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Contributive Analysis Of The Use Of Digital Infographic Media On The Chronological Thinking Ability Of SMK Students

[1]Heri Susanto, [2]Kamelia Amiruddin, [3]Fathurrahman, [4]Sriwati, [5]Siswandari, [6]Helmi Akmal

[1,2,4,6]Universitas Lambung Mangkurat, Banjarmasin, Indonesia
[3,5]Universitas Sebelas Maret, Surakarta, Indonesia
[1]Email: iniherisusanto@ulm.ac.id

Abstract

The difficulty vocational students have in understanding the chronology of historical events is the background of this study. The purpose of the study was to analyze the effect of digital infographic media on the chronological thinking ability of students in class XI MPLB at SMK Negeri 1 Banjarmasin. The research method used a quantitative experimental approach with a true experimental post-test-only control design. This study involved 48 students who were divided into experimental and control groups. Data collection was done through cognitive tests and documentation, with data analysis using a t-test. The results showed that the use of digital infographic media had a significant effect on students' chronological thinking ability, where the experimental class showed better ability than the control class. Digital infographic media proved to be effective in helping students understand the chronology of historical events, improve understanding of cause-and-effect relationships, and increase interest and motivation to learn. This research has implications for the importance of integrating digital technology in history learning and developing students' chronological thinking skills in a temporal context.

Keywords: digital infographics, chronological thinking, history learning, learning media

Abstrak

Kesulitan siswa SMK dalam memahami kronologi peristiwa sejarah menjadi latar belakang penelitian ini. Tujuan penelitian adalah menganalisis pengaruh media infografis digital terhadap kemampuan berpikir kronologis siswa kelas XI MPLB di SMK Negeri 1 Banjarmasin. Metode penelitian menggunakan pendekatan kuantitatif eksperimental dengan rancangan post-test only control design. Penelitian ini melibatkan 48 siswa yang dibagi dalam kelompok eksperimen dan kontrol. Pengumpulan data dilakukan melalui tes kognitif dan dokumentasi, dengan analisis data menggunakan uji t-test. Hasil penelitian menunjukkan bahwa penggunaan media infografis digital memiliki pengaruh yang signifikan terhadap kemampuan berpikir kronologis siswa, dimana kelas eksperimen menunjukkan kemampuan yang lebih baik daripada kelas kontrol. Media infografis digital terbukti efektif dalam membantu siswa memahami kronologi peristiwa sejarah, meningkatkan pemahaman hubungan sebab-akibat, serta meningkatkan minat dan motivasi belajar. Penelitian ini berimplikasi pada pentingnya mengintegrasikan teknologi digital dalam pembelajaran sejarah dan mengembangkan kemampuan berpikir kronologis siswa dalam konteks temporal.

Kata Kunci: infografis digital, berpikir kronologis, pembelajaran sejarah, media pembelajaran

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INTRODUCTION

The digital era has brought significant changes in various aspects of human life, including in the world of education. According to Abduh (2023), the digital era is characterized by the emergence of digital technology and the internet which makes it easier for people to receive information faster. The rapid development of information technology cannot be avoided, especially in the world of education, where digital technology plays an important role and continues to develop following the times. Education in the digital era must be able to integrate information and communication technology into all subjects, allowing learners to gain more knowledge in an easier and faster way (AR, 2020). This is in line with the objectives of national education in Law No. 20 of 2003 concerning the National Education System which emphasizes the comprehensive development of learners' potential. To realize this goal, it is necessary to improve the quality of human resources with ICT (Information and Communication Technology) skills through 4C-based learning (Communication, Collaboration, Critical Thinking and Problem-Solving, and Creativity and Innovation).

Digital technology is now an integral part of the learning process. Students, in the context of history learning, are required to have logical, inspiring, critical and innovative thinking or what is called historical thinking skills (Achmadin, 2022). One important component of historical thinking is the ability to think chronologically. Historical thinking skills encompass a range of cognitive abilities including chronological thinking, which enables students to understand temporal relationships and causal sequences in historical events. Saefudin's (2025) research emphasizes that prospective history teachers need comprehensive training in historical thinking skills to effectively implement a competency-based approach in classroom teaching. Hastuti et al. (2021) explain that chronological thinking is historical thinking that can develop the ability to identify the time of each event, measure time, and interpret historical relationships and changes. However, reality shows that there are still many students who have not been able to think chronologically related to historical events. This problem is caused by a lack of motivation in receiving complex historical material, the lack of learning resources that emphasize aspects of chronological thinking, and conventional teaching methods such as lectures that are difficult to understand concretely (Fajriyah & Priyanto, 2023; Hastuti et al., 2021).

The use of appropriate learning media can be a solution to develop students' chronological thinking skills. In the context of digital era learning, various innovative media have emerged as effective alternatives. Anis et al. (2022) demonstrate that digital history as learning resources in the Industrial Revolution 4.0 era provides flexibility and independence in learning, enabling students to explore, create, and study historical content more deeply through digital platforms. This digital transformation aligns with the need for chronological thinking development through visual and

interactive approaches. Digital infographics is one of the innovative learning media that has the potential to overcome these problems. Infographics or information graphics are visual representations that can present complex information quickly and clearly (Hakim, 2023). According to Taufik (2012) in Nasution & Diansyah (2020), infographics can bridge long text data into a simpler visual language. The use of infographics in learning history can make it easier for students to understand the chronology of historical events because it is presented in an attractive visual form.

The effectiveness of infographics in historical education has been demonstrated across various contexts. Pangestu et al. (2025) found that infographics serve as effective historical publication media, successfully conveying complex spatial and temporal information about historical events in an accessible and engaging format. Research on digital infographics in education has explored various dimensions beyond general effectiveness claims. Affandi et al. (2024) specifically examined how the combination of visual and textual elements in infographics affects cognitive retention in vocational education settings, finding improved concept mastery in technical subjects. In contrast, Ramadani et al. (2025) focused on affective outcomes, investigating how infographic-based learning influences student motivation and engagement compared to traditional text-based materials. From an information processing perspective, Khaeranda et al. (2024) analyzed the cognitive load theory application in infographic design, demonstrating how visual simplification of complex information reduces mental processing burden.

However, research in history education presents a different landscape. Nursolehah et al. (2024) examined visual media broadly in Islamic history instruction at elementary level, focusing on general comprehension rather than specific thinking skills. Azhari et al. (2022) investigated infographic applications for historical data presentation in general secondary schools, emphasizing information visualization rather than chronological reasoning development. Meanwhile, Hisyam & Ofianto (2022) developed digital timeline tools for narrative construction in senior high school history classes, though their focus was on storytelling capabilities rather than systematic chronological thinking assessment. Furthermore, Fathurrahman et al. (2025) developed flipbook-based local history teaching modules for high school students, achieving very feasible validation scores from experts, demonstrating the growing acceptance and potential of interactive digital media in history education. These studies in history education have primarily addressed content delivery and general comprehension, leaving chronological thinking skills—a fundamental component of historical reasoning—relatively unexplored, particularly in vocational education contexts.

Based on observations in class XI MPLB at SMK Negeri 1 Banjarmasin, it was found that students have difficulty remembering years and historical events and lack interest in participating in the learning process. This disinterest can be caused by learning media that is less than optimal and not in accordance with the needs of students in the digital era. The gap in existing research becomes apparent when examining the Indonesian vocational education context: while previous studies have explored infographics in general education settings or focused on different aspects of historical thinking, none have specifically investigated the effect of digital infographics on chronological thinking skills in Indonesian vocational high schools (SMK).

This study addresses three key research gaps that establish its uniqueness. First, while existing research has examined infographics in various educational contexts, no study has specifically focused on chronological thinking skills as the primary outcome in Indonesian SMK settings. Second, previous research on historical thinking skills in Indonesia has predominantly used qualitative approaches or focused on general visual media, whereas this study employs a rigorous

quantitative experimental design with a post-test-only control group. Third, the vocational education context presents unique challenges and opportunities that differ from general secondary education, particularly in terms of student characteristics and learning preferences, which have not been adequately addressed in the existing literature.

Therefore, this study aims to analyze the effect of digital infographic media on chronological thinking ability of students in class XI MPLB at SMK Negeri 1 Banjarmasin in learning history. Through this analysis, the study examines the media's impact on students' ability to identify the sequence of historical events, measure dating, analyze data in a timeline, and reconstruct historical events chronologically. Based on the background and research gaps that have been identified, this study seeks to answer the research question, does the use of digital infographic media significantly affect the chronological thinking ability of SMK students in history learning?

RESEARCH METHODS

This study uses a quantitative approach with an experimental type of research. According to Sugiyono (2021), experimental research is a quantitative research method used to determine the effect of independent variables (treatment/treatment) on dependent variables (results) under controlled conditions. This type of research was chosen because it allows researchers to properly test the hypothesis regarding the causal relationship between the use of digital infographic media and students' chronological thinking skills. The research design applied was a post-test-only control design, in which the researcher can control all variables that affect the course of the experiment. In this design, two groups of students are compared by giving treatment to the experimental group and comparing the results with the untreated control group.

The research was conducted at SMK Negeri 1 Banjarmasin with a population of 108 students from class XI MPLB distributed across three classes. Purposive sampling technique was used because only two classes were available for the study. Class XI C MPLB was conducting internship programs during the research period, while class XI A MPLB and XI B MPLB had completed their internship and were willing to participate in the research. The research sample consisted of 48 students, with 24 students from XI A MPLB as the experimental group using digital infographic media and 24 students from XI B MPLB as the control group using PowerPoint media.

Data collection was conducted through cognitive tests designed to measure chronological thinking skills and documentation of learning activities. The test instrument consisted of multiple-choice questions measuring four specific indicators of chronological thinking ability: (1) interpreting sequences of events chronologically, (2) organizing historical events in continuous order, (3) connecting events according to their occurrence sequence, and (4) determining the meaning embedded in historical events. Before implementation, the instrument underwent validity testing using product-moment correlation with a significance level of 5% (r table = 0.291), resulting in 22 valid questions from 35 questions tested. Reliability testing using Cronbach Alpha formula yielded a value of 0.864, indicating very reliable instrument quality.

Data analysis utilized IBM SPSS version 29 software for both descriptive and inferential statistics. Prerequisite analyses included normality testing using the Shapiro-Wilk method (appropriate for samples <50) and homogeneity testing using Levene's test to compare variances between groups. Hypothesis testing employed an independent samples t-test with a significance level of 0.05 to compare the average chronological thinking ability between experimental and control

groups, allowing researchers to determine the effect of digital infographic media on students' chronological thinking skills.

RESULTS AND DISCUSSION

Results

This research was conducted through two main stages of analysis, namely prerequisite testing and hypothesis testing. In the prerequisite test, researchers conducted a normality and homogeneity test and post-test to determine whether the data was normally distributed. After fulfilling the requirements of normality and homogeneity, researchers conducted hypothesis testing using the t-test to determine the effect of using infographics media on the chronological thinking ability of class XI MPLB students at SMK Negeri 1 Banjarmasin.

Prerequisite Test

Before analyzing the data, a prerequisite test is first carried out to determine whether the data is normally distributed or not. In this study, the prerequisite test was carried out through normality test and homogeneity test on post-test data. After fulfilling the prerequisite test and ensuring that the data is normally distributed, the next step is to analyze the results of the hypothesis test.

1. Normality Test

The normality test of students' chronological thinking ability post-test data was carried out using the Shapiro-Wilk test. Decision-making in this normality test is based on a significance level of 5% (0.05), where if the significance value is greater than 0.05, the data is declared normally distributed. The results of the data analysis were obtained as follows:

Table 1. Normality Test Results of Post-test Data on Chronological Thinking Ability of Experimental Class and Control Class Students

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	*df*	*Sig*	*Statistic*	*df*	*Sig*
Unstandardized Residual	.118	20	.200	.913	20	.071

Source: Researcher's Result

Table 1 shows the results of the normality test of post-test data on the chronological thinking ability of experimental and control class students. Based on the results of the analysis using the Shapiro-Wilk test, the statistical value is 0.913 with a degree of freedom (df) of 20 and a significance value (Sig.) of 0.071. Because the significance value is greater than the significance level of 0.05, it can be concluded that the post-test data on students' chronological thinking ability is normally distributed.

2. Homogeneity Test

Homogeneity testing was carried out to evaluate the similarity of variance of post-test data on students' chronological thinking ability between experimental and control classes. This homogeneity analysis uses the Levene test with decision-making criteria based on the significance value. If the significance value obtained exceeds 0.05, then the data variance is declared homogeneous. The results of the data analysis obtained are as follows:

Table 2. Homogeneity Test of Chronological Thinking Ability of Experimental and Control Class Students

		Levene Statistic	*df1*	*df2*	*df3*
Chronological thinking ability	*Based on Mean*	.006	1	22	.941
	Based on Median	.127	1	22	.725
	Based on Median and with adjusted df	.127	1	20.606	.725
	Based on trimmed mean	.039	1	22	.864

Source: Researcher's Result

Table 2 shows the results of the homogeneity test of the chronological thinking ability of experimental and control class students. Based on the analysis using the Levene test, the statistical value is 0.006 with degrees of freedom df1 = 1 and df2 = 22, and the significance value (df3) is 0.941 for testing based on the mean. This significance value is much greater than the significance level of 0.05, so it can be concluded that the variance of chronological thinking ability data between the experimental and control classes is homogeneous.

The same result is also shown in testing based on the median (0.725), based on the median with adjusted df (0.725), and based on the trimmed mean (0.864) which all show significance values greater than 0.05. With this proof of homogeneity of variance, the requirements for conducting statistical analysis of group comparisons have been met and the research can proceed to the hypothesis testing stage.

Hypothesis Test

After prerequisite testing was completed, the results obtained from both classes (experimental and control) were normally distributed and homogeneous. Furthermore, hypothesis testing was carried out using the t-test. This t-test is used to determine the effect of using infographic media on the chronological thinking ability of students in class XI MPLB at SMK Negeri 1 Banjarmasin. The results of the group statistical output in this study are as follows:

Table 3. Results of Group Statistic Output of Chronological Thinking Ability of Experimental Class (Post-Test)

	Class	N	*Mean*	*Std. Deviation*	*Std. Error Mean*
Chronological thinking ability	Control Class	24	-.4880	.10192	.02080
	Experiment Class	24	.4880	.04229	.00863

Source: Researcher's Result

Table 3 shows that there is a significant difference between students' chronological thinking ability in the control class and the experimental class. The experimental class that used infographic media showed a positive mean value (0.4880) while the control class showed a negative mean value (-0.4880). In addition, the experimental class has a smaller standard deviation value (0.04229) than the control class (0.10192) which indicates that the distribution of data in the experimental class is more homogeneous. A visual representation of the difference in mean scores can be seen in the following figures.

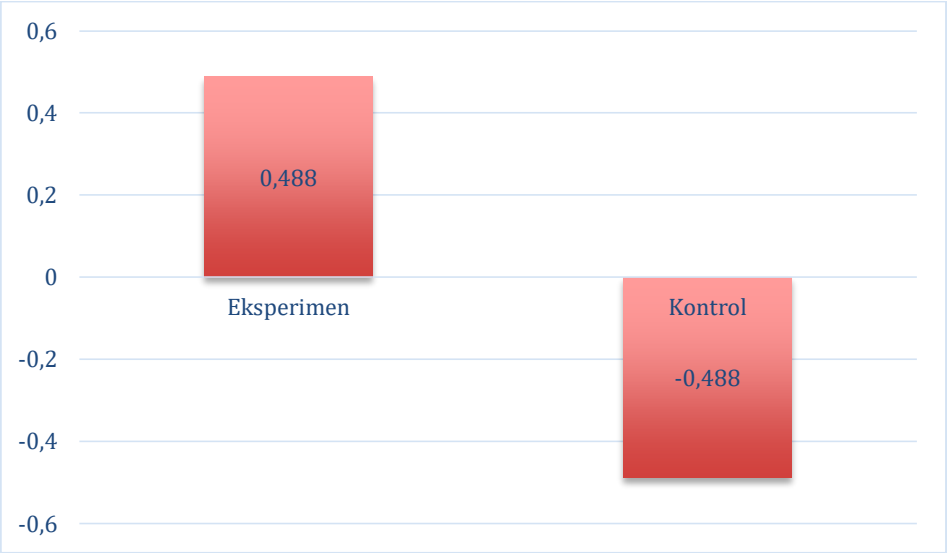

Figure 1. Comparison of Mean Chronological Thinking Scores Between Groups

Table 4. Independent Samples Test Output Results

	Levene's Test for Equality of Variances		*t-test for Equality of Means*						95% confidence Interval of the Difference	
					Significance					
	F	*Sig*	*T*	*Df*	*One-Sided p*	*Two-Sided p*	*Mean Difference*	*Std.Error Difference*	*Lower*	*Upper*
Chronological thinking ability	*Equal variances assumed*	7.017	.011	-43.336	46	<,001	<,001	-.97609	.02252	-1.02143
	Equal variances not assumed			-43.336	30.692	<,001	<,001	-.97609	.02252	-1.02205

Source: Researcher's Result

Table 4 shows that the significance value is <0.001, which is much smaller than the significance value of 0.05. With this very small significance value, it can be stated that there is a significant effect of using digital infographic media on the chronological thinking ability of experimental class students (XI A MPLB).

Discussion

The digital infographic used in this research is an infographic presentation in the form of a timeline that displays the sequence of events leading up to the proclamation of Indonesian independence in chronological order. This infographic was designed using the Canva application by combining visual and narrative elements that visualize a series of historical events in sequence based on the time of occurrence, making it easier for students to understand the temporal relationship between historical events and develop chronological thinking skills, as can be seen in the following image.

Figure 1. Digital Infographic "Events Leading up to the Proclamation"

Based on the research results, the use of digital infographic media has a significant effect on the chronological thinking ability of students in class XI MPLB at SMK Negeri 1 Banjarmasin. The experimental class that used digital infographic media showed substantially better chronological thinking skills than the control class using conventional PowerPoint presentations. Widiastuti et al. (2023) support this finding by demonstrating that visual media in learning history significantly improve students' understanding of historical material, particularly in vocational education contexts. This indicates that digital infographics successfully present complex historical information in a structured format, enabling students to understand both the sequence of events and their cause-and-effect relationships more effectively than traditional methods.

The substantial mean difference of 0.976 points between groups indicates that digital infographic media offers considerable practical advantages for chronological thinking development. Students in the experimental group demonstrated superior ability to process temporal information, establish chronological relationships, and construct coherent historical narratives. Putri & Ofianto (2023) corroborate this finding by demonstrating that students using visual-based applications show enhanced ability to remember chronological sequences and identify causal relationships between events. This improvement suggests that visual representation helps students build mental frameworks for organizing temporal information, making chronological thinking skills more accessible and sustainable.

Digital infographic media proved particularly effective in helping students understand analytical questions such as why Japan promised independence to Indonesia, why Soekarno and Moh. Hatta rejected the youth group's request to immediately proclaim independence at Rengasdengklok, and the purpose of broadcasting proclamation news in Madurese by Surabaya radio. Azhari et al. (2022) corroborate this finding, showing that infographic visualization of historical data enables more efficient information processing and stronger connections between historical concepts. This enhanced analytical capability demonstrates that students developed genuine understanding of causal processes rather than mere memorization of chronological sequences, enabling them to think critically about historical relationships and evaluate complex historical scenarios.

The experimental class results show that digital infographic media provides optimal learning outcomes for material requiring chronological understanding across different student ability levels. Ismaeel & Al Mulhim (2021) confirm that digital infographics provide superior results for chronological understanding materials at various levels of students' initial abilities, supporting the inclusive effectiveness demonstrated in this study. This finding indicates that infographics effectively

accommodate diverse learning styles and initial competencies, making chronological thinking skills accessible to all students regardless of their academic background or prior knowledge levels.

The research findings also reveal that digital infographic media significantly improved student engagement in history learning. Students exhibited higher enthusiasm and active participation throughout the learning process, engaged more meaningfully in class discussions, posed more sophisticated questions, and demonstrated greater interest in historical topics. Nindiati et al. (2024) support this observation, demonstrating that infographic integration in history learning substantially increases student engagement and participation in classroom activities. This increased engagement reflects the visual and interactive nature of digital infographics that align with digital generation students' preferences for visually presented information, creating more meaningful connections between students and historical content.

Digital generation students benefit particularly from learning approaches that utilize technology and align with their information processing preferences. Sumantri et al. (2024) reinforce this finding by showing that interactive digital media integration results in significant improvements in historical analysis skills compared to traditional instruction methods. This technological integration proves effective because students can interact with historical information visually, allowing them to explore chronological patterns and relationships that enhance their understanding of historical causation and sequence development.

This study provides empirical evidence regarding digital technology integration, especially digital infographics, in improving students' chronological thinking skills in vocational education contexts. Lee (2023) emphasizes that integrating digital technology with critical thinking skills development produces significant improvements in various aspects of students' historical thinking abilities, supporting the comprehensive benefits observed in this research. The findings demonstrate that history learning should extend beyond memorizing facts and dates to developing critical thinking skills within temporal frameworks, particularly in vocational education settings where practical application of knowledge is essential.

This study provides an empirical contribution regarding the use of digital technology, especially digital infographics in improving students' chronological thinking skills. The findings strengthen the argument that learning history is not only about remembering facts and dates but also about developing critical and analytical thinking skills in a temporal context. By focusing on the development of chronological thinking skills through the use of digital infographic media, this study confirms a learning pattern that can improve the quality of history education in the specified aspect, in this case, chronological thinking skills. Practically, the findings of this research can be applied in the formulation of more effective history learning media, as well as in the professional development of history teachers. This research also enriches the understanding of how digital technology, especially infographics, can be integrated into history learning to improve learning outcomes.

The implementation of innovative learning media in history education is closely related to teacher autonomy and institutional context. Saefudin et al. (2024) demonstrate that teachers with greater autonomy in lesson planning are more likely to adopt innovative teaching methods and integrate digital technologies effectively. This study has some limitations that need to be considered in interpreting the results. The study was conducted with a relatively small sample size of 48 students from one vocational school, which may limit generalizability to other contexts. The purposive sampling technique and post-test only design, although necessary due to practical limitations, may introduce selection bias and prevent assessment of individual student progress over

time. In addition, the short time frame limits understanding of the long-term impact on the development of chronological thinking. Future research should address these limitations through longitudinal studies with larger and diverse samples across institutions, using a randomized controlled trial design with pre-test measures.

Based on the findings of this study, history teachers can implement some concrete strategies to integrate digital infographic media effectively. Teachers should allocate 15-20 minutes per lesson for infographic-based activities, using the infographic timeline as a learning starter and ending with a chronological pattern identification exercise. For practical implementation, free platforms such as Canva Education, Timeline JS, or Piktochart can be utilized to create curriculum-aligned history infographics, starting with readily available templates and gradually developing custom materials. Assessment strategies should integrate formative approaches such as "timeline talk" activities where students explain chronological order, and summative methods including infographic analysis questions in tests as well as semester projects that require students to create comprehensive historical timelines with written explanations that demonstrate the development of chronological thinking skills.

CONCLUSION

Based on the results of the research and discussion that has been carried out, it can be concluded that the use of digital infographic media has a significant effect on the chronological thinking ability of students in class XI MPLB at SMK Negeri 1 Banjarmasin. The results of the analysis show that the experimental class using digital infographic media has better chronological thinking skills compared to the control class using conventional learning methods. The use of digital infographic media proved effective in helping students understand the chronology of historical events because it is able to present complex information in a structured and attractive visual form. This media allows students not only to remember the sequence of events but also to understand the cause-and-effect relationship of these events. In addition to improving the ability to think chronologically, the use of digital infographics is in line with the tendency of students as digital natives, which is indicated by significantly better learning outcomes in the experimental class when compared to the control class. The visual interest and ease of remembering information on infographics allow students to develop cognitive structures and better retention of history teaching materials.

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