using the JIA Application are as follows:

Table 5. Posttest Results

Number	Control Classes Posttest Results	Experimental Classes Posttest Results
1	47	80
2	40	87
3	47	73
4	40	80
5	47	73
6	47	80
7	40	73
8	47	80
9	40	80

10	53	73
11	40	73
12	47	73
13	47	87
14	47	67
15	47	73
16	53	80
17	47	87
18	53	87
19	40	80
20	67	73
21	53	93
22	47	73
23	73	73
24	53	80
25	53	73
26	47	100
Average	**48,46**	**78,97**

Based on Table 5 above, it was found that the average score of the control group is 60.77 while the average score of the experimental group is 78.97. Based on these results, it can be seen that there is an improvement in learning outcomes in the experimental group compared to before, with the experimental group scoring 18.20 points higher than the control group. This improvement occurred after researchers used the JIA application in the experimental class.

According to the research findings, the percentage of student learning activity after using the JIA application as a media for Pancasila Education in Grade X at SMA Methodist 02 Palembang was also obtained. Almost all indicators of learning activity show that the use of the JIA application has a positive effect in enhancing student learning activity. The percentage of student learning activity before (initial condition), meeting 1, and meeting 2 in both control and experimental groups can be seen in the graph below:

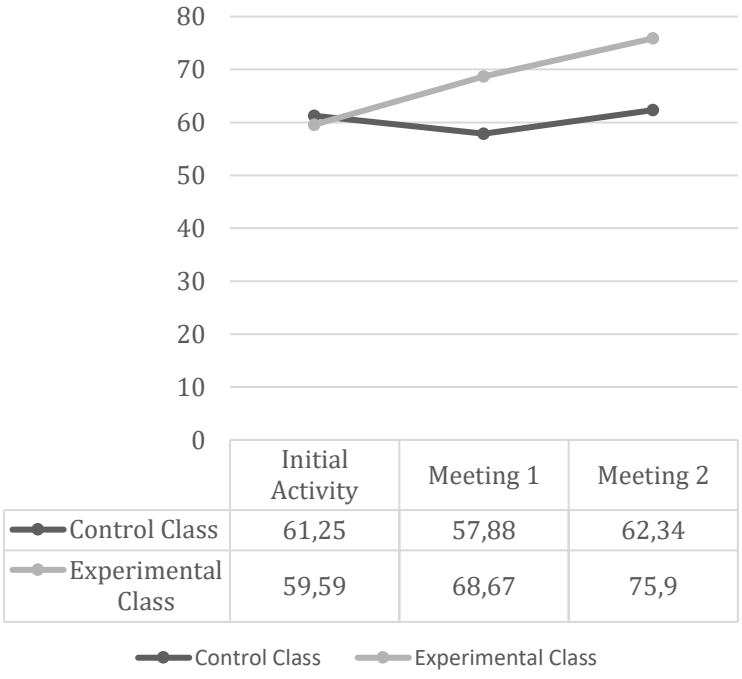

Figure 6. Learning Activity in Control and Experimental Classes

If the average student learning activity is calculated for meeting 1 and meeting 2, and then compared with the initial activity level of the students, the resulting graph is as follows:

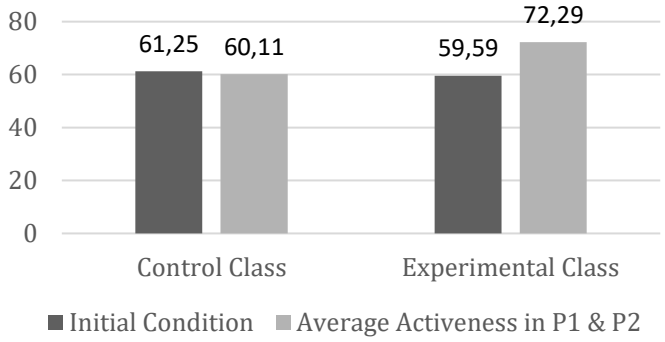

Figure 7. Comparison of Initial State and Average

From the Figure 7, it can be seen that there is an increase in the percentage of student learning activity in the experimental class, from an initial 59.59% to 72.29% (an increase of 12.70%). Meanwhile, in the control class, there was a decrease in activity, from an initial 61.25% to 60.11% (a decrease of 1.14%). Based on these activity data, it can be concluded that the JIA application as a learning media can be used to enhance student learning activity in Pancasila Education by 12.70%.

To strengthen the results of the quantitative descriptive analysis above, the researchers also conducted a t-test on the research results regarding student learning activity in Pancasila Education. Before conducting the t-test, preliminary tests were performed. Data normality testing in this study was conducted using SPSS Version 25 software. The normality test was performed to determine whether the distribution of student learning activity observation data was normal or not. The results of the testing on student learning activity can be seen in the table below:

Tabel 7. Tests of Normality of Learning Activity Data

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	**Sig.**
Active Learning	Previous-Kon	.089	26	.200*	.976	26	**.772**
	After-Kon	.123	26	.200*	.970	26	**.627**
	Before-Eks	.130	26	.200*	.919	26	**.042**
	After-Eks	.265	26	.000	.856	26	**.002**

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on the normality test results, it is found that the data for the control class is greater than 0.05 (>0.05), indicating normal distribution, while for the experimental class it is less than 0.05 (<0.05), indicating non-normal distribution. With these normality test results, the t-test for the control class was conducted using parametric statistics, specifically paired sample t-test, while for the experimental class, a non-parametric test, specifically Wilcoxon test, was used.

Before proceeding with parametric and non-parametric tests, a test for data homogeneity was performed to determine if the research data is homogeneous or not. However, this test is optional because regardless of the outcome, the subsequent tests will still proceed. The results of the homogeneity test for student learning activity are as follows:

Tabel 8. Test of Homogeneity of Variances Class Control

		Levene Statistic	df1	df2	Sig.
Active Learning	**Based on Mean**	**2.117**	**1**	**50**	**.152**
	Based on Median	1.740	1	50	.193
	Based on Median and with adjusted df	1.740	1	43.210	.194
	Based on trimmed mean	2.017	1	50	.162

Based on Table 8 above, it can be seen that the two-tailed significance value for the homogeneity test of the control class is 0.152, which means it is greater than 0.05 (>0.05), indicating homogeneous data.

Table 9. Test of Homogeneity of Variances Class Eksperimen

		Levene Statistic	df1	df2	Sig.
Active Learning	**Based on Mean**	**3.628**	**1**	**50**	**.063**
	Based on Median	3.594	1	50	.064
	Based on Median and with adjusted df	3.594	1	45.694	.064
	Based on trimmed mean	3.778	1	50	.058

Based on Table 9 above, it was found that the data in the experimental class is also homogeneous because it is greater than 0.05 (>0.05), with a two-tailed significance value of 0.063.

After conducting the preliminary tests, the next data analysis is the paired sample t-test for the control class, as the observation data for learning activity in the control class is normally distributed. This test is conducted to compare the effectiveness of learning between the control class and the experimental class. The results of the paired sample t-test for the control class can be seen in the table below:

Tabel 10. Paired Samples Test Control Class Activeness

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Initial and *post-treatment conditions*	-1.615	7.879	1.545	-4.798	1.567	-1.045	25	.306

In Table 10 above, the results of the paired sample t-test for the control class show a two-tailed significance value of 0.306, which is greater than 0.05 (>0.05). Therefore, based on the conclusion drawn from the paired sample t-test, there is no significant difference in learning activity before and after conventional (lecture-based) learning in the control class.

The Wilcoxon test was conducted on the data for student learning activity in the experimental class. This test was performed to measure the difference in student learning activity before and after using the JIA application. Since the data for the experimental class is not normally distributed, the test for mean difference was conducted using the Wilcoxon test. The results of this test can be seen below:

Tabel 11. Uji Wilcoxon **Experimental Class** Activity

Test Statistics[a]

	Post-Test - Pre-Test
Z	-4.434[b]
Asymp. Sig. (2-tailed)	.000

Based on Table 11, it can be observed that the two-tailed significance value for the student learning activity in the experimental class is 0.000, which is less than 0.05 (<0.05). Therefore, it can be concluded that there is a significant difference in student learning activity between before and after the treatment (use of the JIA application) in the experimental class.

The researcher conducted descriptive testing followed by a t-test to address the research hypothesis. The hypotheses were as follows:

H0: There is no significant difference in learning activity in the experimental class.

H1: There is a significant difference in learning activity in the experimental class.

To clarify the results of the testing for the difference in values between the control class and the experimental class, refer to the table below:

Table 12. Recapitulation of the Test of Differences in Learning Activity

Class	Exit Sig. (2-tailed)	Information
Control	0,306	There is no significant difference
Experiment	0,000	There are significant differences

Based on Table 12 above, it is found that there is no significant difference in the control class and there is a significant difference in the experimental class. Therefore, it can be concluded that the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. To further understand the effectiveness of using the JIA application, an additional test is conducted, namely the N-Gain Score effectiveness test. The results of the N-Gain Score testing for student learning activity can be seen in the table below:

Table 13. *N-Gain Score* Experimental Classroom Learning Activity Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NGain_Score	**26**	**-.04**	**.76**	**.4685**	.19012
Valid N (listwise)	26				

Based on Table 13 above, it is found that the N-Gain Score for the experimental class is 0.4685 (46.85%). The interpretation of the N-Gain Score value can be seen below:

Normalized Gain Value	Interpretation
-1.00 ≤ g ≤ 0.00	There is a decline
g = 0.00	Remain
0.00 < g < 0.30	Low
0.30 < g < 0.70	Keep
0.70 ≤ g 1.00	Tall

N-Gain (%)	Category
81 - 100	Highly Effective
61 - 80	Effective
41 – 60	Quite Effective
21 - 40	Ineffective
≤ 20	Highly Ineffective

Based on the normalized N-Gain value, there was an increase in student learning activity in the experimental class categorized as "Moderate" by 0.4685. Based on the percentage of the N-Gain value, the use of the JIA application to enhance student learning activity in Pancasila Education for Grade X at SMA Methodist 02 Palembang falls into the category of "Fairly Effective," which is 46.8%.

Next, the discussion focuses on the effectiveness of using the JIA application to improve student learning outcomes. Data on student learning outcomes before (Pretest) and after (Posttest) are obtained. These learning outcome data serve as a reference to address the hypothesis in this research. The graph of student learning outcome data can be seen below:

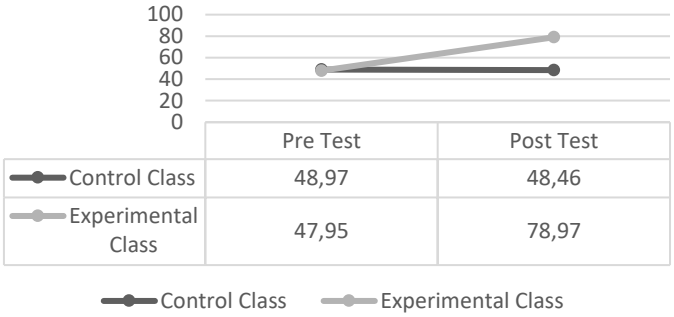

Figure 8. Learning Outcomes of the Control Class and the Experimental Class

Based on the data from Figure 8 above, it can be seen that the pretest score for the control class is 48.97, while the pretest score for the experimental class is only 47.95. This means the pretest score for the control class is higher by 1.02 (>1.02) compared to the experimental class. This difference is reasonable at the initial stage because both classes had not yet started using varied learning media.

Furthermore, it is evident that the posttest score for the control class is lower (30.51) compared to the posttest score for the experimental class. This is because learning activities in the experimental class were conducted using digitalized learning media (JIA application), whereas the control class still used conventional learning methods.

If we compare the average learning outcomes between the pretest and posttest for the control and experimental classes, the graph would look as follows:

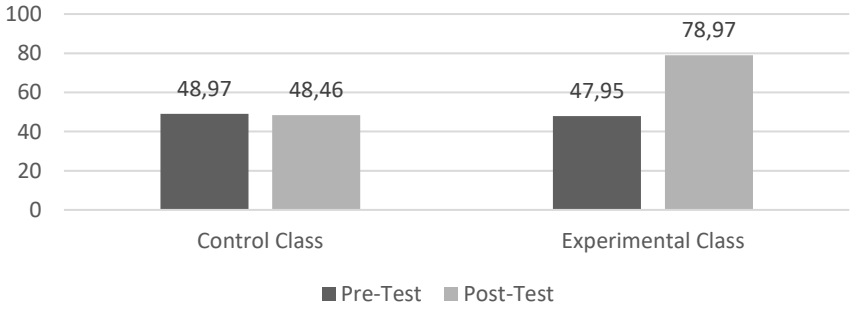

Figure 9. Comparison of Average Post-Test and Pre-Test Scores

Based on Figure 9 above, it provides an overview of the comparison between the average pretest and posttest scores of the control and experimental classes. The average score increased in the experimental class by 31.02, while it decreased in the control class by 0.51. Based on these learning outcome data, it can be concluded that the JIA application as a learning media can be used to improve student learning outcomes in Pancasila Education with an average score increase of 31.02.

To strengthen the results of the quantitative descriptive analysis above, the researcher also conducted a t-test on the research results regarding student learning outcomes in Pancasila Education. Before conducting the t-test, preliminary tests were performed. The results of the normality test on the research data related to student learning outcomes are as follows:

Table 14. Test of Normatify of Variances

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Variance	Pre-Kon	.172	26	.047	.915	26	.035
	Post-Kon	.270	26	.000	.791	26	.000
	Pre-Eks	.140	26	.200*	.929	26	.044
	Post-Eks	.242	26	.000	.862	26	.002

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on the normality test results for the learning outcomes above, it is evident that all the significance values (2-tailed) for the student learning outcome data are below 0.05 (<0.05), indicating that none of them follow a normal distribution.

The results of the homogeneity test for student learning outcome data can be seen in the table below:

Tabel 15. Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Variance	Based on Mean	12.412	3	100	.000
	Based on Median	11.264	3	100	.000
	Based on Median and with adjusted df	11.264	3	81.149	.000
	Based on trimmed mean	11.825	3	100	.000

Based on the homogeneity test results above, it can be concluded that all the pretest and posttest data, both for the control and experimental classes, are not homogeneous because each has a significance value (2-tailed) less than 0.05 (<0.05), specifically 0.000.

Since the student learning outcome data are not normally distributed, the test to find significant differences between pretest and posttest scores was conducted using the Wilcoxon test. The results of the Wilcoxon test for each class can be seen in the table below:

Table 16. Test Wilcoxon Control Class

Test Statistics[a]

	Post Kontrol - Pre Kontrol
Z	-.014[b]
Asymp. Sig. (2-tailed)	.989

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

From Table 16, it can be observed that there is no significant difference between the pretest and posttest scores in the control class, with a two-tailed significance value of 0.989, which is above 0.05 (>0.05). Therefore, it can be concluded that there is no significant difference in learning outcomes for the control class.

Table 17. Wilcoxon Test for Experimen Class

Test Statistics[a]

	Post Kontrol - Pre Eksperimen
Z	-4.310[b]
Asymp. Sig. (2-tailed)	.000
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

From the Wilcoxon test results on the learning outcomes of the experimental class, it was found that there is a significant difference between the pretest and posttest scores with a two-tailed significance value of 0.000, which is less than 0.05 (<0.05). Therefore, the use of the JIA application has a positive impact on student learning outcomes.

The researcher conducted descriptive testing followed by a t-test to address the research hypothesis. The hypotheses were as follows:

H0: There is no significant difference in learning outcomes in the experimental class.

H1: There is a significant difference in learning outcomes in the experimental class.

To clarify the results of the testing for the difference in values between the control class and the experimental class, refer to the table below:

Table 18. Recapitulation of Wilcoxon Test Results Learning Outcomes

Class	Exit Sig. (2-tailed)	Information
Control	0,989	There is no significant difference
Experiment	0,000	There are significant differences

Based on the table above, it was found that there is no significant difference in the control class, while there is a significant difference in the experimental class. Therefore, it can be concluded that the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. To further understand the effectiveness of using the JIA application, an advanced test was conducted, namely the N-Gain Score effectiveness test.

This test was performed to determine how effective the use of the JIA application is in improving student learning outcomes in Pancasila Education for Grade X at SMA Methodist 02 Palembang. The test was only conducted on the experimental class because the control class did not show significant differences, and the requirement for calculating N-Gain Score is data with significant differences. The results of the N-Gain Score testing for student learning outcomes can be seen in the table below:

Based on Table 4.20 above, it can be seen that the mean N-Gain Score for the experimental class is 0.5252 (52.5%). The interpretation of the N-Gain Score value can be seen below:

Table 19. N-Gain Score Test for Learning Outcomes

Normalized Gain Value	Interpretasi
$-1.00 \leq g \leq 0.00$	There is a decline
$g = 0.00$	Remain
$0.00 < g < 0.30$	Low
$0.30 < g < 0.70$	Keep
$0.70 \leq g$ 1.00	Tall

N-Gain (%)	Category
81 - 100	Highly Effective
61 - 80	Effective
41 – 60	Quite Effective
21 - 40	Ineffective
≤ 20	Highly Ineffective

There was an increase in student learning outcomes in the experimental class categorized as "Moderate" by 0.5252. Based on the percentage of the N-Gain score, the use of the JIA application to enhance student learning outcomes in Pancasila Education for Grade X at SMA Methodist 02 Palembang falls into the category of "Fairly Effective," which is 52.5%.

3.2 Discussion

Based on the research findings, it was discovered that teachers are not yet fully optimal in utilizing the JIA application provided by the school as a learning media, primarily due to their limited technological skills. The impact of this technological limitation among teachers can result in suboptimal use of educational media, thereby affecting overall learning effectiveness and the ability of teachers to meet diverse learning needs of students (Suryana & Somadi, 2018). Therefore, it is important for the education system to identify and address these challenges through appropriate training, adequate infrastructure support, and continuous professional development for educators. This aligns with the findings of research conducted by (Muspawi, 2021) which indicate that obstacles faced by teachers in utilizing computers as learning tools can diminish the quality of education, especially in the modern era.

The educational background and teaching experience of teachers also influence their capabilities. The Pancasila Education teachers at SMA Methodist 02 Palembang are not graduates of Pancasila Education programs, and their teaching experience in Pancasila Education is relatively limited. Furthermore, regarding background and teaching experience, the findings of this research are consistent with the opinion expressed by (Ningrum & Sobandi, 2021) where a teacher's ability is influenced by three factors: educational background, teaching experience, and student achievement. In performing their duties, teachers must possess the appropriate attitudes, skills, and knowledge that are relevant to their profession.

Good instructional media can design more interactive and engaging learning experiences. This can involve simulations, educational games, or multimedia presentations that enhance student engagement. Some concepts in certain subjects may be challenging to understand through verbal explanations alone (Aji, 2018). Instructional media can help visualize these concepts through images, diagrams, or animations, thereby facilitating student comprehension. With access to various media, teachers can design creative tasks that encourage students to explore and express their own ideas. This can stimulate creativity and innovation in the learning process, making students more enthusiastic about learning, which in turn can impact student engagement and ultimately, their learning outcomes (Rahmi & Samsudi, 2020).

With the right instructional media technology, students can learn independently outside the classroom. This helps build self-directed learning skills and prepares them for lifelong learning. The use of visualization, interactivity, and repetition through instructional media can enhance information retention and understanding of concepts (Septiyaningsih & Waskito, 2023). This allows students to establish a strong foundation in the material being studied. Therefore, mastering and utilizing instructional media optimally is crucial to supporting the effectiveness of learning in this modern era. It not only enriches students' learning experiences but can also significantly improve their academic outcomes. This is in line with the opinion expressed by (Ramadhan et al., 2021) stating that technology-integrated learning can have a positive impact on the teaching process. (MM, 2020) also notes that online instructional media significantly influences students' learning interest, which subsequently impacts improved academic performance. Furthermore (Usep Setiawan et al., 2022) assert that instructional media includes physical tools used effectively to deliver learning content. Well-designed instructional media can enhance student engagement in the learning process. The use of engaging media such as images, videos, or simulations can stimulate student interest and attention, thereby increasing student engagement and improving students' academic performance (Hanifah et al., 2020).

Based on the opinions of experts and previous researchers, it is known that teachers' ability to master technology, their educational background, teaching experience, the instructional media they use, and the support provided to them are crucial factors. Regular training for teachers to deepen their understanding and proficiency in using the JIA application is also a significant factor contributing to its effectiveness in enhancing student engagement and learning outcomes in the teaching of Civic Education for Grade X at SMA Methodist 02 Palembang.

4. CONCLUSION

The research findings indicate that the use of the JIA application to enhance student engagement and learning outcomes in Civic Education for Grade X at SMA Methodist 02 Palembang was moderately effective, with effectiveness ranging between 41% and 60%. Specifically, the N-Gain Score for student engagement was 46.8% (0.4685), and for learning outcomes, it was 52.5% (0.5252). These results suggest that while the JIA application has the potential to improve student performance, its impact is moderate and may require refinement or additional support strategies to achieve higher levels of effectiveness. However, several limitations should be considered, including the small sample size, which was limited to a single school, and the short duration of the research, which may not fully capture the long-term effects of the application. Additionally, the reliance on self-reported data and observations could introduce bias or inaccuracies. To enhance the generalizability of these findings,

future research should expand the sample size and include multiple schools. Longitudinal studies would be valuable for assessing the sustained impact of the JIA application over time, and incorporating qualitative data, such as student and teacher interviews, could provide deeper insights into the factors influencing its effectiveness and identify areas for further improvement.

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