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A Hypermedia-Supported program and its effect on developing historical reasoning skills among first year secondary school students

Kholoud Magdy [1], Samia Fayed [2],

[1] PhD researcher, Curricula & Teaching Methods of History department, Faculty of Education , Tanta University ,Egypt
Khloudibrahim2016@gmail.com
[2] Professor of Curricula and methods of teaching history, Faculty of Education , Tanta University, Egypt

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Abstract

This study examines the impact of a hypermedia-supported program on the development of historical reasoning skills among first-year secondary school students in Egypt. A quasi-experimental design was employed, involving an experimental group (n=30) that received instruction through the hypermedia program and a control group (n=30) that received traditional instruction. Historical reasoning skills were evaluated across six components: formulating historical questions, analyzing sources, contextualizing events, constructing evidence-based arguments, applying historical concepts, and understanding meta-historical concepts. Results from independent samples t-tests indicate that the experimental group significantly outperformed the control group across all components as well as in overall historical reasoning skills ($p<.01$). These findings suggest that integrating hypermedia—characterized by multimedia elements, interactivity, and non-linear navigation—can enhance students' abilities to critically analyze historical sources, contextualize events, construct evidence-based arguments, and apply essential historical concepts. This study supports the use of technology-enabled, student-centered approaches grounded in multimedia learning theory and constructivist pedagogy to promote historical reasoning competencies essential for developing nuanced understandings of the past. Implications for the integration of educational technology in history curricula are also discussed.

Keywords: *hypermedia, historical reasoning*

Introduction

In the rapidly evolving digital landscape, education is increasingly exploring innovative methods to enhance student learning and engagement (Kinshuk et al., 2016). One approach that has attracted considerable attention is the integration of hypermedia into educational curricula (Eman Abo shaisha 2023) Hypermedia refers to digital content that interconnects various data formats—such as text, images, audio, and video—through non-linear hyperlinks. This interactive, multimedia-rich format allows users to navigate and explore information beyond the traditional, linear presentation of knowledge (Tukura et al., 2017; Madkour, 2020).

The potential benefits of integrating hypermedia in educational settings are multifaceted (Nsofor et al., 2015; Sauli et al., 2018). By incorporating multimedia elements, hypermedia creates immersive and engaging learning

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experiences that stimulate multiple senses, supporting a deeper understanding of complex concepts (Mayer, 2021). Additionally, the interactive, non-linear structure of hypermedia fosters active learning, enabling students to independently explore and navigate information, thus promoting autonomy and ownership of their learning process This aligns with constructivist learning theories, which emphasize the importance of active knowledge construction and student-centered approaches (Maneira, 2014).

In history education, the integration of hypermedia shows particular promise. Historical reasoning—a complex skill involving the analysis, interpretation, and contextualization of historical sources—is essential for students to develop Traditionally, history education has relied on expository texts in textbooks, which can often be dense and challenging, especially for students transitioning from primary to secondary education (Van Boxtel & Van Drie, 2018).

Hypermedia-supported programs have the potential to transform how historical content is presented and engaged with, offering a multifaceted and immersive approach to learning. By integrating textual information with multimedia elements such as images, videos, and interactive timelines, hypermedia can provide a more contextualized understanding of historical events, figures, and socio-cultural dynamics (Abo Shaisha, 2023). This multimedia-rich environment aligns with multimedia learning theory, which posits that learners can form more coherent mental representations when information is presented through multiple modalities, such as text and visuals (Mayer, 2021).

This study centers on a comprehensive framework for historical reasoning skills, comprising six key components as outlined by Van Boxtel and Van Drie (2018). The first component, asking historical questions, assesses students' ability to formulate inquiries related to sequencing information, comparing historical events, identifying motives behind events and specific incidents, evaluating historical figures, and describing changes resulting from historical events. Formulating historical questions is fundamental to historical inquiry, as it initiates the process of investigation and analysis (Reisman & Wineburg, 2008).

The second component, using sources, evaluates students' ability to distinguish between primary and secondary sources, identify the most pertinent sources, assess the significance and role of historical sources in documenting events, and make informed decisions about various sources for a single historical event. Source analysis is a critical aspect of historical reasoning, involving the assessment of reliability, perspectives, and biases within historical accounts (Kamal, 2021).

The third component, contextualizing, assesses students' ability to identify the spatial, temporal, and socio-cultural contexts in which historical events took place. Contextualizing is essential for understanding the motivations, decisions, and actions of historical figures, as well as for interpreting historical sources within their proper frames of reference (Seixas & Morton, 2013).

The fourth component, using evidence and arguments, evaluates students' ability to identify evidence supporting a historical viewpoint, assess the reliability of historical evidence, and accept or reject counterarguments and evidence that contradict their interpretation. Constructing evidence-based arguments and considering multiple perspectives are key aspects of historical reasoning (Monte-Sano, 2011).

The fifth component, using historical concepts, examines students' ability to identify and apply key concepts relevant to historical events and figures and to distinguish between commonly occurring and unique historical concepts. Mastery of historical concepts is crucial for interpreting historical narratives and developing a nuanced understanding of the past (Popa, 2022).

The sixth and final component, using meta-historical or second-order concepts, assesses students' ability to describe processes of historical change—whether gradual or sudden—compare historical phenomena, identify causes and types of historical events and their interrelationships, and recognize both short-term and long-term consequences. Meta-historical concepts, such as cause and consequence, change and continuity, and historical significance, provide a foundational framework for understanding and interpreting historical events (Seixas & Morton, 2013).

By examining the impact of a hypermedia-supported program on students' development across these six components, this research aims to determine whether such an approach can facilitate student engagement with historical content, enhance their understanding of historical contexts, and foster their ability to analyze, interpret, and reason about historical sources.

While previous studies have often focused on specific aspects of historical reasoning, such as sourcing or contextualization (Nokes et al., 2007), this research adopts a more comprehensive framework. Addressing the multifaceted nature of historical reasoning competency is essential, as students must develop a diverse set of skills

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to engage critically with historical narratives and gain a nuanced understanding of the past.

Potential barriers faced by adolescents in lower secondary education must also be acknowledged. These may include a lack of background knowledge, limited experience in critically evaluating historical sources, and a tendency toward presentism—the inclination to interpret past events through a contemporary lens (Duhaylongsod et al., 2015; Nokes, 2011; Perfetti et al., 2012). By leveraging the interactive and multimedia capabilities of hypermedia, this study seeks to explore whether such an approach can help students overcome these challenges and foster the development of historical reasoning skills.

The integration of hypermedia into history education offers a promising approach to enhancing historical reasoning skills among first-year secondary school students. By adopting a comprehensive framework encompassing six key components and drawing on principles of multimedia learning, this study aims to contribute to the growing body of research on the intersection of technology and historical reasoning in secondary education. The findings have the potential to inform pedagogical practices and curriculum design, ultimately strengthening students' ability to engage critically with historical narratives and develop a nuanced, evidence-based understanding of the past.

Feeling the Problem

The sense of the research problem emerged from the following foundations:

- Recommendations of Previous Studies: Numerous prior studies, such as those by Khawla Al-Dulaimi (2018), Suad Al-Ahmadi (2019), Jamila Al-Omariya (2019), and Heba Allam (2020), emphasized the necessity of developing historical reasoning skills. These studies highlighted the importance of involving students in the learning process and providing opportunities to engage in activities that foster historical reasoning skills.
- Further Recommendations: Other studies, such as those by Omnia Hijazi (2019) and Abdullah Haj (2021), recommended integrating technology into history curriculum instruction. They advocated for designing and implementing educational websites using hypermedia due to their effectiveness and the need to reduce reliance on traditional teaching methods for history.
    - **Exploratory Study:** To reinforce the sense of the research problem, the researcher conducted an exploratory study aimed at assessing the level of first-year secondary students in historical reasoning skills.
    - A historical reasoning skills test consisting of 35 items, each worth one point (with a total of 35 points), was also administered to the same sample. The results revealed a weakness in historical reasoning skills among the students, with an overall test score of 29%. The table below illustrates the results of the exploratory study.

Table (1):Results of Applying the Cultural Identity Scale and the Historical Reasoning Skills Test on the Exploratory Sample

Measurement Tool	Number of Students	Mean Score	Percentage
Historical Reasoning Test	30	15	29%

The problem lies in the evident weakness in historical reasoning skills among first-year secondary students.
This weakness is attributed to the lack of a teaching strategy that engages students with specific objectives while allowing them to choose among various alternatives to achieve these objectives according to their capabilities. Additionally, it reflects their inability to address their problems in a logical and structured manner.
To address this issue, the current research aims to answer the following main question:
What is the impact of using a hypermedia-supported program on developing historical reasoning skills among first-year secondary students?

Research Hypotheses

1. There is a statistically significant difference at the level of ($\alpha \leq 0.05$) between the mean scores of the experimental group and the control group on the post-application of the historical reasoning test as a whole, in favor of the experimental group.
2. There are statistically significant differences at the level of ($\alpha \leq 0.05$) between the mean scores of the experimental group and the control group on the post-application of the historical reasoning test in favor of the experimental group for each dimension individually.

Research Materials and Tools (Prepared by the Researcher)

1. A list of historical reasoning skills.
2. Teacher's guide preparation.
3. Historical reasoning skills test.

Definition of Hypermedia:

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Hypermedia refers to the use of computers to present and deliver static and animated images, audio, written text, and graphical illustrations within a cohesive system. These media are interconnected to enable students to navigate, explore, and interact independently, thereby making the learning process more effective. (Eman Abo shaisha, 2023).

Elements of Hypermedia:

According to (Lama Talalouh 2022), the essential elements of creating an electronic learning environment, which forms the foundation of hypermedia, include text, images, animations, and videos. These elements must be carefully considered to ensure effectiveness.

Explanation of These Concepts:

- Written Text: This is the simplest form of hypermedia elements, where texts are enhanced with various effects, such as font type, size, color, and animation. Texts must be appropriately formatted to achieve their educational objectives effectively.
- Graphics: These include various types of illustrations, such as charts, diagrams, and schematic drawings, whether static or animated.
- Images: This category encompasses both static and animated images, including two-dimensional and three-dimensional visuals.
- Audio Effects: These include natural and synthetic sounds as well as music.

Hypermedia provides diverse ways to utilize knowledge, offering numerous opportunities to introduce new approaches to learning. It allows learners using computers to access information through various multimedia formats within non-linear educational programs. This instructional approach enables students to interact effectively with educational media in an organized, integrated, and regulated manner, operating as a unified system through a computer. (Nahed Habib 2018).

Axis Two: Historical Reasoning Skills

Historical reasoning skills are defined by (Noor Al-Subhi 2023) as the student's ability to understand and comprehend the historical facts presented in the history textbook. These skills involve a method of thinking that enables the student to analyze the relationship between historical facts, as well as gather historical evidence and data from original sources, organize them, and classify them.

According to (Heba Allam 2020), historical reasoning is characterized by the following:

- The ability to understand and analyze historical phenomena.
- The historical context of events, which considers social, political, economic, and cultural conditions, is an integral part of historical reasoning.
- Historical reasoning encompasses complex sub-skills, such as evaluating or describing processes of change and continuity, interpreting historical phenomena, or comparing historical events and periods.
- A holistic and spatial perspective is adopted when examining historical events, as students cannot develop historical reasoning skills in isolation from geography.
- Rationality is a fundamental feature of historical reasoning; explanations and interpretations must be supported by logical evidence that leaves no room for doubt.
- Comparing historical periods and phenomena is a central process in historical reasoning.

The Importance of Historical Reasoning Skills:

Historical reasoning holds significant importance in the educational process due to its application in practical life and various fields. Its importance can be identified through the roles it fulfills, as it helps in:

1. Enabling students to solve problems by connecting their prior experiences with the information currently available to them.
2. Predicting students' success in their academic pursuits.
3. Serving as a method for making decisions in daily life.
4. Integrating into other cognitive mental processes, such as perception, comprehension, and learning.
5. Being utilized as a method, approach, and set of procedures for action. (Sherine Abdel Hadi 2017).

Developing a Program Based on Hypermedia:

- In light of the previous discussion, the researcher developed a framework for a program based on hypermedia to enhance historical reasoning skills among first-year secondary school students. This was achieved through the following procedures:

(A) Determining the Foundations of the Program:

- The hypermedia-supported program for developing historical reasoning skills is based on the following principles and foundations, which clarify the educational philosophy and conceptual framework guiding its development:
  - Historical reasoning skills can be developed through the use of educational activities that rely on hypermedia. These activities engage the students' senses directly, making the learning process more relatable and engaging.
  - Hypermedia interacts with students' intelligence, providing suitable instructional stations and an environment rich in multimedia resources.
  - The diversity and variety of activities within the hypermedia-based program allow students to develop their historical reasoning skills.

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- These principles and foundations were carefully considered in designing the program, along with the age group characteristics of secondary school students.

(B) Program Objectives:

The objectives of the hypermedia-supported program were defined as follows: The program is fundamentally designed to align with educational objectives, which are essential components of the program. Therefore, it is crucial to identify these objectives with precision.

The objectives of the program are essential for enabling teachers to assess the students' achievement of the intended outcomes after studying through this program. The objectives are divided into two categories:

A-General Objectives of the Hypermedia-Supported Program:

The general objectives of the program are:

Evaluating the program's effectiveness in developing historical reasoning skills among first-year secondary school students through the study of two units: Introduction to the Study of the (Civilization of Egypt, the Ancient World and The Civilization of Ancient Egypt), as prescribed in their curriculum, thereby achieving the overall educational goals of these units.

The procedural objectives related to each lesson in the hypermedia-supported program were formulated as behavioral objectives and distributed across each lesson in the program.

(C) Stages of the Instructional Design for the Program

The instructional design stages of the program were developed by reviewing several previous studies, including those by Amani Al-Hefnawi (2018), Sherine Ibrahim (2020), and Shaikha Al-Zoabi (2021). These studies collectively identified three main stages of design:

1. Analysis: This stage includes the following levels:

- **Identifying Needs:** This involves uncovering individual differences among students to provide suitable opportunities for each student according to their unique capabilities and abilities.
- **Student Characteristics:** It is essential to consider students' characteristics, such as their interests, attitudes, abilities, and needs. These considerations facilitate the planning of the program and the development of appropriate content. (Khaled Younes, 2018).
- **Objectives:** Determining educational objectives is critical for accurately identifying learning outcomes that can be assessed and measured. These objectives are formulated as behavioral statements that students strive to achieve after studying the program's educational content.
- **Educational Stages:** It is necessary to provide all possible opportunities for students to engage in self-assessment of their learning through individual or collaborative group work. Thus, there is a strong relationship between the content provided to the students and the level of difficulty, which must align with their abilities and capacities.

2. Development:

This stage involves allocating a set of strategies used in the instructional design of the program, carried out in three steps:

First: Identifying the Educational Model Used in Teaching the Content The program incorporates multiple types of computer-assisted instruction to deliver the educational material or content for which the program was designed.

Among the most commonly used types are:

- **Training:** In this approach, questions are presented via the computer, followed by the evaluation of the student's responses.
- **Simulation:** This involves employing activities that mimic real-life situations as closely as possible.
- **Personalized and Comprehensive Learning:** The computer presents content using various illustrative examples along with assessments. In this model, the computer acts as a substitute for the teacher in providing assistance, helping students acquire skills, and understanding educational content based on their individual and self-paced abilities.
- **Instructional Dialogue:** One of the primary advantages of this approach is the interaction and communication between the student and the computer, using the screen and keyboard. This model relies fundamentally on artificial intelligence techniques. Therefore, it is essential to provide ample opportunities for students to apply what they have learned and to carefully identify suitable strategies. These strategies should determine the type of interaction between the student and the hypermedia program.

3. Methods of Presenting Information: This stage explains how the program's content is presented and is divided into the following components:

Program Construction: Program construction refers to the initial programming or general organization of information, progressing from simpler levels of learning to more complex ones and from concrete to more abstract levels. This can be structured hierarchically or associatively. Additionally, it includes various forms of

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content and data presentation using hypermedia, such as text, graphics, audio, and video.

- Final Programming: Final programming refers to the completed version of the program, encompassing the following:

- General and procedural educational objectives.
- Logical sequencing of content frames.
- Feedback mechanisms.
- Both formative and summative assessments.

- Production of Hypermedia Programs: The production of hypermedia programs typically begins with designing the general framework of the program. This framework includes the user interface, methods for linking various program elements, and task distribution among team members. These tasks include Writing and proofreading texts, preparing graphics, images, and animations, recording audio materials and video clips. Afterward, the gathered information is transformed from its natural state into a format that the computer can process and display effectively.

(Mohamed Esmail 2020)

Based on the above, the stages of designing the program can be summarized as follows:

1. Design Stage: In this stage, the characteristics of students are identified, educational situations are analyzed, and learning objectives are determined.

2. Preparation Stage: This stage involves gathering the requirements for the design, including:

- Defining and formulating objectives procedurally.
- Preparing the educational content in an instructional format.
- distributing graphics, images, and video clips.
- Preparing reinforcements, whether verbal or non-verbal.

3. Scenario Writing Stage: At this stage, the teacher transforms the previously defined general objectives into specific, precise steps that can be implemented. This includes:

- Training on producing animations, images, and video clips.
- Recording sound effects.

4. Implementation Stage: The teacher's goal in this stage is to execute the scenario according to the predetermined objectives, utilizing various devices and programs.

5. Testing and Development Stage: In this step, feedback from program evaluators is collected to refine the program. Strengths and weaknesses are identified to make necessary modifications. These stages were applied in developing a hypermedia-based program to enhance historical reasoning skills among first-year secondary school students.

The researcher designed the program using PowerPoint. The educational content was presented through slides, each containing written text, hyperlinked articles, videos, images, maps, schematic diagrams, and an audio recording of the researcher explaining each element of the lesson. Students were given the freedom to utilize the medium that best suited their learning capabilities. A WhatsApp group was then created, and the experimental sample students were added to it. A Google Classroom link was shared with them, and the teaching process was conducted online via Google Meet for four lessons from the syllabus. Additionally, five lessons from the syllabus were delivered in a traditional classroom setting.

Method

– *Participants*

The study sampled 60 first-year secondary students from Al-Abbasiya Secondary School in Kafr El-Sheikh Governorate, Egypt. Participants were randomly assigned to either the experimental group (n = 30) or the control group (n = 30).

– *Research Design*

A quasi-experimental research design was employed, consisting of two groups (experimental and control) with a pretest-posttest approach. The experimental group received instruction via a hypermedia-supported program, while the control group received traditional instruction.

– *Instruments*

A historical reasoning skills test, developed by the researcher, included ٢٨ open-ended questions assessing six primary components of historical reasoning skills: (1) asking historical questions, (2) using sources, (3) contextualizing, (4) employing evidence and arguments, (5) applying historical concepts, and (6) using meta-historical concepts. Each component included five sub-questions, totaling ٢٨ questions. These questions were systematically designed to thoroughly evaluate students' competencies in these key areas of historical reasoning.

– *Reliability and Validity*

The reliability of the historical reasoning skills test was assessed using Cronbach's alpha, yielding an overall reliability coefficient of 0.62, indicating an acceptable level of internal consistency. Specific Cronbach's alpha values for each component were: 0.70 for asking historical questions, 0.58 for using sources, 0.62 for contextualizing, 0.57 for using evidence and arguments, 0.68 for using historical concepts, and 0.62 for using meta-historical concepts.

Content validity was confirmed through an extensive review by subject-matter experts, while construct validity was supported by calculating the correlation between individual component scores and the overall test score. Correlation coefficients ranged from

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0.55 to 0.65, indicating satisfactory internal consistency across components: 0.58 for asking historical questions, 0.58 for using sources, 0.63 for contextualizing, 0.65 for using evidence and arguments, 0.61 for using historical concepts, and 0.55 for using meta-historical concepts.

– *Procedure*

Prior to the intervention, the historical reasoning skills test was administered as a pretest to both groups to ensure baseline equivalence. An independent samples t-test confirmed no significant differences in historical reasoning skills between the groups ($t(58) = 1.35$, $p > .05$), with mean scores of 13.7 (SD = 2.15) for the control group and 12.97 (SD = 1.83) for the experimental group.

Following this equivalence check, the experimental group received a hypermedia-supported instructional program through Google Classroom, covering two units from the first-year history curriculum: "Introduction to the Study of Egyptian and Ancient World Civilizations" and "Ancient Egyptian (Pharaonic) Civilization." This instruction was delivered through ١٢ in-class sessions and 9 online sessions. The control group received traditional instruction on the same units. Both groups were taught by the same instructor to control for instructor-related variables. Upon completion of the instructional period, the historical reasoning skills test was administered as a posttest to both groups.

The field experiment was conducted through teaching using a hypermedia-supported program.

An introductory session was held to familiarize students with the nature of the hypermedia-supported program, as well as to introduce them to the Google Classroom platform and explain how to access it. In addition to using Google Classroom, it was necessary to utilize Google Meet so the teacher could monitor the students during meetings, interact with them, and respond to their inquiries.

Lessons were attended on Google Classroom, with meetings held through Google Meet.

The first semester curriculum, consisting of two units: “Introduction to the Study of Egyptian and Ancient World Civilization” and “Ancient Egyptian and Pharaonic Civilization”, was taught to the experimental group using the hypermedia-supported program. This approach aimed to develop historical reasoning skills in the history subject. The teaching period extended from November 1, 2023, to December 28, 2023.

– Some lessons from the two units were taught using a **hypermedia-supported program** through Google Classroom, accessible via the following link: https://classroom.google.com/c/NTU0NjAwNzEyODQy?cjc=geiu47v

The researcher shared this link with the students through the WhatsApp application, enabling them to access the lessons and communicate easily with the teacher by posting their comments.

The table below outlines the teaching schedule, which included **12 classroom-based lessons** and **9 online lessons** conducted through Google Classroom.

Table (2) Teaching Time Plan

Unit One	**Introduction to the Study of the Civilization of Egypt and the Ancient World**			
Lesson Number	**Lesson Title**	**Number of Study Sessions**	**Time Allocated for Meetings**	**Time Period (Minutes)**
1	Civilization and History	1		45
2	Sources of the Study of Civilizations	-	2	90
3	Factors Leading to the Rise of Civilizations	2	-	90
Unit Two	**Ancient Egyptian Civilization (Pharaonic)**			
Lesson Number	**Lesson Title**	**Number of Study Sessions**	**Time Allocated for Meetings**	**Time Period (Minutes)**
1	Highlights from Ancient Egyptian History	-	2	90
2	Economic Life	-	3	135
3	Political and Administrative Life	3		135
4	Social Life	3		135
5	Religious Life	-	2	90
6	Cultural and Intellectual Life	3		135

The same two units were taught to the control group using the traditional teaching method during the same time period. Additionally, one session was conducted to introduce the students to the research objective, one session for the pre-test, and another for the post-test.

While teaching the experimental group, the researcher observed the following:

At the beginning of the teaching process, the experimental group showed a lack of discipline in the classroom. However, as the lessons progressed, the students became more serious, attentive, and eager to interact during the explanation.

The students engaged actively with the program's content and demonstrated increased motivation to learn. This was attributed to the variety of media used, including images, videos, illustrations, and written text, as well as the freedom students had to choose the medium that best suited their preferences.

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The students' ownership of tablet devices enabled them to study the content easily, whether in the classroom or at home, making it accessible at any time. This also allowed the researcher to hold meetings via Google Meet for group discussions, where students could view content, share ideas, and engage collaboratively.

The researcher encountered some difficulties, particularly with a few students being unable to access the Google Classroom. This issue was resolved by providing the students with a video tutorial explaining how to join the classroom online.

Another challenge faced during the experiment was the students' concern that the experience might affect their grades in the history subject. To address this, the researcher clarified that the experiment aimed to facilitate the study of the history syllabus and assured the students that the experiment and related tests would have no impact on their school grades.

One of the most significant challenges encountered by the researcher was the limited time available during lessons, which was insufficient to utilize all the hypermedia elements of the lesson content effectively. To overcome this issue, the researcher uploaded the entire educational content to Google Classroom, enabling students to revisit the program and its materials at any time.

Figure (1) Some pictures of using Google meet

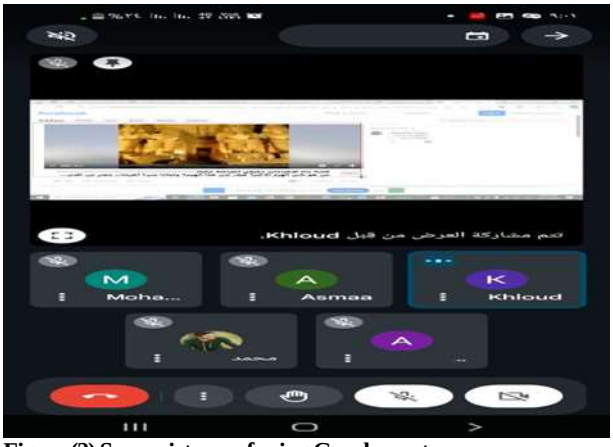

Figure (2) Some pictures of using Google meet

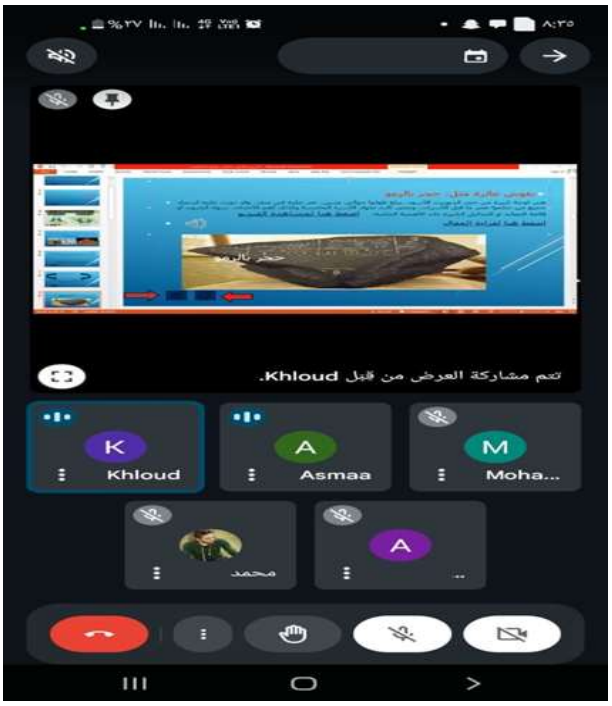

Figure (3) Some pictures of using Google meet

Post-Application of Research Tools

The research tools were applied post-experiment to test the historical reasoning skills of first-year secondary students on December 30, 2023.

– *Statistical Analysis*

Data were analyzed using the Statistical Package for the Social Sciences (SPSS-26). Independent samples t-tests were conducted to compare posttest scores between the experimental and control groups across each component of historical reasoning skills and for the overall test score.

Results

The present study aimed to examine the impact of a hypermedia-supported program on the development of historical reasoning skills among first-year secondary school students. Historical reasoning skills were evaluated across six core components: (1) formulating historical

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questions, (2) utilizing sources, (3) contextualizing, (4) applying evidence and arguments, (5) employing historical concepts, and (6) integrating meta-historical concepts. Table 1 displays the results of the independent samples t-test, comparing the posttest scores of the experimental and control groups on the historical reasoning skills assessment.

Table 1: Comparison of Post-test Historical Reasoning Skills Scores Between Experimental and Control Groups

Variable	Experimental		Control		*T*-value	*df*
	M	*SD*	*M*	*SD*		
Asking Historical Questions	3.80	2.90	2.40	1.65	4.63**	58
Using Sources	3.85	1.53	2.50	2.19	5.74**	58
Contextualizing	3.85	2.45	2.50	3.15	5.13**	58
Using Evidence and Arguments	3.90	3.89	2.40	3.61	7.13**	58
Using Historical Concepts	3.90	3.10	2.53	2.11	6.15**	58
Using Meta-Historical Concepts	3.97	2.12	2.90	2.71	6.77**	58
Total Historical Reasoning Skills	24.17	3.05	16.27	2.23	7.103**	58

Note. N = 60. **p < .01.

The experimental group, which received instruction through the hypermedia-supported program, significantly outperformed the control group, which received traditional instruction, across all six components of historical reasoning skills. For the component of asking historical questions, the experimental group (M = 3.80, SD = 2.90) scored notably higher than the control group (M = 2.40, SD = 1.65), t(58) = 4.63, p < .01. This suggests that the hypermedia program effectively enhanced students' ability to formulate historical inquiries related to sequencing information, comparing events, identifying motives, and describing changes resulting from historical events.

In the using sources component, the experimental group (M = 3.85, SD = 1.53) performed significantly better than the control group (M = 2.50, SD = 2.19), t(58) = 5.74, p < .01, indicating that the hypermedia program supported students in distinguishing between primary and secondary sources, identifying relevant sources, and assessing the importance of historical sources in documenting events.

For the contextualizing component, the experimental group (M = 3.85, SD = 2.45) also scored significantly higher than the control group (M = 2.50, SD = 3.15), t(58) = 5.13, p < .01. This result suggests that the hypermedia program facilitated students' ability to identify the spatial, temporal, and socio-cultural contexts of historical events, fostering a deeper understanding of the motivations and actions of historical figures.

In the using evidence and arguments component, the experimental group (M = 3.90, SD = 3.89) outperformed the control group (M = 2.40, SD = 3.61), t(58) = 7.13, p < .01. This finding indicates that the hypermedia program supported students in identifying and evaluating the reliability of historical evidence, as well as in considering counterarguments and contradictory evidence.

For the using historical concepts component, the experimental group (M = 3.90, SD = 3.10) scored significantly higher than the control group (M = 2.53, SD = 2.11), t(58) = 6.15, p < .01. This result suggests that the hypermedia program enhanced students' ability to identify and apply key historical concepts, contributing to a more nuanced understanding of historical narratives.

Finally, in the using meta-historical concepts component, the experimental group (M = 3.97, SD = 2.12) performed significantly better than the control group (M = 2.90, SD = 2.71), t(58) = 6.77, p < .01. This finding indicates that the hypermedia program facilitated students' ability to describe processes of historical change, identify causes and consequences, and recognize interrelationships between historical phenomena.

Overall, the experimental group (M = 24.17, SD = 3.05) demonstrated significantly higher historical reasoning skills compared to the control group (M = 16.27, SD = 2.23), t(58) = 7.103, p < .01. These results suggest that the hypermedia-supported program had a positive effect on fostering a comprehensive range of historical reasoning skills among first-year secondary school students.

Discussion

The findings of this study provide compelling evidence that integrating hypermedia-supported programs in history education can significantly enhance the development of historical reasoning skills among first-year secondary school students. Across all six components of historical reasoning—formulating historical questions, utilizing sources, contextualizing, applying evidence and arguments, employing historical concepts, and incorporating meta-historical concepts—the experimental group, which received instruction via the hypermedia program, demonstrated superior performance compared to the control group, which received traditional instruction.

These results are consistent with the principles of multimedia learning theory (Mayer, 2021; Ammar Al-Adly, 2024), which suggests that learners can construct more coherent mental models when information is conveyed through multiple modalities, such as text, images, and videos. By capitalizing on the multimedia capabilities of hypermedia, the program likely provided a more immersive and engaging learning experience, thereby enhancing students' comprehension and retention of historical content (Kilag et al., 2023).

Furthermore, the interactive and non-linear structure of hypermedia aligns with constructivist approaches to

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learning which prioritize active knowledge construction and student-centered exploration. By enabling students to navigate and examine historical information independently, the hypermedia program may have promoted a sense of autonomy and ownership in the learning process, ultimately leading to improved historical reasoning skills.

Notably, the results regarding the "formulating historical questions" component suggest that the hypermedia program effectively enhanced students' abilities to generate questions related to sequencing events, comparing historical phenomena, identifying underlying motives, and describing the consequences of historical events. This outcome supports the view that the formulation of historical questions is a foundational element of historical inquiry, driving students' processes of investigation and analysis.

Regarding the "using sources" component, the hypermedia program appears to have bolstered students' abilities to distinguish between primary and secondary sources, identify relevant sources, and assess the importance of historical sources in documenting events. This finding highlights the potential of hypermedia in facilitating source analysis, a vital element of historical reasoning that entails evaluating the reliability, perspectives, and biases present in various historical accounts.

The experimental group's superior performance on the "contextualizing" component suggests that the hypermedia program enhanced students' abilities to identify the spatial, temporal, and socio-cultural contexts surrounding historical events. This skill is essential for comprehending the motivations, decisions, and actions of historical actors and for interpreting sources within their proper contextual framework (Seixas & Morton, 2013).

Moreover, results related to the "using evidence and arguments" component indicate that the hypermedia program supported students in recognizing and evaluating the reliability of historical evidence, as well as in considering counterarguments and contradictory information. This aligns with the idea that constructing evidence-based arguments and acknowledging multiple perspectives are central to historical reasoning (Monte-Sano, 2011).

Findings regarding the "using historical concepts" and "using meta-historical concepts" components further underscore the hypermedia program's role in promoting a nuanced understanding of historical narratives. By enhancing students' ability to identify and apply essential historical concepts, describe processes of historical change, identify causative relationships, and recognize connections between historical phenomena, the program likely contributed to deeper engagement with historical content.

Overall, these findings illustrate the potential of hypermedia to create immersive and engaging learning experiences that incorporate multimedia elements, aligning with multimedia learning theory (Mayer, 2021). Additionally, the interactive, non-linear design of hypermedia aligns with constructivist learning principles, supporting active knowledge construction and student-centered exploration.

Conclusion

This study provides compelling evidence that integrating hypermedia-supported programs can significantly enhance the development of historical reasoning skills among first-year secondary school students. Across the six components of historical reasoning skills examined—asking historical questions, using sources, contextualizing, using evidence and arguments, using historical concepts, and employing meta-historical concepts—the experimental group that received hypermedia-supported instruction outperformed the control group, which received traditional instruction.

By aiding students in formulating historical questions, analyzing sources, contextualizing events, constructing evidence-based arguments, and applying both historical and meta-historical concepts, the hypermedia program facilitated a more nuanced and critical engagement with historical narratives. These competencies are crucial for cultivating a comprehensive understanding of the past and fostering historical reasoning skills among students.

The implications of this study are substantial, providing empirical support for the integration of technology and multimedia in history education. Educators and curriculum designers can leverage these findings to develop and implement hypermedia-supported programs that strengthen students' historical reasoning skills and deepen their appreciation for the complexity of historical narratives.

However, this study focused on a specific cohort of first-year secondary students, and further research is needed to examine the generalizability of these findings across diverse educational settings and age groups. Future research could also investigate the long-term impact of hypermedia-supported programs on historical reasoning skills, as well as explore potential synergies between such programs and other pedagogical approaches, such as inquiry-based learning or collaborative learning.

Overall, this study contributes to the growing body of research on the intersection of technology and historical reasoning in secondary education. By demonstrating the positive impact of a hypermedia-supported program on historical reasoning skills, this research underscores the potential of multimedia and interactive technologies to create engaging, effective learning experiences that foster critical thinking, analysis, and a sophisticated understanding of the past.

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