

# Design and Formative Evaluation of an AI Application to Search for Recent News Similar to the History Studied in Class

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**Abstract:** Developing history education that considers learners' contexts and interests has been a long-standing challenge. To address this issue, this study designed an AI application based on an existing algorithm that can present multiple contemporary news sites with similar causal structures when learners input the causal relationships of interest into what they have learned in history. Formative evaluations with high school students confirmed the effectiveness of the application in providing contemporary news sites that learners find relevant according to their interests, as well as in increasing the significance of history learning in various ways. For example, the effects of new discoveries regarding the relationship between history and recent news increased interest in both were confirmed. The design of this AI application therefore has practical significance for the advancement of education methods.

## Introduction

There has been a longstanding interest in learning sciences to develop ways to enhance the meaningfulness of learning by connecting classroom history content with learners' contexts. Research on history education has increased since the 1990s to develop historical thinking; and in recent years, students have been able to learn history with a focus on their interests and contexts (Barton & Levstick, 2004; Van-Boxtel & Van-Drie, 2018).

Consequently, three major models were developed to increase the significance of learning history for modern learners. The first is a teaching model in which the teacher presupposes an important contemporary theme in modern society and historical causation related to that theme, and conducts "learning from history" activities, culminating in a discussion on the contemporary theme. For example, Mansilla (2000) used the Rwandan genocide as an important theme in the present day, taught the history of the German genocide during World War II, and conducted a class that examined the Rwandan genocide in light of what was learned from that history. Other studies have developed systems that allow learners to enter the text of contemporary news of interest to them and search for related historical causations, allowing them to learn from history and deepen their consideration of contemporary news (Ikejiri et al., 2019). The second is an inquiry class model in which learners formulate historical questions about the theme they wish to inquire about and analyze historical sources on their own. Various historical inquiries have been reported by Barton and Levstick (2004), mainly in informal settings, and this model has been systematically summarized by Van-Boxtel et al. (2021). The third is a teaching model that allows students to extract the causal characteristics of a certain history taught in class, recall related contemporary events, and reflect on the present day. For example, Harris (2006) developed a class in which students analyzed the impact of the Norman Conquest in England at the time, while making them aware that similar changes occur in contemporary global society.

However, each of these models faces its own challenges in teaching classes that reflect student interests and contexts. The first model has the problem that themes that teachers consider important and themes that learners consider important do not always coincide. The second model is still less discussed in terms of how students formulate historical questions, and research is required to envision a long-term learning process in which students formulate questions as they learn about history. The third model relies heavily on students' knowledge of relevant contemporary events. In other words, scaffolding is required to diversify the contemporary events that can be recalled; however, this technique has not yet been developed.

This study focused on solving the problems of the third model. This is because while research on the first and second models to approach *history from the present day* has progressed, research on the third model, which approaches *the present day from history*, has been scarce. History is composed of a series of cause-and-effect relationships, and because of this characteristic, many curricula teach history in a general historical manner while incorporating theme studies related to the present day in the middle or at the end of the curriculum. This is also the case in Japan (Ministry of Education, Culture, Sports, Science and Technology, 2018). Therefore, upgrading the method of approaching *the present day from history* is significant because it will allow students to learn while moving back and forth between history and contemporary events at any stage of the history education curriculum.

In this study, we designed an AI-based application that can present multiple modern news sites with similar causal structures when the learner inputs texts of cause-and-effect of interest among the contents studied

in the history course. Additionally, we formatively evaluated the kind of learning and the significance learners experience when using this application.

## Design

### Examination of history input information and modern output information

In recent years, history classes have tended to emphasize the inference of historical causality (Van-Boxtel & Van-Drie, 2018). When relating history to the present day, the focus is not only on superficial elements (labor) but also on historical causality (the industrial revolution caused labor problems), which is often used to examine the causes of contemporary social problems and future trends (Mansilla, 2000).

Therefore, as input data, we consider it appropriate to establish causal relationships, that is, cause-and-effect sentences learned in that day's history class. Additionally, we considered it necessary to have the ability to input which aspect of historical causality (political, economic, cultural, or social) the learner is interested in, so that the weighting could be based on the learner's interest.

We set the contemporary output information related to historical causality as modern web news. A variety of approaches can be considered for contemporary historical information such as news that includes contemporary social issues (Ikejiri et al., 2019). Therefore, we collected daily web news provided by Japanese public broadcasters along with titles, dates, news categories (political, social, etc.), and URLs and grouped similar news. This allowed the presentation of newsgroups that were similar to the history students entered and allowed them to view individual web news items from those newsgroups.

### Algorithm to output modern web news sites related to historical causality

To develop the application, we used an algorithm developed by Matsumaru et al. (2022), which outputs contemporary news related to historical input causal relations. Specifically, the algorithm converts a particular era-specific expressions into general expressions (e.g., "Italy" → "country") for a pre-prepared contemporary news causal sentence and performs the same conversion when the learner inputs a past causal sentence (e.g., "Roman Empire" → "country"). Natural language processing and machine learning methods such as morphological analysis, stop word removal, and feature vector creation were then applied to the converted sentences. To apply the method of measuring the similarity between historical and contemporary causal relationships, a bipartite graph was constructed with feature vectors as nodes and edges, whose weights were the similarities between feature vectors, and a maximum weight matching solution was applied. We applied this method to the combination of past causal relations entered by students and all contemporary web news that we continued to collect so that we could search for groups of web news with similar contemporary causal relations in ranking order.

Furthermore, two features were added to further increase each learner's interest. First, the display of news in ranking order was limited to newsgroups whose news was issued within the last month so that learners could feel that the news is recent. We also attempted to highlight and show newsgroups with categories that matched the aspects of interest (political, economic, cultural, and social) entered by the learners.

### Design of the *Historical Spiral* application

The web application that implements the algorithm described above is the *Historical Spiral* shown in Figures 1 and 2. This web application is intended to be accessed at the end of each history class with personal smartphones and to input interesting historical causal relationships learned that day (left side of Figure 1). Then, to reflect the interest of the individual learner, we let them choose which aspect they were interested in and searched for (right side of Figure 1). Consequently, the system can present a group of recent web news items that are similar to the causal history entered, as shown on the left side of Figure 2. Additionally, the stars in the output results in Figure 2 represent news that matches the aspects of interest. By clicking on a newsgroup, the URL of the individual news site is displayed, and the text can be read on the actual news site (right side of Figure 2).

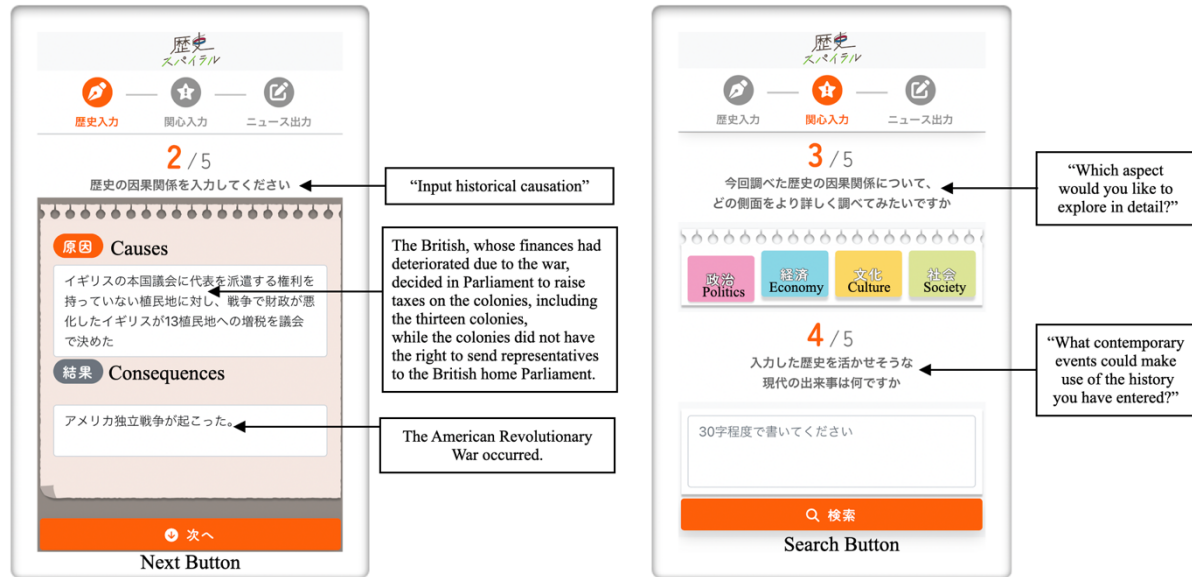
## Formative Evaluation

The formative evaluation in this study was conducted to answer the following two questions: Can this application provide a variety of news items that learners feel are similar to and aligned with their interests? Can this application enhance the significance of learning history and, if so, how does it enhance it?

The formative evaluation was conducted after school in July 2023 with four first-year high school students taking history at a mid-level Japanese high school. The four agreed to a consent form for the use of research data in accordance with research ethics. The procedure was as follows: First, the four students were

**Figure 1**

Example of input screen for learned historical causal relations in the developed application



**Figure 2**

Output screen example of recent news similar to the learned historical causal relationship



grouped together and asked to recall the history they had studied in a recent history class and select one cause-and-effect relationship that they thought was important while viewing the textbook. Consequently, they selected the causal relationship of the American Revolutionary War in the late 18th century. Next, they were asked to recall a contemporary event that they thought was related to the causal relationship of that history and describe it individually, along with the reasons they thought they were similar (5 minutes). They were then asked to individually use our application on the causal relationship of the American Revolutionary War. If they searched for news that they thought was similar, they were free to read the news (15 minutes). The input process was recorded on video. After using the application, they were asked to describe contemporary events that they thought were relevant to the causal relationship of the American Revolutionary War, along with the reasons why they thought they were similar (5 minutes). After that, the four participants were then given a group interview for approximately 20 minutes and asked the following main questions: "How many contemporary news events did you find similar through the application?" "Have the applications changed your usual view of history?"

Two analyses were conducted using the collected data in line with the two objectives of formative evaluation. First, based on the description data and interview data, we analyzed whether they were able to obtain various types of information on contemporary news that they found relevant through this application and whether this application can provide information that corresponds to their individual differences in interest. Second, based on interview data, we analyzed whether and how contemporary and historical interests improved through this application.

## Results and Discussion

Interview data indicated that using the app, an average of 3.00 news items per person ( $SD= 0.82$ ) appeared to be related to the cause and effect of the American Revolutionary War. Additionally, after analyzing their pre- and post-free writing, all four wrote about a new contemporary event similar to the American Revolutionary War, which they had learned through the application. Furthermore, the new news that each wrote did not overlap. This is because the historical causal sentences entered in the application were slightly different for each learner, and the different categories of interest they had selected during the course of the application ("politics" for one, "economics" for one, and "culture" for two), changed the contemporary news that was output or highlighted. Furthermore, the interview data showed that all four participants remarked on a variety of effects that enhanced the significance of their learning history. For example, they mentioned the effects of new discoveries about the relationship between history and recent news that increased interest in both (three students), the effects of wanting to research the relationship between history and the present day in class in the future (two students), the effects of improved interest in history in general that they learned in class (one student), and the effects of being aware of the similarities between history and the present day, making it easier to retain history when learning it (one student). These results suggest the effectiveness of this application in providing contemporary news that students think is relevant to the history studied in our history classes while accommodating individual differences in interest. It has also been suggested that this application could increase the significance of learning history in various ways.

Although the sample size for this formative evaluation was extremely small, it is significant that we designed an AI application that can relate any historical causal relationship to the contemporary context in which learners live, and that the significance of learning history can be improved in various ways by allowing learners to discover various relationships between history and the current context. However, it is a future task to have more high school students use this application in conjunction with long-term history classes and to verify the effectiveness of how the significance of learning history changes over time and how this affects their attitude toward taking regular history classes.

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