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History in Your Hands: The Impact of AR Media on Developing Historical Thinking Skills in Social Studies Learning

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ABSTRACT

This research aims to evaluate the impact of using Augmented Reality (AR) media on the development of students' historical thinking skills in learning Social Sciences (IPS). The research approach uses quantitative with the method used is quasi-experimental nonequivalent control group design, with two Experiment and Control classes at SMPN 13 Bandung as the research sample. The experimental class uses AR media, while the control class uses the GimKit platform to compare the effectiveness of interactive learning. Data was collected through historical thinking skills tests before and after treatment in both groups. The research results show that the use of AR can significantly result in effectiveness as seen from the increase in students' historical thinking skills compared to GimKit media. This increase is known from the pre-test to post-test data for 36 students. The average historical thinking score increased significantly from the pre-test score with an average of 62.63 to the post-test with an average of 75.13. Overall this increase rose to 20%. This research hopes to provide students with important insightful experiences regarding the application of interactive technology in improving the quality of history learning.

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1. INTRODUCTION

History learning is often considered boring by students because the teaching methods tend to be traditional and focus on memorization. In fact, history requires historical thinking skills, such as the ability to analyze, evaluate, and relate events to the context of the era. The low level of these skills makes it difficult for students to understand the relevance of history to the present (Bae et al., 2021). The application of technology in education, especially Augmented Reality (AR) and game-based media such as GimKit, has become an innovative alternative. AR is able to visualize historical events interactively and immersively, thereby increasing students' interest in learning and understanding of abstract material (Cooper, 2020). The learning experience through AR helps students develop critical thinking skills through simulations of real historical events (Dingeldein et al., 2020).

On the other hand, GimKit is a game-based learning platform that emphasizes strengthening concepts through interactive quizzes. This platform is often used to strengthen mastery of historical concepts, although it tends to focus more on memorizing facts than critical thinking skills (Arrasyid et al., 2024). The use of GimKit can help students remember information in a fun way, but its development for analytical skills is still limited (Ruhimat et al., 2022). This study used a quasi-experimental method at SMPN 13 Bandung by comparing two groups of students. The experimental class used AR as a medium for learning history, while the control class used GimKit. The main purpose of this study was to determine whether AR was more effective in developing historical thinking skills than GimKit (Darmawan & Parhan, 2023).

The historical thinking skills developed in this study include the ability to analyze historical sources, see patterns, and understand the social, political, and cultural contexts behind historical events (Porda & Putro, 2013). With AR, students can explore different perspectives of historical events, so that they can encourage deeper and more reflective understanding (Budhi Salira et al., 2022). Several studies have shown that AR significantly increases student engagement in learning history and helps them understand the relationship between historical events and the present (Logayah et al., 2023). In addition, AR allows students to learn more actively, where they can be directly involved in the historical context through relevant simulations (Darmawan et al., 2024).

This research is important to do because there are not many studies that directly compare the effectiveness of AR and game platforms such as GimKit in developing historical thinking skills. The results of this study are expected to provide new insights into how technologies such as AR can be integrated into more effective and interactive history learning (Fikri, 2022). Thus, this study makes a significant contribution to the development of technology-based history learning methods in schools, as well as providing recommendations for educators to choose the right media to improve students' critical thinking skills in understanding history (Setiawan et al., 2021).

As one of the innovations in education, the use of AR has been proven to increase student interactivity in history learning. AR not only presents information visually, but also creates a more immersive learning experience through direct interaction with historical objects. For example, students can see historical buildings in 3D or participate in important war simulations. This learning experience strengthens the critical and analytical thinking skills needed in history (Berry Allena, 2021). Through this research, it is hoped that effective strategies can be found in integrating technology into history learning. The application of AR

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and game-based platforms such as GimKit have great potential in improving the quality of learning, but the right approach needs to be adjusted to broader educational goals, especially in developing historical thinking skills. This research can also provide guidance for educators in choosing effective and innovative learning media in the digital era (Haniah et al., 2020).

2. METHOD

This study used a quasi-experimental method with a nonequivalent control group design to test the effect of Augmented Reality (AR) media in developing students' historical thinking skills on Hindu-Buddhist material. The experimental class was class VII K which used AR to display Hindu-Buddhist historical objects, while the control class, VII I, used GimKit as a learning medium. This study was conducted at SMPN 13 Bandung with the aim of comparing the effectiveness of the two learning methods. Data collection was carried out using a pre-test and post-test. The implementation of the understanding test using a pre-test and post-test of students to see how far students understand the Hindu-Buddhist history material before and after the treatment was applied by looking at the final test, namely the effectiveness of good learning media to use. The following is data on the number of students in the experimental and control classes :

Tabel 2.1
Data of students in the experimental and control classes

Experimental Class (VII-K)		**Control Class (VII-I)**	
Male	**Female**	**Male**	**Female**
17	19	17	19
Total		**Total**	
36		36	

The experimental class learned with AR which presented objects such as temples, statues, and Hindu-Buddhist artifacts in a 3D visual format. The control class utilized GimKit which presented the same material in an interactive quiz format. After the learning was complete, the second class was given a post-test with the same questions to improve historical thinking skills. The test result data was analyzed quantitatively using statistical tests to see if there were significant differences in historical thinking skills between classes using AR and classes using GimKit, especially in understanding historical events and Hindu-Buddhist artifacts.

3. RESULTS AND DISCUSSION

3.1 Historical Thinking Skills There is a Difference Between Before and After Historical Thinking Actions of Students in Experimental Classes

Historical Thinking Skills are important skills that help students understand past events in a more critical and analytical way. Through the application of Historical Thinking Skills, students can distinguish between facts and interpretations, recognize various historical perspectives, and understand the complexity of events that occurred. In the context of history education, the application of Historical Thinking Skills in experimental classes showed a significant difference between before and after students used these skills. This emphasizes

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the importance of teaching based on the development of historical thinking skills to deepen students' understanding of history (Rafiepour & Farsani, 2021).

After the application of Historical Thinking Skills in experimental classes, student learning outcomes showed a clear increase. Before the application of historical thinking skills, students tended to understand history superficially, only memorizing important facts and dates. However, after they were trained with the Historical Thinking Skill approach, students became more able to critically evaluate historical sources, analyze cause-and-effect relationships, and draw deeper conclusions about past events (Basri et al., 2022). These changes indicate that the application of Historical Thinking Skills can change students' way of thinking and improve their understanding of historical material as a whole. The following are the results of the decision-making hypothesis based on data analysis. In statistics, a result can be said to be statistically significant if the event is almost impossible to be caused by chance factors, according to predetermined probability limits. These results are based on observing the symptoms of the influence of changes before and after the augmented reality treatment was carried out as a learning medium to improve students' historical thinking abilities (Setiawan et al., 2020a).

Tabel 3.1.1

Hypothesis Testing Differences in Historical Thinking between Initial Measurement (Pre-test) and Final Measurement (Post-test) of the Experimental Classes

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	*Pretest Historical Thinking* Eksperimen - *Posttest Historical Thinking* Eksperimen	-25.00000	10.55597	1.75933	-28.57163	-21.42837	-14.210	35	**.000**

The table presents the results of the hypothesis test using the paired sample t-test, a parametric test for measurement data, which compares the results of the pre-test and post-test after implementing the augmented reality treatment in the experimental class. The significant value obtained is 0.000, which is less than 0.05, which leads to the rejection of Ho and acceptance of Ha. Therefore, it is proven that there is a difference in students' Historical Thinking before and after the treatment of interactive augmented reality learning media in the experimental class, in the context of social studies learning. Furthermore, the validation

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of this hypothesis is strengthened by comparing the t-value with the t-table, with the following decision-making guidelines:

- If t-value> t-table, Ho is rejected and Ha is accepted.

- If t-value < t-table, Ho is accepted and Ha is rejected.

In this case, the t-value exceeds the t-table, which leads to the rejection of Ho and acceptance of Ha, thus confirming the difference in students' Historical Thinking before and after the introduction of augmented reality learning media in the experimental class, in the social studies learning environment. Sig. Value. (2-tailed) < 0.05 and t count > t table further strengthens the rejection of Ho and acceptance of Ha.

Tabel 3.1.2
Recapitulation of Pre-test and Post-test Data Results for Historical Thinking Experiment Class

No	Name	Historical Thinking	
		Pre test	Post test
1	Student Experiment 1	50	70
2	Student Experiment 2	80	95
3	Student Experiment 3	75	95
4	Student Experiment 4	35	95
5	Student Experiment 5	40	85
6	Student Experiment 6	50	75
7	Student Experiment 7	75	90
8	Student Experiment 8	70	95
9	Student Experiment 9	65	90
10	Student Experiment 10	60	85
11	Student Experiment 11	65	80
12	Student Experiment 12	70	95
13	Student Experiment 13	65	95
14	Student Experiment 14	65	95
15	Student Experiment 15	55	80
16	Student Experiment 16	60	90
17	Student Experiment 17	55	85
18	Student Experiment 18	55	80
19	Student Experiment 19	80	95

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No	Name	Historical Thinking	
		Pre test	Post test
20	Student Experiment 20	55	85
21	Student Experiment 21	55	90
22	Student Experiment 22	50	90
23	Student Experiment 23	90	95
24	Student Experiment 24	70	80
25	Student Experiment 25	65	90
26	Student Experiment 26	50	90
27	Student Experiment 27	70	90
28	Student Experiment 28	45	80
29	Student Experiment 29	60	85
30	Student Experiment 30	70	90
31	Student Experiment 31	60	85
32	Student Experiment 32	60	85
33	Student Experiment 33	80	90
34	Student Experiment 34	65	85
35	Student Experiment 35	70	90
36	Student Experiment 36	75	90

This study aims to analyze the effectiveness of students' historical thinking skills in social studies learning by comparing the abilities before and after being given treatment using augmented reality learning media in the experimental class. During four meetings, the researcher provided treatment using AR media, and there was a difference in the average historical thinking skills after using the media. Based on the results of the pre-test and post-test data analysis of historical thinking skills in the experimental class, especially class VII K on Hindu-Buddhist material using AR learning media. Based on the data displayed, it shows the results of an increase in scores on historical thinking from pre-test to post-test for 36 students. The average historical thinking score increased significantly from the pre-test score which ranged from an average of 62.77 to a post-test with an average of 87.77.

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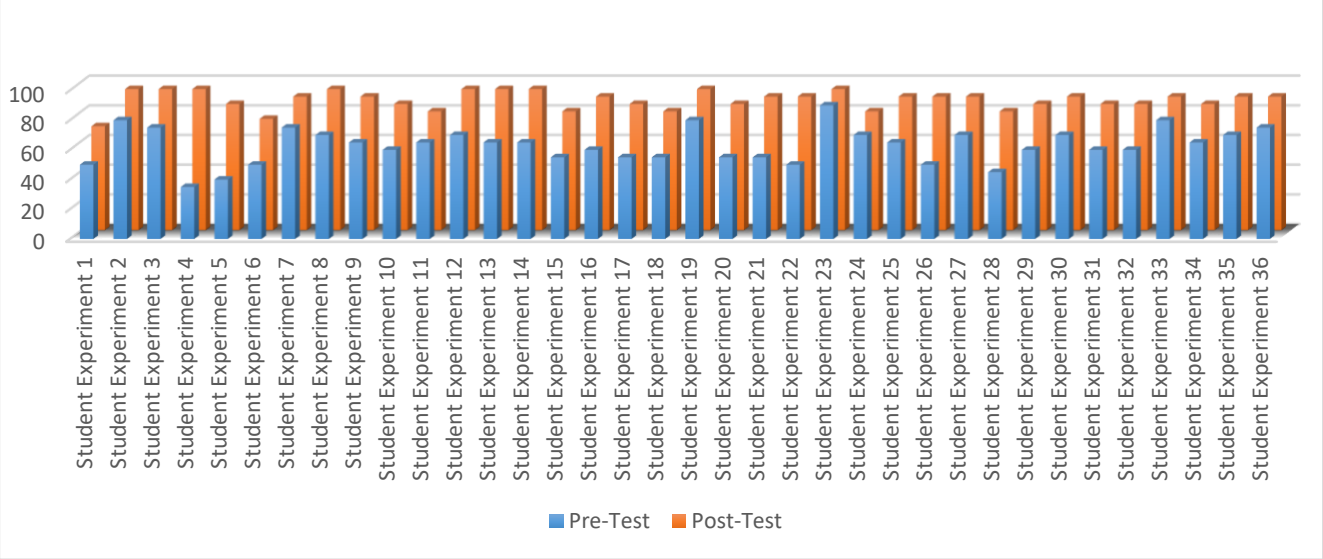
Grafik 3.1.1

Grafik Recapitulation of Pre-test and Post-test Data Results for Historical Thinking Experiment Class



This increase is indicated by an increase in the average for historical thinking by 40%. This shows that there is an increase in students' ability to think historical thinking after following the treatment that has been given. Therefore, there is a significant increase in students' historical thinking skills. The results of this study are in accordance with the theory which states that augmented reality media has a positive influence on increasing historical thinking skills in the experimental class. The use of augmented reality allows students to gain a deeper understanding of historical concepts through virtual viewing, interaction with, and manipulation of historical objects.

3.2. Historical Thinking Skills There is a Difference Between Before and After Historical Thinking of Students in Controll Classes

In the control class that used conventional learning media, namely GimKit as a comparison media in the control class in learning Hindu-Buddhist history, there was a striking difference in student actions before and after studying the material. Before learning, students in the control class tended to rely on memorizing historical facts without doing much critical analysis. After participating in learning with traditional methods, although there was an increase in factual understanding of Hindu-Buddhist history, students still did not show in-depth historical thinking skills, such as evaluating sources critically and understanding the historical context more broadly. This comparison shows that the use of media can affect students before using learning media and after using learning media. This is natural because the application of learning media can improve student learning outcomes (Clark, R. C., & Mayer, R. E., 2016).

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Tabel 3.2

Hypothesis Testing Differences in Historical Thinking between Initial Measurement (Pre-test) and Final Measurement (Post-test) of the Control Class

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	*Pretest Historical Thinking* Kontrol - *Posttest Historical Thinking* Kontrol	-12.50000	13.91299	2.31883	-17.20748	-7.79252	-5.391	35	**.000**

The table presents the results of the hypothesis test using the paired sample t-test, a parametric test for measurement data, which compares the pre-test and post-test results after implementing the GimKit treatment in the Control class. The significant value obtained is 0.000, which is less than 0.05, leading to the rejection of Ho and acceptance of Ha. Therefore, it is proven that there is a difference in students' Historical Thinking before and after the GimKit interactive learning media treatment in the Control class, in the context of social studies learning. Furthermore, the validation of this hypothesis is strengthened by comparing the t-value with the t-table, with the following decision-making guidelines:

- If t-value> t-table, Ho is rejected and Ha is accepted.

- If t-value < t-table, Ho is accepted and Ha is rejected.

In this case, the t-value exceeds the t-table, leading to the rejection of Ho and acceptance of Ha, thus confirming the difference in students' Historical Thinking before and after the introduction of GimKit learning media in the Control class, in the social studies learning environment. Sig. Value. (2-tailed) < 0.05 and t count > t table further strengthens the rejection of Ho and acceptance of Ha.

Tabel 3.2.2

Recapitulation of Pre-test and Post-test Data Results for Historical Thinking Control Class

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No	Name	Historical Thinking	
		Pre test	Post test
1	Student Control 1	45	45
2	Student Control 2	55	60
3	Student Control 3	85	90
4	Student Control 4	45	55
5	Student Control 5	80	95
6	Student Control 6	35	90
7	Student Control 7	40	55
8	Student Control 8	80	90
9	Student Control 9	50	80
10	Student Control 10	60	85
11	Student Control 11	85	90
12	Student Control 12	35	50
13	Student Control 13	90	95
14	Student Control 14	65	70
15	Student Control 15	45	90
16	Student Control 16	40	80
17	Student Control 17	70	60
18	Student Control 18	70	85
19	Student Control 19	80	90
20	Student Control 20	85	90
21	Student Control 21	90	90
22	Student Control 22	90	95
23	Student Control 23	50	75
24	Student Control 24	50	55
25	Student Control 25	50	55
26	Student Control 26	95	85
27	Student Control 27	55	85
28	Student Control 28	45	55

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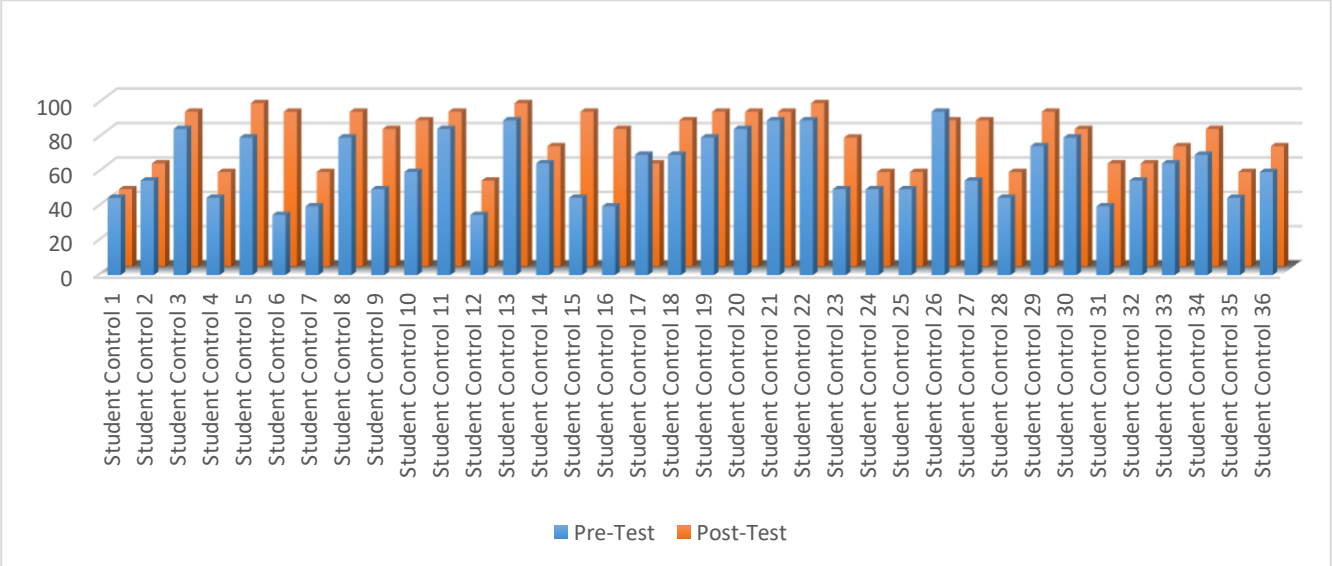
No	Name	Historical Thinking	
		Pre test	Post test
29	Student Control 29	75	90
30	Student Control 30	80	80
31	Student Control 31	40	60
32	Student Control 32	55	60
33	Student Control 33	65	70
34	Student Control 34	70	80
35	Student Control 35	45	55
36	Student Control 36	60	70

This study aims to analyze the effectiveness of students' historical thinking skills in social studies learning by comparing the abilities before and after being given treatment using augmented reality learning media in the experimental class. During four meetings, the researcher provided treatment using AR media, and there was a difference in the average historical thinking skills after using the media. Based on the results of the pre-test and post-test data analysis of historical thinking skills in the experimental class, especially class VII K on Hindu-Buddhist material using AR learning media. Based on the data displayed, it shows the results of an increase in the historical thinking skill score from the pre-test to the post-test for 36 students. The average historical thinking score increased significantly from the pre-test score which ranged from an average of 62.63 to a post-test with an average of 75.13.

Grafik 3.2.1

Grafik Recapitulation of Pre-test and Post-test Data Results for Historical Thinking Control Class



This increase is indicated by an average increase in historical thinking of 20%. This shows that there is an increase in students' ability to think historical thinking after following the

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3.3 The Effectiveness of Using Augmented Reality Media in Social Studies Learning for Historical Thinking

The use of N-gain is important to illuminate the extent to which Augmented Reality media can improve students' historical thinking skills. N-gain provides a purposeful way to measure the effectiveness of using Augmented Reality media in students' social studies learning before and after using AR media. By comparing pre-test and post-test scores, N-gain allows researchers to assess the effectiveness of AR media more accurately, regardless of differences in students' initial abilities. This is important to ensure that AR media truly has a positive impact on students' understanding and analysis of history, not just increasing scores without considering the potential for maximum improvement. In addition, N-gain helps overcome bias that may occur due to variations in students' initial levels of understanding.

In the context of social studies learning, historical thinking skills involve critical analysis of historical sources, interpretation of past events, and understanding more complex historical contexts. The use of N-gain allows researchers to see how significant the role of AR media is in developing these skills among students, so that they can provide more valid conclusions regarding the effectiveness of AR media as a learning tool. Thus, the results of this study can provide strong evidence to support the use of digital technology in improving the quality of social studies learning, especially in developing students' historical thinking skills. The following is a summary of the N Gain test on the effectiveness of augmented reality media to improve Historical Thinking Skills in social studies learning:

Tabel 3.3.1 N-Gain Test

Recapitulation Experimental and Control Class

Experimental Class					Control Class			
No	**Pretest**	**Protest**	**N Gain Skor**	**Improvement**	**Pretest**	**Protest**	**N Gain Skor**	**Improvement**
1	50	70	0,4	Standard	45	45	0	No improvement
2	80	95	0,75	High	55	60	0,11	No improvement
3	75	95	0,8	High	85	90	0,33	Standard
4	35	95	0,92	High	45	55	0,18	No improvement
5	40	85	0,75	High	80	95	0,75	High
6	50	75	0,5	Standard	35	90	0,85	High
7	75	90	0,6	Standard	40	55	0,25	No improvement

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Experimental Class					Control Class			
No	**Pretest**	**Protest**	**N Gain Skor**	**Improvement**	**Pretest**	**Protest**	**N Gain Skor**	**Improvement**
8	70	95	0,83	High	80	90	0,5	Standard
9	65	90	0,71	High	50	80	0,6	Standard
10	60	85	0,63	Standard	60	85	0,63	Standard
11	65	80	0,43	Standard	85	90	0,33	Standard
12	70	95	0,83	High	35	50	0,23	No improvement
13	65	95	0,86	High	90	95	0,5	Standard
14	65	95	0,86	High	65	70	0,14	No improvement
15	55	80	0,56	Standard	45	90	0,82	High
16	60	90	0,75	High	40	80	0,67	Standard
17	55	85	0,67	Standard	70	60	-0,33	No improvement
18	55	80	0,56	Standard	70	85	0,5	Standard
19	80	95	0,75	High	80	90	0,5	Standard
20	55	85	0,67	Standard	85	90	0,33	Standard
21	55	90	0,78	High	90	90	0	No improvement
22	50	90	0,8	High	90	95	0,5	No improvement
23	90	95	0,5	Standard	50	75	0,5	Standard
24	70	80	0,33	Standard	50	55	0,1	Standard
25	65	90	0,71	High	50	55	0,1	Standard
26	50	90	0,8	High	95	85	-2	No improvement
27	70	90	0,67	Standard	55	85	0,67	High
28	45	80	0,64	Standard	45	55	0,18	Standard
29	60	85	0,63	Standard	75	90	0,6	High
30	70	90	0,67	Standard	80	80	0	No improvement
31	60	85	0,63	Standard	40	60	0,33	Standard
32	60	85	0,63	Standard	55	60	0,11	Standard
33	80	90	0,5	Standard	65	70	0,14	Standard
34	65	85	0,57	Standard	70	80	0,33	Standard
35	70	90	0,67	Standard	45	55	0,18	Standard

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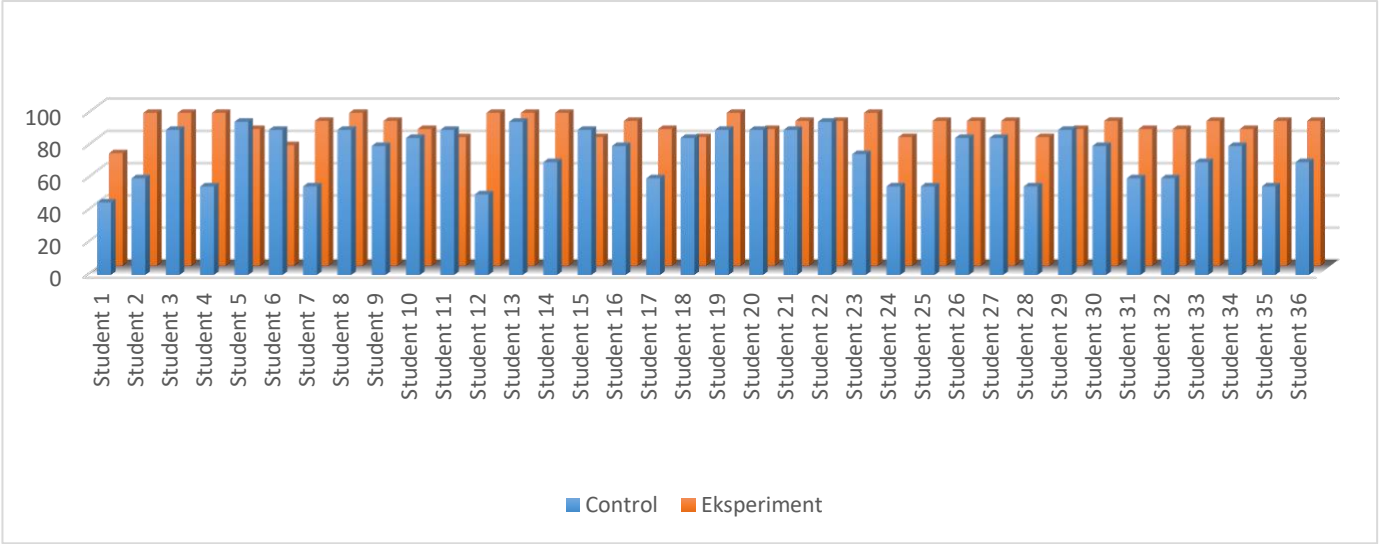
Experimental Class					Control Class			
No	**Pretest**	**Protest**	**N Gain Skor**	**Improvement**	**Pretest**	**Protest**	**N Gain Skor**	**Improvement**
36	75	90	0,6	Standard	60	70	0,25	Standard

Based on the results of the pre-test and post-test data analysis on historical thinking skills in the experimental class in class VII K in social studies learning on Hindu-Buddhist material using augmented reality learning media, the average historical thinking ability of students during the pre-test was 62.77. This shows that students' historical thinking abilities are still in the very poor category. This can be seen based on the pre-test work, students are still guessing the answers and there is no material and learning that has been obtained by students so that they answer according to their abilities. After being given treatment using augmented reality learning media, the average post-test historical thinking score was 87.77.

Grafik 3.3.1 N-Gain Test
Grafik Recapitulation Experimental and Control Class



Based on these results, there was an increase in historical thinking and digital literacy abilities. These results are in accordance with the theoretical framework which states that augmented reality media provides effectiveness on the historical thinking abilities of students in the experimental class. This ability is inversely proportional to the control class from the higher results in the experimental class. These results indicate that augmented reality learning media is more effective in social studies learning to improve students' historical thinking abilities compared to GimKit learning media. Although these results show that the two media have experienced quite good changes, it appears that augmented reality learning media is more effective when used in classroom learning.

4. CONCLUSION

Augmented reality media is a media that can be used in learning, especially for Social Studies Learning. The presence of augmented reality is utilized as a digital collaboration with learning to maximize and make learning in the classroom more effective and proven by the results of this study to successfully collaborate technology and education. This utilization is able to enable students to improve their historical thinking skills by inserting learning media

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in the form of augmented reality that displays 3D visualization so that students can be helped to know objects visually. shows that the use of Augmented Reality (AR) media has a significant impact on improving students' historical thinking skills in Social Sciences learning (Setiawan et al., 2020).

Through the N-gain test that measures the increase in students' understanding before and after using AR media, it was found that students who learned with the help of AR technology showed better critical analysis skills, the ability to evaluate historical sources more deeply, and a more complex understanding of the historical context. This increase in historical thinking skills is not only shown through higher scores on the post-test compared to the pre-test, but also through students' mastery in interpreting and connecting various historical events (Yefterson et al., 2020). AR allows students to experience history more interactively and deeply, which ultimately enriches their understanding of the past. The results of this study strengthen the evidence that digital technology, especially AR media, can be an effective tool for developing students' historical thinking skills, making history learning more interesting, contextual, and meaningful (Rijal Fadli et al., 2020).

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