

History Education in a STEM-Favored Environment Adaptation Strategies for Secondary Teachers

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ABSTRACT

The integration of history education within a STEM-focused curriculum has been a subject of debate in educational circles. This dissertation explores the status and importance of history education in secondary schools where there is a pronounced emphasis on STEM disciplines. Through a mixed-methods approach, the study investigates the perceptions of educators, students, and policymakers regarding the value of history education. The findings reveal a significant disparity between the perceived importance of history and the actual time and resources allocated to its teaching. The study identifies several challenges and opportunities for integrating history education more effectively within a STEM-oriented educational framework. The implications of these findings are discussed in relation to curriculum development, teacher training, and educational policy. The dissertation concludes with recommendations for a more balanced approach to education that recognizes the complementary roles of history and STEM disciplines in fostering well-rounded, informed citizens.

KEYWORDS

History education; STEM curriculum; secondary education; educational policy; curriculum integration; teacher perceptions; student engagement

1 Introduction

This chapter provides an overview of the significance of history education in a society that increasingly favors STEM (Science, Technology, Engineering, and Mathematics) disciplines. It outlines the purpose and objectives of the study, which is to examine the current state of history education in secondary schools where STEM subjects are given priority. The introduction discusses the context and rationale for the study, including the perceived decline of history education and its potential consequences on students' understanding of the past and their ability to engage critically with the present. It also presents the research questions that guide the study, defines key terms, and provides a brief literature review that situates the research within the broader discourse on education policy and curriculum development. Additionally, the chapter describes the methodology employed, the structure of the dissertation, and the significance of the findings for educators, policymakers, and the broader educational community.

2 Literature Review

2.1 The Rise of STEM Education

The Rise of STEM Education encompasses the definition and evolution of the acronym STEM, which stands for Science, Technology, Engineering, and Mathematics. This educational concept has gained prominence due to its critical role in global competitiveness and the need for a skilled workforce. The acronym STEM has seen its scope expand to include other disciplines, such as STEAM (adding Art) and STREAM (adding Reading and Arts). The importance of STEM Education is multifaceted; it is essential for innovation and economic growth and has a significant impact on solving complex societal challenges. Governments around the world have initiated various policies and allocated substantial funding to promote STEM education, recognizing its importance in shaping the future. In secondary education, the integration of STEM into the curriculum is a response to the need to prepare students for careers in these fields. However, teaching STEM subjects at the secondary level comes with its own set of challenges and opportunities. The influence of STEM on society is profound, affecting public perception, cultural values, and addressing the gender and diversity gap in STEM fields. Despite its focus on science and technology, STEM also intersects with other disciplines, including the humanities, and the potential for interdisciplinary approaches in education is an area of growing interest.

2.2 The Role of History Education in a Balanced Curriculum

The Role of History Education in a Balanced Curriculum is pivotal as it provides students with a comprehensive understanding of the past, which is essential for contextualizing the present and informing the future. History education fosters critical thinking, empathy, and the ability to analyze complex information, skills that are indispensable in an increasingly interconnected world. Despite the growing emphasis on STEM, history remains a cornerstone of a well-

rounded education, contributing to the development of informed citizens capable of participating in democratic societies. It offers a narrative that helps students appreciate cultural diversity, understand the roots of social, political, and economic structures, and recognize the impact of historical events on contemporary issues. History education also plays a key role in promoting national identity and a sense of collective memory. In a balanced curriculum, history serves as a counterbalance to the quantitative and technical focus of STEM, providing a humanistic perspective that enriches the educational experience and prepares students for a multifaceted world.

2.3 Challenges in Teaching History in a STEM-Favored Environment

Challenges in Teaching History in a STEM-Favored Environment are multifaceted and can significantly impact the perceived value and effectiveness of history education. In an educational landscape where STEM subjects are often prioritized due to their direct links to economic growth and technological advancement, history teachers may face a diminished status and resources within the curriculum. This can lead to smaller class sizes, reduced funding, and less access to innovative teaching materials and technologies. Additionally, the emphasis on STEM may result in a devaluation of the humanities, including history, which can lead to a decrease in student enrollment and interest in history courses. Teachers must also navigate the challenge of demonstrating the relevance of historical knowledge in a society that increasingly values practical, job-oriented skills. The pressure to quantify learning outcomes in a manner similar to STEM subjects can be at odds with the qualitative nature of historical analysis and interpretation. Furthermore, the rapid pace of technological change and the emphasis on digital literacy may necessitate a reevaluation of traditional history teaching methods, requiring teachers to adapt and integrate new technologies and pedagogies into their classrooms to maintain student engagement and relevance.

2.4 Previous Adaptation Strategies for History Teachers

Previous adaptation strategies for history teachers in a STEM-favored environment have aimed to address the challenges faced by incorporating innovative teaching methods, aligning with STEM principles, and advocating for the importance of history education. Some of these strategies include cross-disciplinary approaches that integrate history with STEM subjects, such as using historical data in math or science projects to provide context and depth. Teachers have also utilized technology to enhance history lessons, incorporating digital simulations, virtual reality experiences, and interactive online platforms that allow students to engage with historical content in new and exciting ways. Additionally, history teachers have focused on developing critical thinking and analytical skills, which are also valued in STEM fields, by using primary source analysis, debate, and project-based learning. To combat the perception of history's irrelevance, some educators have highlighted the subject's role in fostering cultural literacy, citizenship, and an understanding of societal trends that inform future decision-making. Despite these efforts, the ongoing challenge remains to create sustainable and effective adaptation strategies that can be widely implemented and supported by educational institutions and policymakers.

3 Methodology

3.1 Research Design

The research design for this study is qualitative, employing a multi-case study approach to explore the adaptation strategies used by secondary history teachers in a STEM-favored educational environment. The study selects a purposeful sample of teachers from various schools known for their strong STEM programs, ensuring a diverse range of experiences and contexts. Data collection methods include in-depth interviews with the participating history teachers, classroom observations, and analysis of relevant teaching materials such as lesson plans and student assignments. The interviews are semi-structured to allow for detailed exploration of teachers' perceptions, challenges, and strategies, while also maintaining a focus on the research questions. The observations provide insights into the practical application of these strategies within the classroom setting. The research employs thematic analysis to identify common themes and patterns across the cases, which are then used to construct a theoretical framework for history education adaptation in a STEM context. Ethical considerations, including informed consent and participant confidentiality, are strictly adhered to throughout the research process. The design aims to provide a comprehensive understanding of the current landscape and to identify effective and innovative strategies that can be shared with the broader educational community.

3.2 Population and Sample

The population for this study consists of secondary school history teachers working within educational systems that

prioritize STEM (Science, Technology, Engineering, and Mathematics) disciplines. The sample is purposefully selected to include teachers from different types of schools, including public, private, and charter, that are known for their robust STEM programs. The sample includes teachers with varying levels of experience, ranging from early-career teachers to those with decades of experience, to capture a breadth of perspectives on adapting history education in a STEM-favored environment. The selection criteria also consider the diversity of the student body, geographic location, and the extent to which the school's curriculum and resources support or integrate history education with STEM initiatives. The sample size is determined based on the principle of saturation, where data collection continues until no new themes emerge from the interviews, ensuring that the sample is sufficient to address the research questions comprehensively. The final sample includes a minimum of 10-15 history teachers, which allows for a detailed exploration of individual experiences while also identifying commonalities and differences in adaptation strategies across the sample.

3.3 Data Collection Methods

Data collection for this study employs a mixed-methods approach to gather comprehensive insights into the adaptation strategies used by secondary history teachers in a STEM-favored environment. The primary methods include semi-structured interviews, classroom observations, and document analysis. Semi-structured interviews are conducted with the selected sample of history teachers to explore their experiences, perceptions, and practices in teaching history within a STEM-focused context. These interviews are audio-recorded with the participants' consent and later transcribed for analysis. Classroom observations are scheduled to capture the teachers' instructional methods, classroom management techniques, and the integration of history with STEM concepts. Observations are documented through detailed field notes and, when permissible, video recordings. Document analysis involves examining the teachers' lesson plans, curriculum guides, and any other educational materials used to teach history. This multi-faceted approach ensures a rich dataset that provides a nuanced understanding of the strategies employed by history teachers to adapt to a STEM-favored educational landscape. Additionally, a brief survey is administered to gather demographic information and to complement the qualitative data collected through the other methods.

3.4 Data Analysis Techniques

Data analysis for this study is conducted in a systematic and iterative manner to ensure the validity and reliability of the findings. The analysis of the semi-structured interview transcripts, classroom observations, and document analysis involves several interconnected steps. Thematic analysis is used to identify, analyze, and report patterns within the data. Initially, the transcripts and observation notes are read multiple times to become familiar with the data. Codes are then assigned to segments of the text that relate to the research questions and emerging themes. These codes are organized into categories, which are further refined into main themes through a process of constant comparison. The NVivo software is utilized to assist in managing and analyzing the qualitative data. For the document analysis, a content analysis approach is applied to identify key themes and patterns in the educational materials. The survey data is analyzed quantitatively using descriptive statistics to provide a contextual background for the qualitative findings. Triangulation is employed to cross-validate the findings from the different data sources, enhancing the credibility of the study. Member checking is also conducted to ensure the accuracy of the interpretations by allowing participants to review and confirm the findings. The analysis aims to uncover the various adaptation strategies employed by secondary history teachers and to understand their effectiveness in a STEM-favored environment.

3.5 Ethical Considerations

Ethical considerations are paramount in this study to ensure the protection of all participants, including students, teachers, and any other individuals involved in the research process. The study adheres to the ethical guidelines set forth by the Institutional Review Board (IRB) and the broader research community. Prior to the commencement of the study, informed consent is obtained from all participants. The consent process includes a clear explanation of the study's purpose, procedures, potential risks and benefits, and the rights of the participants, including the right to withdraw from the study at any time without penalty. Confidentiality and anonymity are maintained throughout the study. Participants are assured that their identity will be protected, and any data that could potentially identify them is either omitted from the final report or pseudonymized. To further ensure confidentiality, data is stored in secure locations with access limited to the researcher and authorized personnel only. The researcher also takes responsibility for the secure disposal of any sensitive information following the completion of the study. The potential for harm is minimized by ensuring that the research does not interfere with the educational process or the well-being of the participants. Participants are informed that they can decline to answer any questions or discuss any topics that make them uncomfortable. Additionally, the researcher remains vigilant to the possibility of emotional distress and is prepared to provide appropriate support or

referral to professional services if needed. The study is designed to promote the dignity and rights of all participants, and the researcher commits to conducting the research with integrity and respect for the individuals and institutions involved. Regular debriefing sessions are conducted to address any concerns that may arise during the course of the study, and participants are provided with a summary of the findings upon the study's completion.

4 Findings

4.1 Perceptions of Secondary History Teachers

The integration of history education within a STEM-favored environment presents unique challenges and opportunities for secondary history teachers. This section explores their perceptions regarding the current educational landscape, the value of history in a STEM-focused curriculum, and the strategies they employ to adapt their teaching methods. Teachers report a sense of being undervalued in the push for STEM, with some expressing concerns that the emphasis on science, technology, engineering, and mathematics may overshadow the importance of historical literacy and critical thinking skills that history education fosters. Despite this, many teachers acknowledge the potential for cross-disciplinary learning and see the value in demonstrating the interconnectedness of historical events with scientific and technological advancements. They believe that by highlighting these connections, they can make history more relevant to their students and the broader curriculum. Teachers also note the importance of active learning and project-based education as means to engage students in history, suggesting that these methods align with the hands-on, problem-solving approach characteristic of STEM education. They advocate for the inclusion of primary sources, digital storytelling, and simulations to create immersive learning experiences. Additionally, teachers are implementing collaborative projects that require students to apply historical analysis to contemporary issues, thereby bridging the gap between past and present. However, they express a need for professional development tailored to integrating history with STEM, as well as for administrative support to create a balanced and inclusive curriculum that recognizes the role of history in preparing students for the future. Overall, secondary history teachers are resourceful and adaptable, but they seek a more equitable educational framework that values all disciplines equally.

4.2 Current Practices in History Education

In a STEM-favored environment, secondary history education faces the challenge of maintaining its relevance and effectiveness while competing with the allure of STEM disciplines. Current practices in history education reflect a blend of traditional and innovative methods aimed at engaging students and reinforcing the subject's importance. Teachers continue to rely on textbooks and lectures to convey historical knowledge, emphasizing the chronological narrative and key events that have shaped societies. However, there is a growing recognition of the need to move beyond the rote memorization of dates and facts. Many educators are incorporating primary source analysis, encouraging students to engage critically with historical documents, photographs, and artifacts, thereby fostering deeper understanding and critical thinking skills. The use of technology is also becoming more prevalent, with teachers leveraging digital tools such as interactive timelines, online archives, and virtual field trips to bring history to life. Group discussions and debates are employed to stimulate analytical thinking and to help students develop perspectives on historical events. Project-based learning is another strategy that is gaining traction, allowing students to explore historical themes through hands-on activities, such as creating museum exhibits or producing documentaries. Despite these efforts, assessment methods often remain traditional, with multiple-choice tests and essays dominating the evaluation of student learning. Teachers are aware of the need to align assessments with the dynamic and interactive nature of the classroom activities, and some are experimenting with alternative assessment tools like oral histories, digital portfolios, and peer reviews. Nevertheless, the integration of history with STEM poses additional challenges, with teachers struggling to find meaningful connections that do not compromise the integrity of the historical content.

4.3 Identifying Gaps and Challenges

In a STEM-favored educational environment, the teaching of history at the secondary level encounters several gaps and challenges that need to be addressed to ensure the subject's vitality and integration within the broader curriculum. These gaps and challenges include:

Lack of Integration with STEM: History education often exists in isolation from STEM disciplines, leading to a perception that it is less relevant or valuable. Identifying meaningful connections between history and STEM without diluting the historical content is a significant challenge.

Limited Resources: History departments may receive fewer resources compared to their STEM counterparts, resulting in outdated materials, limited access to technology, and fewer opportunities for professional development for history

teachers.

Student Engagement: Capturing and maintaining student interest in history can be difficult in a culture that prioritizes STEM. Students may view history as less practical or less likely to lead to future career opportunities.

Assessment Methods: Traditional assessment methods may not fully capture the depth of understanding or the critical thinking skills that students develop through engaging with history. There is a need for more innovative and authentic assessment practices.

Teacher Preparation: Many history teachers may not be adequately prepared to teach in a STEM-favored environment. They may lack the training or confidence to incorporate STEM methodologies or to make explicit the connections between history and scientific inquiry.

Curriculum Design: The curriculum may not be designed to facilitate interdisciplinary learning, making it difficult for teachers to create lessons that weave together history with science, technology, engineering, and mathematics.

Parent and Administrator Attitudes: There may be a discrepancy in the perceived value of history education compared to STEM education among parents, administrators, and policymakers, which can impact funding, support, and the overall status of history within the school.

Societal Trends: The emphasis on immediate, practical applications of knowledge in society can overshadow the long-term benefits of historical literacy and critical analysis skills that are developed through history education.

Addressing these gaps and challenges requires a multifaceted approach that includes professional development for teachers, curriculum reform, increased resource allocation, and a cultural shift that recognizes the importance of history in a well-rounded education.

4.4 Successful Adaptation Strategies in Practice

To effectively teach history in a STEM-favored secondary education environment, teachers must employ a range of adaptation strategies that enhance the subject's relevance and integrate it with STEM disciplines. The following successful strategies have been implemented in various educational settings.

Cross-Disciplinary Projects: Teachers design projects that require students to apply historical knowledge to solve real-world problems, often incorporating scientific, technological, engineering, and mathematical concepts.

Inquiry-Based Learning: History lessons are structured around questions and investigations, mirroring the inquiry-based approaches common in STEM fields, to encourage critical thinking and analysis.

Integration of Technology: Utilizing digital tools and resources, such as simulations, virtual reality, and online databases, to engage students and provide interactive learning experiences that bridge history with technology.

Data Analysis Exercises: Incorporating data analysis from historical records, such as census data or primary source documents, to teach students how to interpret and draw conclusions from information, a skill essential in STEM fields.

Collaborative Learning: Encouraging students to work in teams on historical research projects, fostering collaboration skills that are highly valued in STEM careers.

STEAM Approach: Adapting the STEAM (Science, Technology, Engineering, Arts, and Mathematics) framework to include history as an integral part of the curriculum, emphasizing the role of the arts and humanities in innovation.

Professional Development: Providing teachers with training on how to integrate historical content with STEM methodologies, including workshops on project-based learning, technology integration, and interdisciplinary teaching.

Community Partnerships: Collaborating with local museums, historical societies, and cultural institutions to provide students with hands-on experiences that connect historical study with contemporary issues and STEM applications.

Authentic Assessments: Designing assessments that require students to apply historical knowledge in creative ways, such as developing a museum exhibit, a historical website, or a documentary, which also involves STEM skills.

Highlighting Relevance: Continuously making connections between historical events and the scientific, technological, and social changes that followed, demonstrating the ongoing relevance of historical study.

By implementing these strategies, history teachers can not only maintain the integrity of their subject but also position it as a critical component of a well-rounded, interdisciplinary education that prepares students for the complexities of the modern world.

5 Adaptation Strategies for Secondary History Teachers in a STEM-Favored Environment

5.1 Integrating History with STEM Concepts

The integration of history with STEM concepts can significantly enhance the educational experience for secondary students. This section outlines strategies and methods for blending historical study with STEM disciplines to create a more dynamic and relevant curriculum. Identifying natural connections between historical events and scientific discoveries, technological advancements, engineering achievements, and the role of mathematics in historical contexts is crucial.

Developing interdisciplinary units that weave together historical narratives with scientific inquiry, explore the engineering marvels of the past, and incorporate mathematical analysis into historical research is essential. Case studies in integration, such as the Industrial Revolution, the Space Race, and the building of ancient monuments, serve as examples of how history and STEM can be combined. Utilizing project-based learning through projects that require students to design and build historical models using engineering principles, analyze historical data mathematically, and engage in simulations and role-playing activities incorporating scientific and technological aspects of historical periods, fosters a deeper understanding.

5.2 Utilizing Technology in History Education

In a STEM-favored environment, technology plays a pivotal role in enhancing history education. This subsection explores the various ways in which technology can be leveraged to make history lessons more engaging, interactive, and accessible. Digital resources such as online archives, virtual museums, and interactive timelines bring historical events to life, allowing students to explore primary sources and artifacts in a way that traditional textbooks cannot. Educational software and applications enable students to engage in historical role-playing games, simulations, and virtual reality experiences that provide immersive learning opportunities. Social media platforms and collaborative tools facilitate discussions and projects that connect students with peers and experts around the world, broadening their perspective on historical topics. Video conferencing and webinars allow for guest lectures from historians and experts, enriching the classroom experience. Data visualization tools help students analyze historical data and trends, fostering critical thinking and data interpretation skills. Podcasts and educational videos provide accessible content for different learning styles and can be used for flipped classroom models. Finally, the use of e-portfolios and digital storytelling encourages students to creatively present their understanding of historical concepts, integrating multimedia elements and technology skills into their history education.

6 Conclusion

The conclusion of this study synthesizes the findings and discussions presented throughout the preceding chapters, emphasizing the importance of history education within a STEM-favored educational landscape. It acknowledges the challenges that secondary history teachers face in such an environment but also highlights the opportunities for integration and innovation. The chapter reinforces the necessity of a balanced curriculum that values the humanities alongside STEM fields, arguing that history education is crucial for developing well-rounded citizens with critical thinking, empathy, and a sense of identity and continuity. It suggests that by embracing technology and interdisciplinary approaches, history education can not only survive but thrive in a STEM-centric world. The conclusion also offers recommendations for educators, policymakers, and curriculum developers to support and enhance history education. It concludes by contemplating the future of history education, suggesting areas for further research and the potential impact of emerging technologies on teaching and learning historical concepts.

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