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Audiovisual material as a means of gaining information from a historical source

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ABSTRACT

This study investigates the impact of audiovisual materials on upper secondary school students' learning outcomes and interest in history lessons, comparing video with textual history sources. The research was conducted in the Czech Republic and involved 155 students. It measured immediate knowledge acquisition, long-term retention, and interest levels using post-activity and follow-up tests. Results revealed no significant differences in learning outcomes between the two groups, with both formats showing similar retention rates and only marginal differences in student interest. The findings align with prior studies, suggesting that audiovisual tools primarily enhance initial engagement but do not ensure sustained learning. This research highlights the importance of integrating multimedia resources into inquiry-based frameworks, advocating for blended approaches to optimize engagement and critical historical thinking in education.

KEYWORDS

Audiovisual Materials, History Teaching, History Didactics

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Introduction

The aim of this paper is to describe a pedagogical experiment conducted in the Czech Republic. The research investigates the impact of visual materials on upper secondary school students in history classes. Specifically, it focuses on the benefits of using video as an audiovisual source of information in the classroom. The study aims to determine whether the form of information delivery influences learning outcomes and students' interest in the subject and topic. This involves a comparison between audiovisual and textual formats.

The research problem addressed in this study is the effect of perceiving visual materials in history teaching on the learning outcomes of upper secondary school students.

Research questions and hypotheses

The research sets out the following research questions:

1. Do instructional videos in history lessons influence students' interest in history and history lessons?
2. Do the learning outcomes of students who were taught using textual sources differ from those of students who were taught using instructional videos?
3. Does watching an instructional video have an effect on long-term retention?

Null and alternative hypotheses were established for these research questions:

- H_{01}: There is no statistically significant difference between the learning outcomes of students who were taught using text-based historical resources and students who were taught using instructional videos.
- H_{02}: There is no statistically significant difference between the learning outcomes of pupils who were taught using text source analysis and pupils who were taught using instructional video analysis after a period of one month following pupils' exposure to the material.
- H_{03}: The use of instructional videos in history instruction does not statistically significantly affect student interest in history and history lessons.
- H_{A1}: There is a statistically significant difference between the learning outcomes of students who were taught using text-based historical resources and students who were taught using instructional videos.
- H_{A2}: There is a statistically significant difference between the learning outcomes of students who were taught using text source analysis and students who were taught using instructional video analysis one month after the students' exposure to the material.
- H_{A3}: The use of instructional videos in history instruction has a statistically significant effect on student interest

Theoretical basis

The theoretical basis of this paper was derived from a review study focused on articles and studies that dealt with research on the use of video in history teaching. For example, Scott Alan Metzger's (2018) review of the book *Teaching Difficult History Through Film* (Stoddard, Marcus, & Hicks, 2017), identifies several commonalities across the various studies that form this edited collection, notably that films: are often used in teaching as a tool to engage students because the medium appeals to younger generations; and are also utilized to spark classroom discussions, as they can provoke reactions on certain topics, activating students to debate and express their opinions.

Gonzales et. al. (2021) meta-study of 27 sources, primarily scientific articles, concluded that history education should aim to expand students' historical thinking through inquiry-based learning. Gonzales and colleagues highlighted the need for openness to different perspectives, as students' interpretations of sources can vary widely. Teachers, therefore, should welcome alternative interpretations beyond their own. Similarly, Dussel and Priem (2017) addressed this issue in her review. She built upon the premise that inquiry-based methods in history classes were already suggested. Concerning audiovisual material, Dussel and Priem emphasized treating such resources as "living materials," brought to life by students through questions that deepen analysis. Her article validated this approach through research on the analysis and interpretation of two specific films. Muhammad Azmi's (2017) work, likewise, emphasized the use of film to bring history to life in the classroom. Azmi's study argued that preparation is crucial when working with films in education. He outlines several preparatory steps: specifying learning content, selecting materials, preparing technical equipment, viewing the material, creating worksheets, discussing comprehension, and summarizing collectively. Azmi emphasised the importance of teachers preparing custom worksheets for the cinematic material to be used effectively in the classroom. Yasmin Derelioğlu and Evren Şar (2010) also note the importance of the inquiry approach, the need for preparation when using film in the classroom, and the need to engage students in discussions where they defend their analyses. According to Derelioğlu and Şar this develops students ability to formulate and justify arguments in a group setting.

Another scoping study by Syaripuddin, Ahmad, and Awang (2019) reviewed 22 sources, highlighting several benefits of audiovisual materials in history lessons. According to Syaripuddin et. al., videos encourage students to seek additional information, support general knowledge, stimulate discussion, motivate students, and enhance teaching effectiveness. He emphasized the importance of multimedia tools in 21st-century education. William Peters' (2020) overview study provides an additional interesting perspective. Analyzing over 500 sources, Peters selected 50 as relevant, focusing on the use of audiovisual tools in history education, Peters highlighted the shift in how audiovisual materials are used in the 21st century, primarily to deepen historical thinking.

A mixed-method study conducted by Sefa Yildirim (2018) with over 800 high school seniors in Turkey's Ağrı Province, involved two experimental groups (403 and 452 students) and two control groups (138 and 58 students). Each group viewed one video and answered a 50-item questionnaire, including open-ended questions. Discussions followed with the experimental group. Results showed better outcomes for students taught using multimedia (animation and sound) than those taught with only text and audio. Numerous studies on multimedia-based education emerged during the COVID-19 pandemic. For instance, Gusnissa, Soepeno, and Sugiyanto (2021) examined the impact of documentary films on students' academic performance. In a mixed-method study of 33 students, qualitative analysis was conducted on a selected group of 6 students. Surveys revealed that 80% of students preferred documentary videos over other media types. Among the smaller group, the average score increased from 42 to 88 points out of 100 after using documentaries, confirming their positive effect on student outcomes. Researching in German high schools, Barsch (2020) aimed to engage students in creating educational videos. A qualitative study involving 25 students aged 12 to 14 showed positive results for both knowledge acquisition and student activation.

Research on incorporating videos in history lessons has also examined teachers' perspectives, such as the study by Nasrutdinova, Mahinina, and Shustova (2022) conducted with a group of Masters' degree students at Kazan Federal University. 37 graduate student teachers participated in the study, with 32 preferring lessons incorporating video over traditional lectures. In a complex qualitative study involving semi-structured interviews with 19 Norwegian high school teachers, part of broader European research involving 1,000 teachers, David-Alexander Wagner (2019) found that while videos were widely used, their application often lacked alignment with efforts to expand students' historical awareness. Teachers primarily used videos to capture attention or introduce new topics. Debra Donnelly's (2016) work has also investigated how teachers use historical feature films in Australian secondary history education. Her three-phased study

included surveys of 203 teachers and 178 students, semi-structured interviews with 30 teachers, and detailed case studies of six educators. Findings revealed that while 65% of teachers regularly used films, primarily for engagement and visualization, only 8% leveraged films to explore historiography and develop critical historical understanding. Teachers often favored films for their ability to captivate students and stimulate recall, yet few systematically integrated them into broader historical inquiries or used them to interrogate the constructive nature of historical narratives. Donnelly identifies gaps in teacher training related to film analysis and highlights the need for explicit pedagogical strategies to transform films from mere storytelling tools into resources for fostering historical literacy, critical thinking, and awareness of historiographical processes. Another study by Debra Donnelly (2013) investigated the use of historical feature films in secondary history education in Australia, involving 371 participants also conducted across three phases. Surveys and interviews revealed that films enhance student engagement and memory by presenting historical content in a multi-sensory format. Case studies highlighted innovative practices, such as rewriting film scenes from alternative perspectives to develop empathy and critical thinking. Cognitive neuroscience validated the effectiveness of films, linking their multi-modal nature to improved retention and analytical skills. The study concluded that explicit teaching of film techniques and structured pedagogies are essential for maximizing films' educational potential. However, Donnelly (2020) has noted that teachers often under-utilize film, failing "to capitalize on film's higher-order potentials" (p. 128), with "a complex interplay of factors in relation to teaching context, learning community perceptions and practitioner understandings and strategies . . . [being] a major contributing factor in the decision-making process" of history teachers (Donnelly, 2014).

These reviews drew from academic articles, studies, and experiments. To provide practical insights and data, our meta-study also examined several research projects focusing on both students' and teachers' perspectives on incorporating video into history lessons alongside inquiry-based methods.

Methodology

This study employs quantitative research, with the primary method being a pedagogical experiment. The target population comprises upper secondary school students in the Czech Republic. The research sample was determined by the availability of the base population, meaning it consisted of accessible upper secondary school pupils within the Czech Republic.

The pedagogical experiment was structured to assess the knowledge gained based on the type of instructional material used. To measure this, a didactic test was employed, designed to verify the acquisition of knowledge.

The experiment was conducted within an upper secondary school setting. However, the research was constrained by the time limitations of a standard 45-minute lesson. At the beginning of the session, students were introduced to the basic framework of the testing procedure. Following this, the activity commenced, where students worked exclusively with the provided materials. The control group used textual materials, while the experimental group worked with audiovisual recordings.

Students were permitted to take notes on paper. For the audiovisual materials, the emphasis was placed on individual engagement; students viewed the video on their mobile devices and were allowed to pause or replay sections. The time allocated for both groups was identical, corresponding to the length of the video or text. This ensured that students had sufficient time to review the material and revisit unclear information.

After completing the activity, students were given a questionnaire that included a didactic test designed to assess the knowledge acquired. This test was validated by several history teachers to ensure clarity and accuracy of the questions. Due to the time constraints of the classroom setting, the test was also limited in duration.

In addition to the didactic test, the questionnaire included questions regarding the students' grade level, their interest in history, and familiarity with the topic covered in the materials. Students were asked to indicate, on a Likert scale, whether they had prior knowledge of the information presented in the materials.

A follow-up post-test was administered approximately one month after the activity. Students were informed about this in advance, and the test was distributed via email. The didactic test questions remained unchanged, but the questionnaire was expanded to include questions assessing the students' sustained interest in the topic.

The didactic tests were evaluated based on predefined criteria, which detailed the scoring system for each question and the conditions for awarding points. This scoring system was essential for subsequent data analysis.

Materials

The primary materials used in this research were teaching materials designed for history education. Given the study's focus on the use of research methods in history teaching, it was essential to utilize historical sources.

The historical source was initially presented in textual form, and a corresponding video was produced to serve as the audiovisual material. The audiovisual version was developed to align with the textual content, retaining the same text but enhancing it with visual elements. The spoken text in the video was supplemented with images to provide additional context.

The historical source selected for this study was the diary of the legionary Matej Šram, which detailed his experiences in Vladivostok, his encounter with Milan Rastislav Štefánik, and his reaction to the news of Štefánik's death in a plane crash. Part of the diary was made into a film with the help of volunteer actors and the loan of props and costumes from Rolling, an association for the development of role-playing and education games. The filming was funded by specific research of the Faculty of Science of the University of Hradec Kralove. The video can be found at the URL: https://youtu.be/KWp3opgKsKQ

All questions for the subsequent didactic tests were directly based on the content of the historical source. These questions were validated by history teachers to ensure their accuracy, clarity, and lack of ambiguity. The tests, as well as the follow-up questionnaires administered one month after the activity, were distributed to respondents via Google Forms.

Statistical methods

The arithmetic mean of the test scores within each group (text vs. video) was used as the primary metric for data comparison. Additionally, the mean and median were calculated to evaluate the average performance and provide insight into the central tendency of the scores. These values helped determine the average points earned by students and their overall performance distribution.

To measure the variability of scores within each group, the standard deviation was calculated. This metric indicates the dispersion of values from the mean, providing insight into the range of scores. The variance across all values was visualized using a boxplot, which is essential for identifying quartiles and the interquartile range (IQR) for each group.

Descriptive statistics were employed to compute skewness and kurtosis. Skewness describes whether the data distribution leans asymmetrically to one side, while kurtosis reflects the sharpness or flatness of the distribution's peak. These metrics are critical for assessing the normality of the data, which is a prerequisite for applying more advanced statistical analyses.

Before deploying statistical methods, the normality of the data was tested. A rough estimation of normality was conducted using key descriptive statistics including the mean, median, skewness,

and kurtosis. Visual tools, such as histograms and Q-Q plots, were also utilized to assess the normality of the data distribution.

For hypothesis testing, Student's t-test was chosen as the primary statistical method. Given the nature of the experiment, a two-sample t-test was necessary to compare the experimental and control groups. To determine whether to apply a t-test with equal or unequal variances, an F-test was performed to evaluate the equality of variances between the two groups.

The F-test was conducted using Microsoft Excel, which provides built-in functions for calculating the p-value. The p-value quantifies the likelihood that any observed differences in variance between the two samples are due to chance, assuming the null hypothesis (equal variances) is true. Microsoft Excel's Data Analysis tool was also employed to generate detailed output, including intermediate calculations.

The Students' t-test was subsequently applied to evaluate the stated null and alternative hypotheses. A two-sample t-test with equal variances was used, as equality of variance was confirmed by the F-test. This statistical test is appropriate for comparing similar samples and provides a p-value to determine whether the differences between the groups are statistically significant. The implementation of the t-test was also carried out in Microsoft Excel, leveraging its built-in functions and Data Analysis tool to ensure accuracy and transparency in the analysis.

Attitudinal questions

Since the research also aimed to explore the perspectives of the participants (students), several attitudinal questions regarding students' interest and prior knowledge were included. To collect accurate and measurable data, the questions were presented as statements. Respondents indicated their level of agreement or disagreement with the statements on a scale.

The Likert scale, a widely used method for measuring respondents' attitudes, opinions, and feelings, was employed for these responses. It consists of statements to which respondents respond using predefined options arranged on a scale, ranging from "strongly disagree" to "strongly agree."

In this study, a four-point Likert scale was used, offering the options: "strongly disagree," "disagree," "agree," and "strongly agree." This design eliminated the possibility of a neutral stance, as no middle option (e.g., "I don't know") was provided. The absence of a neutral choice ensured that respondents were required to take a clear position on each statement.

To evaluate measurable student interest in the materials and in historical learning more broadly, the data collected using the Likert scale were subjected to statistical analysis. The chi-squared test was selected as the primary method to test hypotheses about the independence between variables. Specifically, the test was used to determine whether students' interest in the topic or material was influenced by the type of didactic resource (textual or audiovisual) they engaged with during the activity.

The chi-squared test was conducted using spreadsheet software. Contingency tables were constructed, and the necessary calculations were performed using straightforward formulas within the spreadsheet. This approach allowed for an efficient analysis of categorical data to test the independence of the observed variables.

Results

The research was conducted using methods previously verified during pilot research carried out in autumn 2023. The results of this research were presented in a paper for the MIPRO 2024 conference (Mottl & Musílek, 2024).

The main research was implemented at a grammar school in the Czech Republic. It involved students from the 1st to 3rd year of upper secondary school aged between 15 and 18. The study

was conducted at the same institution where the pilot research took place. A total of 155 participants were involved in the main research, while the second post-test on long-term memory yielded 135 responses.

Participants were randomly assigned to control and experimental groups, with 74 students in the video group and 81 in the text group. This division ensured a balanced representation of students across the 1st to 3rd years of upper secondary school.

The test was scored based on predetermined criteria, with students earning between 0 and 17 points per question. The results of the scoring are summarized in Table 1.

Table 1
Comparison of results according to descriptive statistics

Material	After the activity (155 participants)			Long-term memory (135 part.)		
	Arithmetic mean	Standard deviation	Median	Arithmetic mean	Standard deviation	Median
Text	10,38	2,19	10	5,86	2,58	6
Video	10,76	2,16	11	5,88	3,12	5

The results obtained after the activity were further examined and analyzed based on participants' prior knowledge of the material. This was assessed during the post-test, where respondents were asked to indicate their agreement on a scale regarding their familiarity with the material prior to the activity. Table 2 illustrates the differences in results between the groups, categorized by prior knowledge, along with the distribution of participants within these categories.

Table 2
Comparison of results after the activity based on prior knowledge

Material	With prior knowledge (20 part.)			No prior knowledge (or minimal) (135 part.)		
	Arithmetic mean	Standard deviation	Median	Arithmetic mean	Standard deviation	Median
Text	10,33	2,30	9,5	10,39	2,18	10
Video	9,75	2,25	9	10,88	2,14	11

To test the hypotheses, a t-test was conducted. Before performing the t-test, it was necessary to assess the normality of the data. This was evaluated by comparing the mean (10.56) and the median (10) of the overall results, which were sufficiently close. Additionally, skewness (-0.18) and kurtosis (-0.26) values were checked and found to be near zero, further supporting the assumption of normality. The data were visualized using a boxplot and histogram, both of which confirmed that the data were normalized.

To determine the equality of variances within the groups, an F-test was performed. The F-test indicated equality of variances, allowing the application of a two-sample t-test with equal variances.

The two-sample t-test with equality of variances was carried out to reject or confirm the null hypothesis. This test was applied separately for each material type. The results are summarized in Table 3.

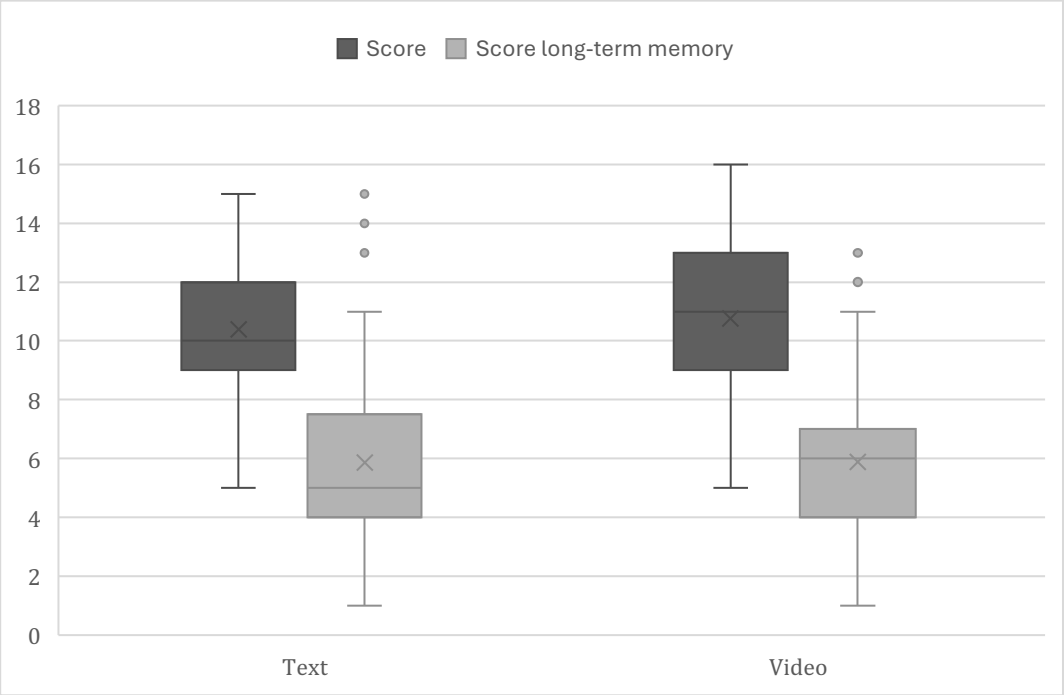
Table 3
F-test and Student's T-test results

Division of results	F-test p-value	T- test p-value
After the activity – the whole sample	0,462	0,287
After activity – With prior knowledge	0,492	0,583
After the activity – No prior knowledge (or minimal)	0,431	0,193
Long-term memory (after 4 weeks)	0,062	0,962

The t-test results indicate no significant difference between the materials. The most notable observation is a near-significant difference in post-activity responses from the group with minimal or no prior knowledge of the topic.

In contrast, when examining long-term memory, the results reveal virtually no difference between the materials used. Thus far, the findings remain superficial, and further analysis is needed to explore variations across different classes. Figure 1 summarizes these findings, illustrating the differences between the materials and the outcomes of the individual post-tests.

Figure 1
Score for long-term memory



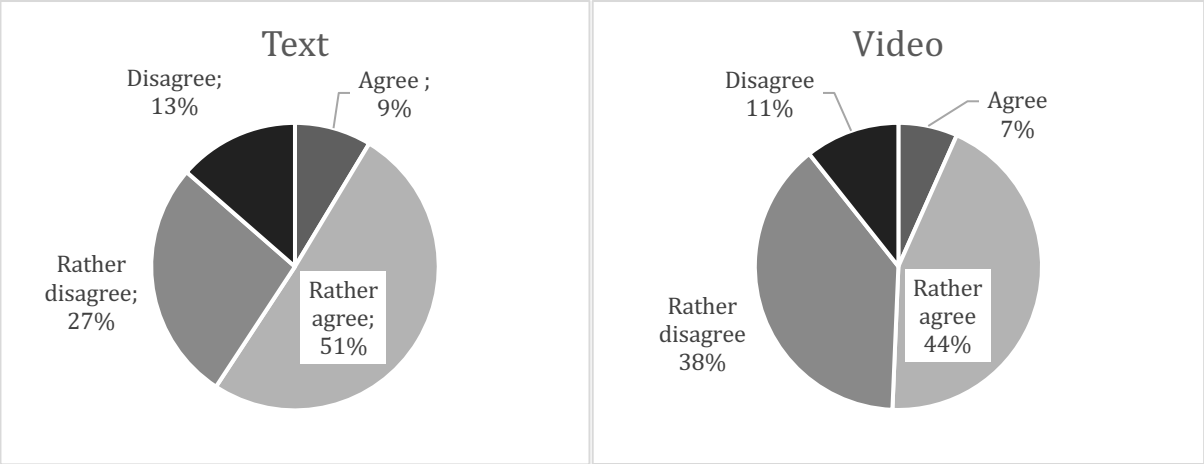
Attitudinal questions on student interest

Regarding students' interest in history in relation to the materials used, a semi-structured interview was carried out with selected members of the experimental group. Prior to this, attitudinal questions were included in both post-tests.

In the post-activity test, students were asked to indicate their agreement with the statement: *"After the activity, I am more interested in historical science and the story of the Czechoslovak Legionnaires in Siberia."* The results, as displayed in Figure 2, show that the responses are almost

identical between the groups. Interestingly, students who worked with the text showed a slightly greater increase in interest in the subject matter after the activity.

Figure 2
Pie charts of output on attitudinal questions by material



The long-term memory post-test also examined how many students had sought additional information or maintained an interest in the topic during their free time since the activity.

Among the 135 respondents, only three students (one from the video group and two from the text group) reported doing so. This suggests that audiovisual material does not significantly enhance students' interest in history.

To confirm or reject the null hypothesis, the responses to attitudinal statements from the post-activity questionnaire were analyzed using a chi-square test. This test compared the group that disagreed or somewhat disagreed with the statement to those who agreed or somewhat agreed, based on the material type. The chi-square test yielded a p-value of 0.280, which is insufficient to reject the null hypothesis.

Discussion

The results of this study provide significant insights into the role of audiovisual materials in history education. Consistent with prior studies by Donnelly (2020) and Syaripuddin et. al. (2019), the findings demonstrate that while instructional videos can enhance engagement and provide immediate knowledge retention, their long-term benefits in retaining information do not significantly surpass traditional textual methods. This aligns with the meta-analysis conducted by Peters (2020), which suggested that audiovisual tools are more effective in sparking initial interest rather than ensuring deep, sustained learning outcomes.

Interestingly, this study found no significant statistical difference between the learning outcomes of students exposed to textual versus audiovisual materials. This result mirrors the findings of Merkt et al. (2011), who concluded that while videos can offer interactive learning features, their effectiveness depends heavily on how the material is presented and the viewer's engagement level. The slightly higher interest levels in the text group post-activity challenge the general assumption, as noted by Metzger (2018), that videos inherently foster greater interest.

The lack of significant differences in long-term retention suggests a need to integrate both modalities for optimal learning. This dual-method approach is echoed in Yildirim's (2018) findings, which highlighted the complementary role of text and video in reinforcing historical thinking skills. Furthermore, the minimal engagement with the topic after the activity aligns with

the concerns raised by Wagner (2019) regarding the superficial use of audiovisual materials without fostering deeper analytical skills or historical awareness.

From an attitudinal perspective, the chi-square test results indicate that neither method had a pronounced impact on sustained interest in history, reinforcing the observations of Derelioğlu and Şar (2010) about the importance of combining audiovisual tools with discussion-based pedagogies to cultivate critical thinking and collaboration among students.

Overall, the results emphasize the need for strategic implementation of audiovisual materials, aligning them with inquiry-based frameworks as suggested by Dussel and Priem (2017). By doing so, educators can bridge the gap between engagement and deeper, lasting historical understanding.

Conclusion

This study aimed to determine the effects of audiovisual materials on learning outcomes, long-term retention, and student interest in history lessons by addressing three key research questions. The findings provide mixed answers to these questions and offer insights into the corresponding hypotheses.

Do learning outcomes differ between students taught using textual sources versus instructional videos? Both formats produced comparable learning outcomes immediately after the activity, as indicated by the t-test results. Therefore, the null hypothesis (H01) is confirmed: there is no significant difference in learning outcomes between students taught using text-based historical resources and those taught using instructional videos.

Does watching instructional videos affect long-term retention? The study found negligible differences in long-term retention between the two groups, refuting the alternative hypothesis (HA2). Consequently, the null hypothesis (H02) is confirmed: instructional videos do not significantly enhance long-term retention compared to textual sources.

Do instructional videos influence students' interest in history and history lessons? The results show no statistically significant difference in the interest levels between students who used instructional videos and those who used textual materials, as supported by the chi-square test results. Thus, the null hypothesis (H03) is confirmed: the use of instructional videos does not significantly affect students' interest in history lessons.

While the findings confirm the null hypotheses across all research questions, they also highlight the contextual strengths of audiovisual tools. Videos may be effective in sparking initial engagement but fail to outperform textual methods in sustaining interest or retention. These results suggest that the mode of delivery alone does not guarantee improved educational outcomes and should be complemented by inquiry-based learning strategies.

Future research should explore blended approaches that combine audiovisual and textual resources while fostering critical thinking and deeper engagement. Such strategies may unlock the full potential of multimedia materials in history education, ultimately bridging the gap between engagement and meaningful, lasting learning

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