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## The Sourcer's Apprentice A Tool for Document-Supported History Instruction

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History offers a literacy environment as rich as any a student is likely to encounter prior to college. The study of history centers on documents—letters, treaties, notes, official records, diaries—as well as textbooks. Instruction that makes good use of this rich text environment has the potential to support broad-based literacy skills that may extend beyond history classrooms to other cases of text learning, reasoning, and writing. This potential is acknowledged in the recommendations of the National Standards for United States History concerning historical thinking skills, which “enable students to evaluate evidence, develop comparative and causal analyses, interpret the historical record, and construct sound historical arguments and perspectives on which informed decisions in contemporary life can be based.”<sup>21</sup>

High, literacy-rich standards in history education offer many possibilities for going beyond simple transmission of consensual narratives. A basic high standard requires that students demonstrate more reading of more sources, more informed analysis, and more writing than is currently common. The call for higher standards can embrace much more than these requirements, but they constitute a reasonable minimum. The narrative is the starting point. Literacy—thinking, reasoning, and writing about history via the use of documents—is the trajectory. Thus, the National Standards also suggested that teachers capitalize on younger students’ interest and skill in learning from narratives, but only as a starting point to be cultivated and developed into more sophisticated literacy

skills. The Standards report introduces its description of historical skills this way:

Children should also have opportunities to compare different stories about a historical figure or event in order to analyze the facts each author includes or omits, and the interpretations or point-of-view communicated by each—important early steps in the development of students' abilities to compare competing historical interpretations of events.<sup>2</sup>

These goals embody reasonable standards that, apparently, are far from being met. Only 10 percent of twelfth graders test at or above the proficiency level, which includes the ability to use historical evidence to support positions and to write arguments that reflect an in-depth grasp of issues and that refer to sources.<sup>3</sup> The standards are thus high as well as reasonable, and need for some correspondingly higher effort by students and teachers is implied.

Use of sources relates closely to capacity for handling conflicting viewpoints. Currently, average students have few opportunities to learn by reading multiple texts on the same topic and by discussing controversies of interpretation. According to Ravitch and Finn, these activities are not routine in typical history classrooms. These authors summarize eleventh graders' view of history instruction as follows:

[T]he typical history classroom is one in which they listen to the teacher explain the day's lesson, use the textbook, and take tests. Occasionally they watch a movie. Sometimes they memorize information or read stories about events and people. They seldom work with other students, use original documents, write term papers, or discuss the significance of what they are studying.<sup>4</sup>

Although many teachers encourage interpretative activities, textbooks continue to dominate the curriculum.<sup>5</sup> In fact, only 39 percent of the twelfth-grade students in the 1988 National Assessment of Educational Progress (NAEP) history assessment claimed to have read material from a source other than a textbook.<sup>6</sup> Current textbooks provide very little opportunity to learn the interpretative skills required by the National Standards. In an effort to simplify the presentation of events, textbooks often gloss over controversial interpretations, possibly conveying to the student that interpretations are facts. Furthermore, history textbooks tend to omit qualifiers, terms of uncertainty, and signs of authorship (i.e., indicators that the author is giving an opinion), features that are standard in works by historians.<sup>7</sup>

In what follows, we assume, and argue for this assumption only summarily, that reading multiple accounts of common events should be an integral part of high school history instruction. We describe an ongoing project, built on this assumption, which has theoretical, experimental, and instructional components. We refer to sources in terms both of primary documents and of historians' accounts, for both types generate some common issues including diversity of viewpoint. Although here we emphasize the instructional components, the theoretical and empirical components are important. We begin with a summary of these components, as developed through our research. We then describe a computer-based learning environment, the Sourcer's Apprentice (SA), that we developed to assist students in acquiring evidence-seeking and evidence-evaluation skills and to foster students' awareness of document type and document privilege in historical research.

### *Learning by Reading History Texts*

Students require various skills and representational abilities to read a set of historical documents, evaluate them, and construct their own interpretation of the described events. The most basic demand on a reader of history texts is the construction of a simple narrative account of some event. We have found that, after a first reading of a history text, students appear to learn the central events of a story and connect these events with simple causal or temporal links.<sup>8</sup> In some ways, this is similar to what very young children learn from reading fiction.<sup>9</sup> A useful method of describing this knowledge is as a Causal-Temporal Event Structure. The Causal-Temporal Event Structure is a graphical structure in which nodes represent events and connectors represent either causal or temporal links between events. This structure has proved very useful in capturing what students recall and summarize about a single narrative text.<sup>10</sup> Because constructing these types of representations is compatible with the cognitive abilities of even young readers, most history students should have little problem obtaining the basic story from a historical text. Frequently, this level of ability (with the additional learning of many details) is all that is demanded of them in the high school history class.

The demands on the student become significantly greater, however, when the student is presented with either an additional text (e.g., multiple texts) or a single text that does not conform to a narrative structure (e.g., an

historian's argument, a treaty, military correspondence). Each of these cases place special demands on the student that may cause learning difficulties unless the student receives explicit instruction and environmental support. In the next section we describe the representational structure, in addition to a single Causal-Temporal Event Structure, necessary to understand multiple texts. Then we briefly review the empirical results pertaining to students' limited ability to construct such a representation.

#### Learning from Multiple Texts

Integrating information from multiple documents introduces a complexity to history learning that is absent when one is using only a single narrative. When reading two texts on the same topic, it is not enough to simply construct a single Causal-Temporal Event Structure. At the very least, the reader must construct a representation of each author's text. However, a single representation that incorporated information from both texts would be more beneficial to a true understanding of the events discussed. For a student to form a single coherent representation of the situation, he or she must create an additional level of structure that can resolve any discrepancies between the individual representations. We call this additional structure the *Documents Model*.<sup>11</sup>

#### DOCUMENTS MODEL

A documents model, shown in Figure 22.1, has two components: the *situations model* and the *intertext predicates*. The situations model is similar to the Causal-Temporal Event Structure in that nodes are linked to express the relationships between events. The difference is that the situations model is a model of both the overlapping and the unique information from all texts read about the topic (i.e., all described situations). We consider this situations model to be mostly a cumulative and integrative representation of the situation described by all the texts read on this topic, within certain constraints. For instance, in the cumulative situations model in Figure 22.1, the boxes represent the events (e.g., *U.S. military arrives*), and the solid arrows represent the relations between events. Some events were mentioned by only one author: *U.S. recognizes Panama* was mentioned only by LaCosta and *Panama gains independence* was mentioned only by Clark. Other events were mentioned by both authors: *U.S. military arrives* was mentioned by both Clark and LaCosta.

The situations model is elaborated with an intertext model to indicate

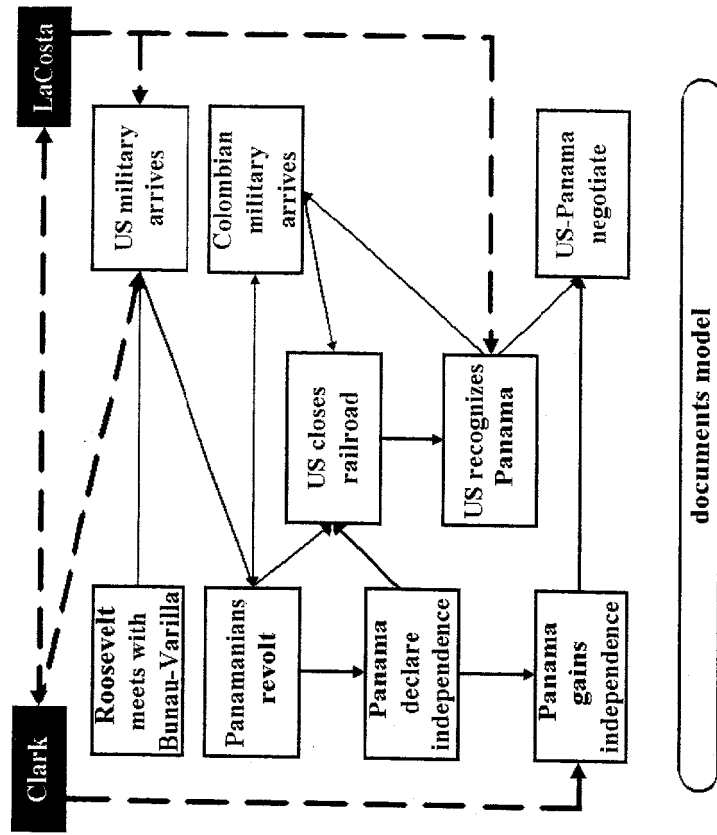


Figure 22.1. Documents' Model representing a segment of Text from two authors (Clark and LaCosta). Representation of situation (boxes and solid arrows) and Intertext links (dotted lines) to a Document Node (shaded rectangle).

that selective events are marked for their source origin. The intertext model allows connections to be made between sources and from a source to its content. These relations (see the dotted lines on Figure 22.1) are referred to as *intertext predicates* and represent links from documents to other elements. In this model, we also include representations of entire documents (see the shaded rectangles on Figure 22.1), referred to as *document nodes* (e.g., LaCosta).

The intertext predicates enable document-to-content links that indicate which author mentioned a particular fact. For example, in Figure 22.1 two intertext links from LaCosta's document node show that he mentioned two events: *U.S. recognizes Panama* and *U.S. military arrives*. The intertext predicates also enable links between documents to indicate the relationship between different authors' documents. For example, in Figure 22.1 there is a

link between the document node for LaCosta and the node for Clark. Document-to-document links are generally used to indicate whether an author's text supports or opposes the other author's texts.

Document nodes can be more or less elaborated, depending on the reader's expertise and the reader's goals in reading the document. A fully elaborated document node includes information about the document's source (e.g., who the author is), the document's content (e.g., the main point of the document), and the author's rhetorical goals in writing the document (e.g., author's intentions).

A Documents Model enables the reader to represent multiple authors' versions of the same events. As is common in historical interpretation, authors often disagree over the causal significance of a particular series of events. For example, one author may suggest that Event Y occurred because of Event X, whereas another author may discount the relevance of Event X, arguing instead that Event Z had a greater causal impact. Representing the source of an event or causal relation by an intertext predicate enables the reader to qualify aspects of the situations model, thereby allowing otherwise discrepant information to be incorporated into a single coherent representation.

#### LIMITS ON DOCUMENTS MODEL CONSTRUCTION

There is some evidence that the ability to construct a Documents Model may be beyond the ability of many high school students. Wineburg found large differences between expert historians and high school students in the use of the Corroboration Heuristic, that is, the tendency to make direct comparisons of information learned from several documents.<sup>12</sup> This heuristic enables a reader to check a historian's interpretation of a cited primary document or compare arguments on opposing sides of a controversy and can be represented by an intertext predicate such as *agrees/disagrees* with or supports. Although Wineburg found that experts used this skill often, his Advanced Placement (AP) high school students rarely used it. While it is still an open empirical question whether secondary students are able to form intertext links during reading (e.g., noting corroboration among sources), there are reasons that we would expect this skill to be less developed in high school students than in college students or experts. First, high school students have little experience reading multiple texts on a shared topic. Second, high-school students have less experience using documents as evidence in written arguments. Third, high school students have limited experience evaluating sources when they are reading argumentative

essays. College students, on the other hand, clearly do form links from events to sources and can use these links when writing an essay to present one author's version of the events.<sup>13</sup>

Students are similarly limited in their ability to construct elaborated document nodes (i.e., representations of source information). Indeed, in order for a student to represent the source of a document in some detail, they must know about sources in general and historical sources in particular. Wineburg found that, when studying a document, expert historians use a Sourcing Heuristic wherein they examine the source of a document before working through the content of that document. The AP high school students he studied, however, did not show this behavior, and college students appeared to represent only some of the important characteristics of documents and their sources.<sup>14</sup> In a recent study, Rouet, Britt, Mason, and Perfetti asked students to read a variety of documents to come to an informed opinion regarding four controversies.<sup>15</sup> After finishing their reading, students were asked to rank the documents in terms of their trustworthiness and usefulness and to provide a short justification for each ranking. Classification of the 672 justifications showed that students attended to more than the content of the document. They frequently mentioned features of the author (e.g., author's credentials, motivations or participation in the events) and features of the document type (e.g., when it was written) and made comparisons among the documents (e.g., authors agreed or disagreed). This is just the type of information that students would need to encode in order to create an elaborated document node during studying.

Presenting students with problems can improve their document use and evaluation skills. In several studies with high school and college students, we found that, when students are presented with controversies to address in essays, both their sense of document privilege and their use of documents in providing arguments improve.<sup>16</sup> For example, we asked several groups of students (history graduate students, psychology graduate students, college students, AP high school students, and regular high school students) to read excerpts from primary documents, historian accounts, and a textbook to learn about an historical controversy.<sup>17</sup> The graduate, college, and AP high school students all recognized the importance of primary documents and mentioned both source and content when judging a document's source. They were all able (to varying degrees) to reason about sources in a semisophisticated way under optimal circumstances. This was not true of the regular high school students.

Although they were able to judge primary documents as most trustworthy and frequently used document content to justify their ranking, the regular high school students judged the textbook as most useful and rarely used the source of the document to justify their ranking. Thus, unlike the other four groups, regular high school students were limited in their ability to reason about sources even under optimal circumstances.

The potential for enhanced document use is seen in a large-scale study by Spoehr, who found that high school students in a hypermedia intervention program showed higher history performance than comparison students, including better use of evidence in essay arguments.<sup>18</sup> Thus, although students show limited document awareness, they also show a potential for better use of documents and better learning outcomes with procedures that promote and support document use.

### Representing Nonnarrative Information

The special demands of learning from texts in history are not limited to issues of multiple document representations. Reading beyond the textbook exposes the student to unfamiliar genres and text structures that stretch the student's narrative approach to texts. One text type of specific importance is the historian's essay, which presents an argued interpretation. For students to fully understand and evaluate such essays, they must form an Argument Model for each author's argument, a mental representation of the interrelations of claims, support, evidence, and sources.<sup>19</sup> However, even among college students the ability to detect and understand arguments is incomplete. Britt, Marron, and Perfetti found that half of the students had difficulty spontaneously detecting an argument, and one-quarter failed to detect or represent arguments.<sup>20</sup>

The need for providing students with training and practice in document-based learning in history thus raises the general issue of how to support students' reasoning with and about multiple documents. In the next section, we describe the principles guiding the design of the Sourcer's Apprentice (SA). In following these principles, derived from cognitive theories of learning, the SA environment (a) has students learn by solving problems with richly integrated sets of documents, (b) supports construction of expert representations such as documents and argument models, (c) creates an interface by decomposing the task into necessary elements, (d) supports transfer by using a real world environment and providing several problems

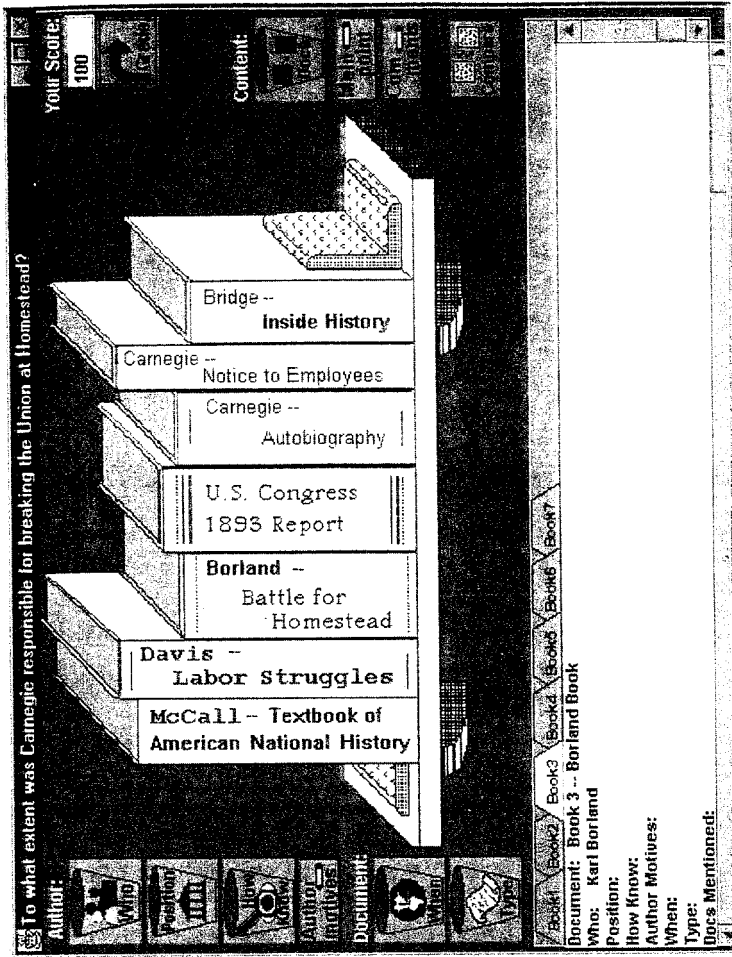


Figure 22.2. Example Bookshelf displayed by the Sourcer's Apprentice. Notes are displayed for Book 3. Note the problem statement at the top of the screen.

of very different types, (d) provides students with explicit and interactive instruction on the relevant skills, (e) motivates student engagement through challenges and immediate feedback. After a discussion of the design principles, we describe SA from a user perspective. We conclude with a report on an effectiveness study that shows that the Sourcer's Apprentice can raise some components of students' document literacy.

### Principles for the Design of a Document-Based Learning Environment

We believe that students who do not spontaneously display the requisite skills and orientations toward texts can, given a supportive environment, begin to develop them. The Sourcer's Apprentice was designed to provide

high school history students with opportunities to practice the kind of document-based reasoning exhibited by expert historians.<sup>21</sup> With the Sourcer's Apprentice, students view a computer screen that displays a bookshelf of excerpts from several documents of various types (see Figure 22.2). Their task is to learn about an historical controversy by reading these excerpts. They are given explicit instruction in attending to features of the source and elements of the author's argument. Also present on the screen are structured note cards that provide further support for the students' efforts to attend to sources and arguments. To motivate engagement, students are given points for filling in these note cards. After reading and filling in the note cards, students are asked several comprehension questions. Finally, they write an opinion essay on the controversy in which they support their claims by citing documents. The note cards, but not the excerpts, are available during the writing process.

Our goal was to create a simple coached-apprenticeship system that would provide students with the support they need to interact with documents in a more authentic way.<sup>22</sup> Although such systems typically are technically complex, the Sourcer's Apprentice is an example of how a coached-apprenticeship system can be implemented in a very simple way. We have incorporated the following six general cognitive principles in designing the Sourcer's Apprentice.

#### Principle 1: Learn by Solving Problems

Providing problems for the learner to solve has proven to be an effective means for teaching procedures in math and physics.<sup>23</sup> Several theories of learning have advocated using problem solving as a way to acquire a cognitive skill or concept. The Cognitive Apprenticeship approach proposes that problem-solving activity be situated in as authentic a context as possible, thereby ensuring a sense of "real world" application for the to-be-learned skills and concepts.<sup>24</sup> Instructional techniques such as modeling, coaching, and fading are then employed to support students' learning in a complex environment.<sup>25</sup> Working in an authentic, problem-solving environment supported by coaching and structured practice should enable students to acquire flexible procedures and concepts, thus allowing them to apply the knowledge when the need arises.

The Sourcer's Apprentice attempts to incorporate several elements of Cognitive Apprenticeship instructional methods. First, it requires an authentic, problem-solving activity central to historical literacy: a simplified

version of the history research paper. When writing a research paper, students are asked to read books, take notes, extract relevant information, and synthesize this information into a coherent essay. Problem-solving activity of this sort, however, requires a very active role for the student, who must apply new procedures and concepts during the learning process. The cost for such active learning is a high cognitive load and possibly also learning impasses. To counter excessive cognitive demands, support must be provided during initial learning states. In designing the Sourcer's Apprentice, we provided structured note cards for each document and buckets for dragging and dropping text from the documents into these note cards. Separate buckets for each source feature provide an important memory aid to free up resources during the early phases of learning.

The apprenticeship approach also allows students to have several experiences with deep learning in the subject matter. The cost of depth, of course, is that it requires time to study a specific problem or topic. Whether "depth" or "coverage" is to be emphasized in a high school history course is a difficult question for which there is no cost-free answer. However, even with standard full coverage as a goal, we suggest that some deeper learning, requiring real time, leads to intrinsically rewarding student achievement that cannot be duplicated with more shallow teaching events.

#### Principle 2: Support Expert Representations

One characteristic difference between expert and novice problem solving is the form of the representation experts and novices develop.<sup>26</sup> Differences in the type of problem representation correspond to different success rates in problem solving. An expert's knowledge is more highly organized and interconnected than a novice's.

The specialized representations required to learn from multiple texts—a Documents Model (i.e., document nodes and intertext predicates) and an Argument Model—need to be supported by various intermediate representations created by learning activities. Note taking, a critical part of historical research, is an explicit intermediate representation that supports acquisition of these models. Specific attention to relevant aspects of the source and document (see earlier discussion of the sourcing heuristic) is another learning strategy that promotes formation of Documents Models and Argument Models. We have noted that many students do not apply this strategy spontaneously. The Sourcer's Apprentice supports the acquisition of this sourcing strategy by providing special buckets for each source and

document feature (e.g., who wrote the document, when it was written). In effect, it combines note taking and sourcing into a single activity in which students enter information on their note cards by dropping information into the bucket for that feature. Likewise, buckets are provided for each important element of an argument, highlighting information necessary for constructing an Argument Model. A series of comprehension questions provide additional support for these representations. The Sourcer's Apprentice includes questions to direct the student's attention toward constructing an elaborated Causal-Temporal Event Structure (e.g., "What demands did the Homestead labor union make in 1892?"), a Documents Model ("Which author mentioned Carnegie's Autobiography?"), and an Argument Model for each historian's account (e.g., "What reason did Professor Wilson offer for believing that Carnegie intended to break the Union?"). Working through several questions of each type helps students build all three types of representations.

#### Principle 3: Decompose the Task

Task analysis is a bedrock of the cognitive approach to determining what should be taught and how that learning should best be accomplished. Complex intellectual skills can be more easily grasped if one first decomposes them into their elements and then develops an understanding of how these elements function together.<sup>27</sup>

In designing the Sourcer's Apprentice, we began by decomposing Wineburg's expert heuristics as well as those skills identified as necessary to comprehend an historical argument.<sup>28</sup> Then we incorporated these components directly into the Sourcer's Apprentice interface (e.g., buckets and structured note cards). For instance, to support the application of Wineburg's corroboration heuristic, the Sourcer's Apprentice allows side-by-side comparison in which a student can open two documents on the screen simultaneously. Comparison of information across documents can be vertical, as when the student checks an historian's interpretation of a cited primary document, or horizontal, as when the student compares arguments on opposing sides of a controversy. Thus, vertical comparisons are made across different levels in the hierarchically structured document set, whereas horizontal comparisons are made at the same level. In order to help the students make clear, meaningful comparisons, we allow the side-by-side comparison of only two documents at a time.

Decomposition at the level of the interface shows students the impor-

tance of each component and allows them to focus on each during learning. Additionally, because learning from problem solving requires high cognitive load, separate buckets for each source feature provides an important memory aid during the early phases of learning.

While we are suggesting a decomposition of the skill, this is only a first step in trying to help students learn to attend to the appropriate information. Eventually, once the skill of identifying elements is automatized, students must be taught how to look at the source as whole. Without teaching them what to pay attention to, we have no chance of helping them evaluate the source as a whole. But, it is critical that we not stop there. Thus, during the tutorial section on source evaluation, the student learns about the importance of looking at a source feature in context of the other features.

#### Principle 4: Support Transfer

Creating transfer is critical to the production of flexible knowledge that can be applied in various "real world" situations. In some respects, only routine, highly structured procedures can be learned without the expectation of transfer, and we believe this type of learning to be the exception rather than the rule. Transfer, while hard to accomplish, can be shown to occur under certain circumstances. For instance, Singly and Anderson found that transfer is dependent on how closely the practice environment and the target environment map onto each other.<sup>29</sup> Druckman and Bjork suggest that providing variability in problem type during practice will increase transfer.<sup>30</sup>

One aspect of the interface that supports transfer is the direct mapping of surface features with the objects in the real world. Students select books from a bookshelf and take notes on a screen section that resembles note cards. These are independent, and the note cards are available whether the student is studying, answering questions, or writing the essay. We expect these activities to enhance transfer to a real library setting, since graphically and functionally they so closely resemble the actual objects and actions in the library setting.

We designed the Sourcer's Apprentice with the assumption that performing multiple varied practice exercises that provide exposure to a wide range of examples allows students to abstract the essence of the heuristic or concept without absorbing context-specific but irrelevant information. In learning and reasoning from historical documents, skills, heuristics, and concepts must be flexible and transferable to many

different settings; they must be abstracted principles. We believe that this flexibility can be promoted by having students solve several very different problems including controversies from military, social, and economic history. This ensures that the type of documents also will vary. For example, treaties and military correspondence are common primary documents for military history, whereas speeches and letters may be more common in social history. By reasoning from documents of different problem types, students can begin to understand the privilege of primary documents and how they function in historians' arguments. This will become abstracted in their minds, and thereby transferable, only after they have had many exposures to different problem types.

#### Principle 5: Provide Explicit Instruction

Direct instruction is a standard method for providing declarative knowledge quickly. Instructor-controlled verbal explanation and description can ensure that important requisite knowledge is available to the student at exactly the necessary moment. Guided instruction that provides opportunities for students to practice applying the material can allow students to test their knowledge before proceeding.

Document literacy skills such as sourcing, corroboration, and argument comprehension can be explicitly taught to students in the form of a short, incremental tutorial. Instruction for each skill involves three incremental levels: identifying, using, and evaluating the component information. For example, a tutorial intended to teach a student enough about attending to source information during reading should help the student to identify source and document features (e.g., who, why, when, and type). Then, the tutorial can help the student understand how this source information is used in problem solving (e.g., citing information in an essay). Finally, the student can be taught how to evaluate this source information (e.g., judging the trustworthiness of a source). All direct instruction is presented in the context of the controversy and is available to students later during problem solving.

#### Principle 6: Motivate Engagement

Motivating students to spend more time on a task, to work harder, and to value their learning process is an important goal that, when achieved, results in performance gains. Malone and Lepper have identified twelve fac-

tors that affect an individual's motivation.<sup>31</sup> We discuss four of the most important factors: challenging goals with uncertain outcomes, performance feedback, (limited) student choice, and fantasy supporting learning.

Challenging goals have been found to improve performance on both simple and complex cognitive tasks.<sup>32</sup> Meaningful success is a by-product of both setting and meeting challenging goals. Such goals, however, must be balanced with assurances that success is in fact possible. Otherwise, there is a risk of diminishing a student's self-esteem and motivation.

A balance between risk and assured success can be partially achieved through the provision of encouraging, informative feedback. Immediate feedback that provides corrective information can be beneficial for learning.<sup>33</sup> It prevents learners from wasting time unproductively on erroneous solutions and can be used to ensure success for all skill and knowledge levels. Furthermore, immediate feedback assures students that they are "on the right path," allowing them to proceed more confidently down that path. The timing of feedback can also be critical; it is not beneficial to provide immediate feedback that interferes with progress through the environment. On the other hand, one of the benefits of computers is that they can provide immediate feedback, which is impossible for a teacher who is working with twenty-five students all of whom work at different paces. Thus, we can take advantage of the feedback capabilities of a computer while not impeding learning.

Student control over choice can also be easily supported by computer environments. There are two ways to allow students to have some control while not interfering with learning. First, we can allow students to proceed at a user-determined pace, pushing ahead or working more slowly depending on their needs. Losing one's place and becoming bored are less likely with self-pacing than when each student is held to some average pace. Second, we can allow students to determine their document selection order. This enables students to follow their own interests and to set their own immediate subgoals.

The final factor shown to affect motivation is the use of fantasy supporting learning. While much of the first generation of educational software tried to capitalize on this motivating factor, we believe that it failed to target the critical component—the to-be-learned target skills or concepts—as part of the fantasy. The bells and whistles either interfered with or were irrelevant to learning in many of these programs. Rather than depend on incidental learning, the software designer should ensure that any fantasy used to make the task more fun and engaging reinforces target skills or concepts.



Game environments are motivating for students and can be effective, provided that the game conditions map onto specific learning goals.

When designing the Sourcer's Apprentice, we incorporated all four motivating factors. In an effort to help students learn to read and reason from a variety of documents, we created an environment that closely matched the surface structure of the target behavior in the "real world." The environment supports selecting books from a shelf, taking notes, answering questions, and writing an essay with the documents and notes available. Thus, we minimized fantasy at the global level, believing this should increase transfer to other situations, such as going to a library and writing a research paper. Instead, the motivating game component centers on the local level of helping students focus on important elements in the readings and include them in their notes. The fantasy is that the students are detectives trying to find important information for later use. This fantasy provides motivation at the level of performing necessary subgoal satisfaction. A critical feature of our motivational component is that the payoff is contingent on the student's building and using a model of the discourse. Students cannot succeed at this game unless they read and comprehend the situation described in the texts as well as the source information.

In the SA environment, when students drag and drop an answer into a bucket, they receive immediate feedback. Incorrect answers result in incremental hints, with the ultimate hint ensuring that every student can complete all parts of the task correctly. Because the point system results in points lost for answering incorrectly, the students are highly motivated to respond without relying on the hints that follow an incorrect response. While it may seem worrisome to give points to students in history, implying that there are simple and correct answers, we limit points to those situations where there is a correct answer. For instance, the author's name either is or is not Andrew Carnegie. Other source features that are more interpretive rather than factual, such as the author's motives, are not scored by dragging-and-dropping responses.

We opted to give students a large degree of freedom in how they work through the controversy. They are free to go at their own pace, select documents in any order, reread any documents, and fill in the notes in any order. They also decide when they have learned enough to write their essay, knowing that their note cards will be available but not the books themselves.

Now we turn to a detailed description of the environment and materials used in the Sourcer's Apprentice, followed by presentation of results from a study of the effectiveness of the Sourcer's Apprentice in two classes.

### Sourcer's Apprentice Environment

Sourcer's Apprentice is a Java application that promotes evidence seeking and evidence evaluation in students while developing an awareness of document type and document privilege in historical research. While we intend to extend the environment to the skills of content integration and argument comprehension, the present version focuses on the skill of sourcing. The SA has three components: *content modules*, *study environment*, and *skills tutorial*.

#### Content Modules

On the basis of our previous research, we created content modules that center on a historical controversy and include hierarchically structured sets of excerpts from real documents. We define controversies as historical events for which historians offer conflicting interpretations. The controversy for the Homestead steel strike module is: "To what extent was Carnegie responsible for breaking the Union at Homestead?" Students are given the controversy and excerpts from seven documents. They are told to read the books and take notes so that they can write an essay on this controversy using only their notes.

A document set comprises several relevant documents that address the controversy and have certain highly constrained features. The first document is a textbook excerpt that provides an overview of the situation, characters, and conflict. The next two documents are historians' interpretations of the events. These documents provide opposing accounts of the events and use primary documents to support their arguments. Finally, there are four primary documents that can be used as evidence to support one of the two accounts. Two of these primary documents were specifically mentioned in the historian's accounts, so the student has a model for citing and using primary documents as evidence. The student then has to relate the other two primary documents to the problem statement by themselves.

We have created five modules, each centered on a controversy. These include:

1. Lexington-Concord controversy: "To what extent were the British responsible for the events of April 19, 1775?"
2. Panama Canal controversy: "To what extent were Roosevelt and his administration responsible for the 1903 revolution in Panama?"

3. Salem witch trial controversy: "What was the primary cause of the Salem witch trials?"
4. Homestead steel strike controversy: "To what extent was Carnegie responsible for breaking the Union at Homestead?"
5. Vietnam War controversy: "What was the Gulf of Tonkin resolution, and why did Lyndon B. Johnson push Congress to pass it in August 1964?"

These modules have been used and evaluated in a classroom setting. The first two modules (Lexington-Concord and Panama Canal) are presently used as the transfer pretest and posttest. The Salem witch trial module is used as a tutorial to directly teach students to develop skills for learning from historical documents.

#### Study Environment

The Sourcer's Apprentice main environment screen is shown in Figure 22.2. The controversy statement is always present in the top of the portion of the screen. Prominently displayed in the center of the screen is a "bookshelf" containing seven books, starting on the left with a textbook, followed by two historians' accounts, and ending with four primary documents. At the bottom of the screen, and available at all times, are "note cards" for each document. These note cards are structured to aid in appropriate note taking during the study period. Along the sides of the screen are buckets for each important source feature. These are separated into features of the author (i.e., WHO: who wrote it, POSITION: what the author's position is, and HOW KNOW: how did the author know the information he or she was writing about), the document (i.e., WHEN: when it was written, and TYPE: what type of document it is), and content (i.e., what documents does it mention). To insert text into the note cards, a student selects a phrase from the author, document, or content page and drags it into the appropriate bucket. Notice that intermixed in the set of buckets are three rectangular "buttons." One button relates to a feature of the author (i.e., AUTHOR MOTIVE: what the author's motives are) and two relate to the content (i.e., MAIN POINT: what the document's main point is, and COMMENTS: important things mentioned in the document). It is not possible to limit all note card information to phrases that can be selected and dragged, so we have included buttons for inputting student-initiated text. The student must click on these buttons to insert text into the note cards.

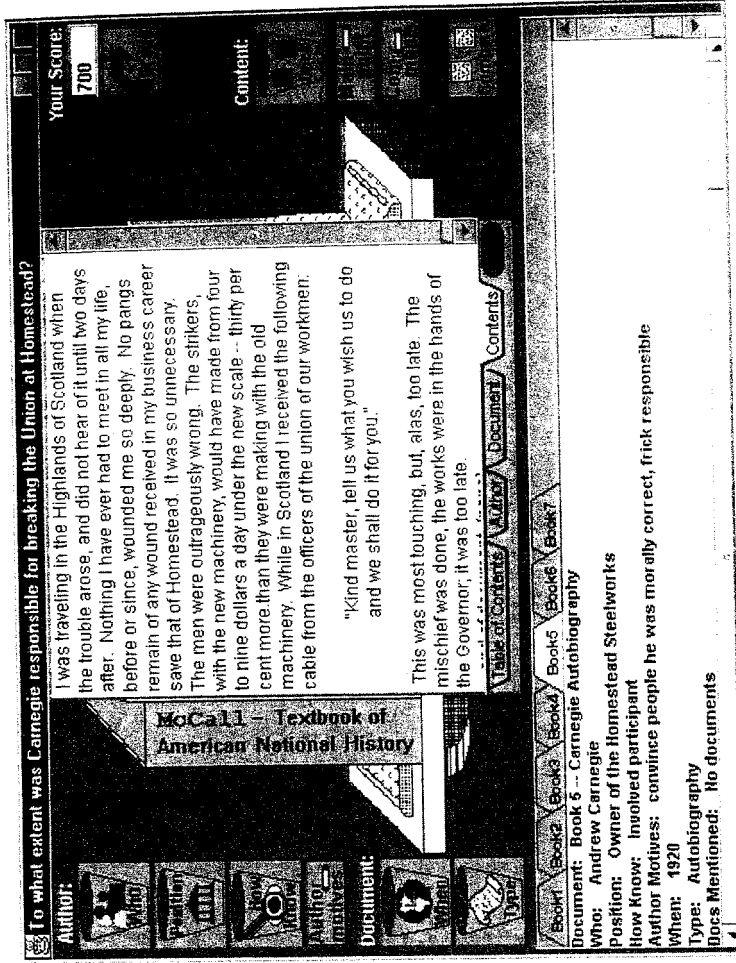


Figure 22.3. Here Carnegie's autobiography is opened to the contents page. Note the four tabs at the bottom of the open book each corresponding to a page in the book.

Students can open a book by clicking it in the bookshelf. An opened book is shown in Figure 22.3. Each book has four pages in the following order: title page, author information page, document information page, and content page. A student can change pages by clicking on the corresponding tab at the bottom of the page. The book in Figure 22.3 is currently opened to the content page. The excerpts are all very short, but if they were longer than the screen length provided, the student could scroll down to view more text. The author page provides detailed source information about the author's credentials and motives. The document page explains the type of document it is, who publishes it, and when it was written. Much of this information is provided on the inside cover of actual books.

Recall that the students' task is to learn about each document's source from the author and document pages and then to read the content page to

learn what this document contributes to the controversy. While they are reading, students fill in the note cards for each book so that information will be available later when they write their essay on the controversy. Figure 22.4 shows how information is inserted into a note card. A phrase is selected from a page in the book by clicking on it. The phrase is then highlighted as shown in Figure 22.4. It can then be dragged into one of the buckets on the side of the screen. In this figure the phrase "is a historian who specializes in labor unions and their effects on business" is being dropped into the "How Know" bucket. If the correct phrase is being dropped into the "How Know" bucket, the previous dropped phrase is inserted into the fourth line of the note card changing to include the phrase: "Scholar in area." The student's score in-

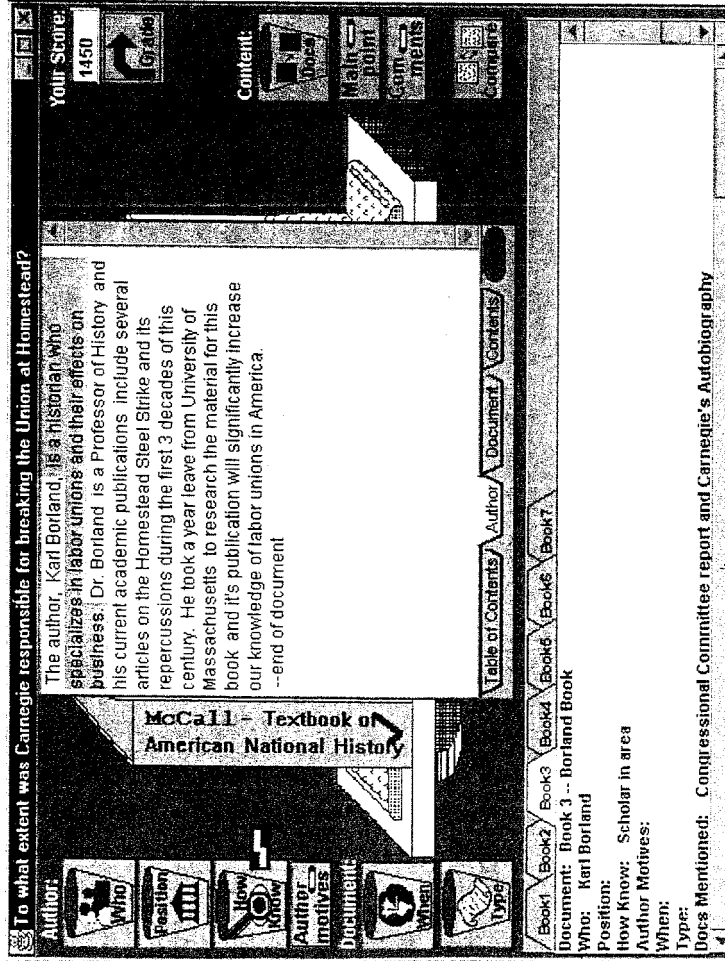


Figure 22.4. Filling in the note cards. To fill in the note cards, students highlight text from the author page and drag it to a bucket (sides of screen). When they drop the phrase into the bucket, an abstracted version is then inserted into the note card, and their score is increased (top right).

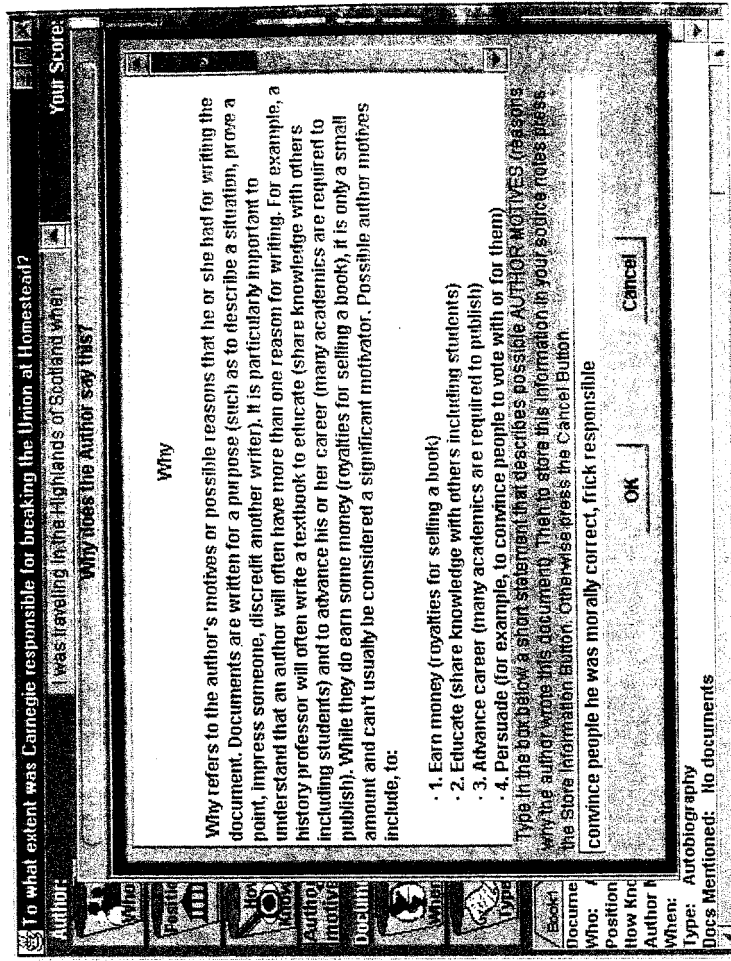


Figure 22.5. Scrollable Help screen for the Author Motives button. Each bucket and button have a help screen associated with them to provide detailed instructions for that source feature. Buttons have an additional field on the help screen for directly typing in text to insert into the note cards.

increases by 100 points and is displayed in the top right corner of the screen. If, however, a student drags an incorrect answer into a bucket, the student loses 50 points and is given graduated hints until he or she selects a correct response.\* The hints vary from vague (e.g., "An historian would probably have an opinion on that point") to very specific (e.g., "Carnegie mentions that information in the last paragraph of his autobiography").

Students can obtain direct instruction on any of the note card features by clicking on the corresponding bucket or button. Figure 22.5 shows the Help screen for the Author Motives button, which appears when a student clicks

\* In version 1.0 no hints were given. In the original version (0.5), hints were given and the students were more satisfied with that aspect of the earlier version. Hints have been re-instituted in the current version.

When students have completed their note cards and integrated all the content into a coherent answer to the controversy, they move on to the questions screen. Students receive several questions of each of the following type: source (e.g., "Which document was written the earliest?" or, "Who thought that Andrew Carnegie deliberately left Pittsburgh to avoid having to take responsibility for the negotiations?"), content (e.g., "What was Frick's first action when the contract was about to end?") and argument (e.g., "What is one reason used to support the claim that Carnegie was responsible for the breaking of the Union?"). These questions are presented in a small window at the bottom of the screen shown in Figure 22.7. To answer a question, the student drags a phrase from one of the books into the

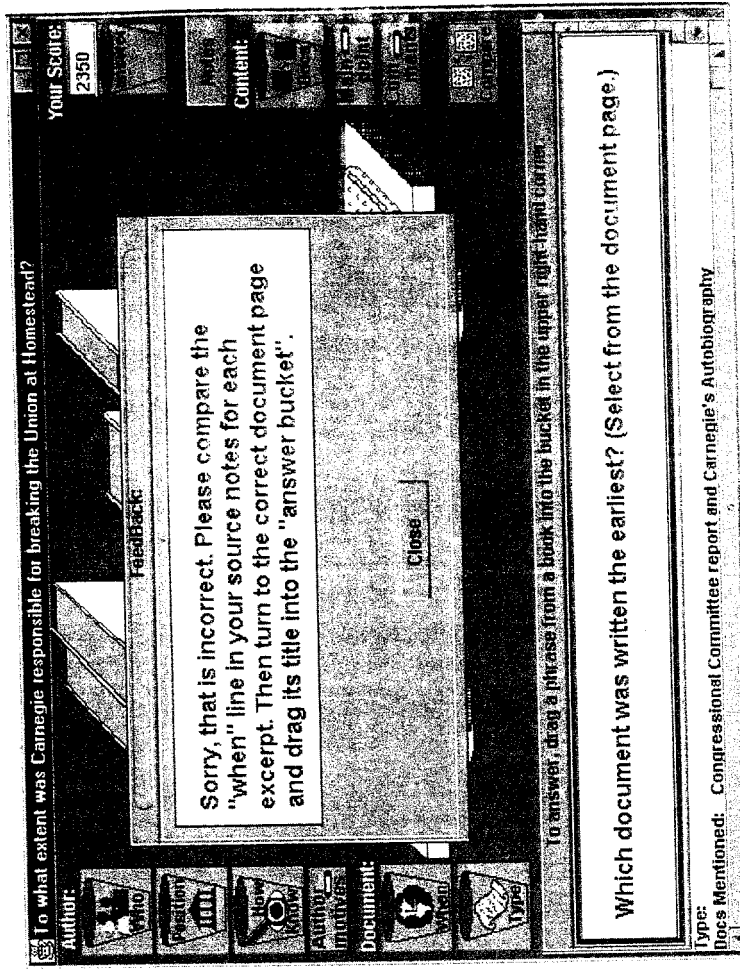


Figure 22.7. Comprehension question environment with feedback. Content, source, and argument questions are presented in a small window (bottom). Students drop answers into a bucket. If the answer is incorrect, a feedback screen appears (center), providing a hint. This feedback screen also appears during the filling of the note cards.

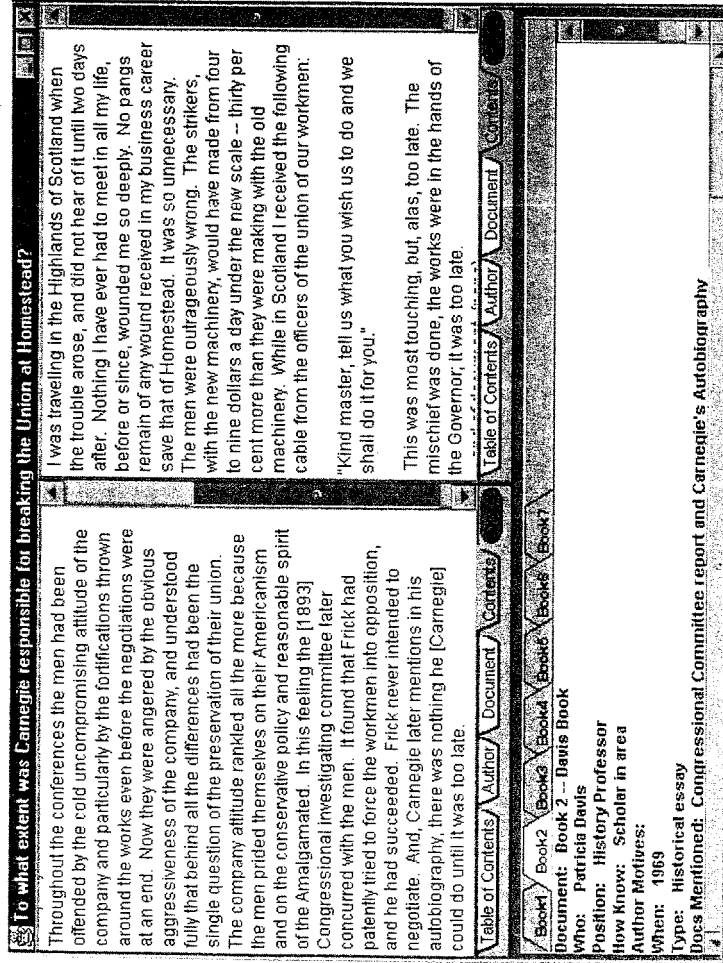


Figure 22.6. Comparing document information. The Sourcer's Apprentice allows side-by-side comparison in which a student can open two documents on the screen simultaneously. The main document, Davis's book, is opened on the left, and the additional document, Carnegie's autobiography, is opened on the right.

the Author Motives button. This scrollable window explains the feature from three perspectives: identifying, using, and evaluating the component information. Help information of this type is available only when a student specifically asks for it, in contrast to hints, which are given when a student makes an error.

The Sourcer's Apprentice allows side-by-side comparison in which a student can open two documents on the screen simultaneously. Students can click the "Compare" button shown in Figure 22.2 to display a second document next to the already opened document. The main document, Davis's book, is on the left in Figure 22.6. The book that is opened on the right is Carnegie's autobiography, which is mentioned in the last sentence of Davis's book. Students can compare Davis's summary of Carnegie's excerpt with Carnegie's actual excerpt.

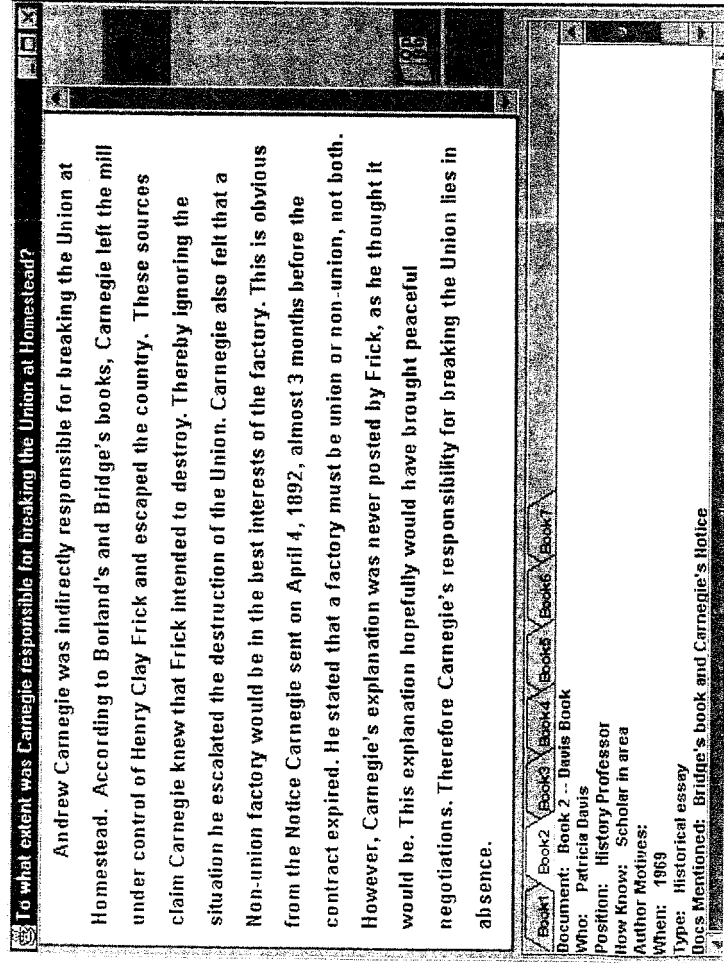


Figure 22.8. Essay environment. When the questions have all been answered, the student receives the final essay environment. The text shown in the essay field is an actual student's answer to this controversy. The note cards are available for review during the writing phase.

answer bucket in the right-hand corner. If the answer is correct, the student receives 300 points. If it is incorrect, the student receives fewer points and gets the next in a series of graduated hints.

When the questions have all been answered, the student receives the final essay environment shown in Figure 22.8. The bookshelf is no longer available. It is replaced by a large screen that includes a field where the student can insert text.\* Note cards are available during this writing phase and the student can flip through these cards using the tabs on the top. The text entered here is an actual essay from an advanced placement student working on the Homestead Module.

\* Students have an option of using a sheet of paper to write their answer if typing is too difficult or frustrating.

## Skills Tutorial

To ensure that students begin their problem solving with the requisite knowledge, the Sourcer's Apprentice begins with a short tutorial on sourcing and understanding arguments. An example screen from the tutorial is shown in Figure 22.9. Students page through the text and occasionally are asked specific questions that they must respond to before continuing. The tutorial provides direct instruction at three incremental levels: identifying, using, and evaluating the component information. Practice follows immediately after each of these three levels. For instance, when teaching the students about sourcing, SA first describes critical features to help the student identify each feature. Then it describes the

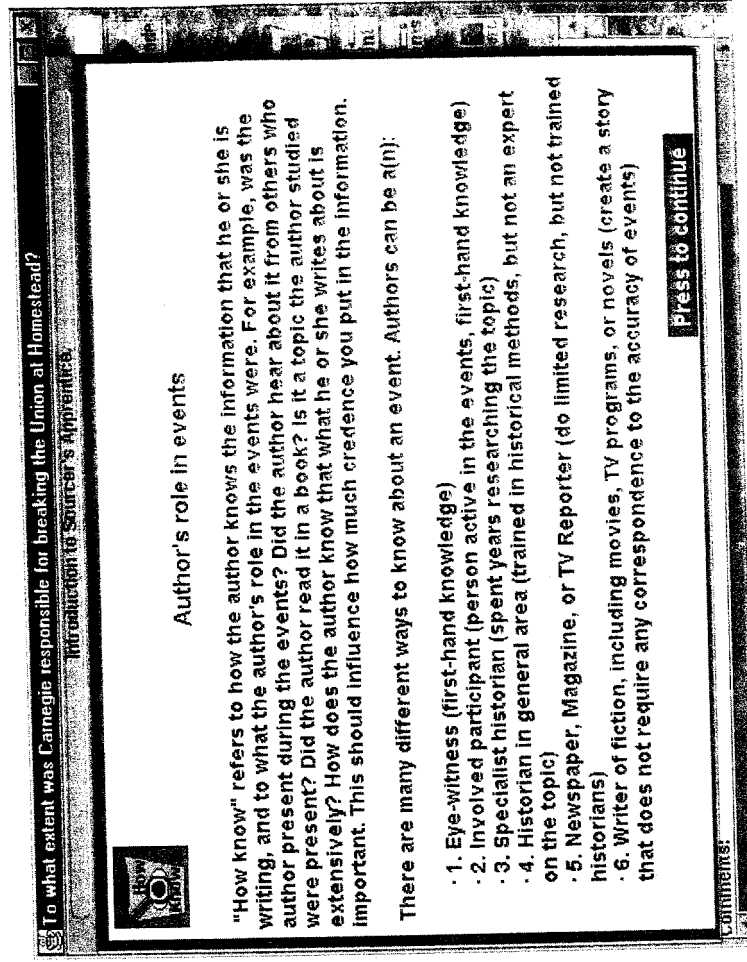


Figure 22.9. Skills Tutorial. Several screens, such as this one explaining the author's role in events, provide direct instruction on the sourcing and understanding arguments. Students page through this short tutorial by pressing a button (bottom right).

conditions under which sourcing would be most useful when writing an essay. Finally, students are taught how to evaluate sources for their trustworthiness. Ideally, the tutorial should be embedded in the context of a separate module, forcing students to transfer what they learn through explicit instruction.

### *Classroom Study*

Recently, we evaluated the Sourcer's Apprentice in two schools. To examine SA's effectiveness, we looked for improved performance on a posttest transfer problem (Panama Canal) compared to pretest performance on another problem (Lexington-Concord). We are currently analyzing the student essays for evidence of SA effectiveness but will not present that data here.

#### *Participants*

In each school, an eleventh-grade history teacher used the Sourcer's Apprentice in one class while another of the teacher's classes served as a control. The teacher from School A (from a small town) had two classes of eleventh-grade regular economics classes, resulting in ten complete participants from the experimental class and nineteen from the control class.<sup>34</sup> The teacher from School B (from a small suburban city) had two classes of regular American history classes, resulting in eight complete participants from the experimental class and seven from the control class.

#### *Procedure*

The general procedure was the same for both schools. On the first day, all students were given a pretest. On the next two to three consecutive days, the experimental students received the SA tutorial on sourcing and a single module. The control students stayed in the classroom engaging in regular classroom activities. On the final day, all students in both conditions received the posttest.

The formats for the pretest and posttest were designed to be equivalent and each took thirty-five minutes to complete. The topic for the pretest was the 1775 battle at Lexington and Concord and the topic for the posttest was the acquisition by the United States of the right to build a

canal in Panama. For both tests, students were given a booklet with six documents that included source information at the bottom of each page. They were told that they could take notes on a one-page sheet and that they could use these notes later when answering questions about the documents. When they were finished studying, students received several questions, including source questions (e.g., which document was written earliest, which document was the least trustworthy), a short-answer controversy question (i.e., "To what extent were the British responsible for the events of April 19, 1775?," "To what extent were Roosevelt and his administration responsible for these events?"), and a short-answer situation question (i.e., "What happened on the Lexington Green on April 19, 1775?," "What happened in 1903 to enable the United States to get a canal in Panama?").

The experimental classes from both schools received training and abbreviated tutorial instruction on a single module. School A received the Home-steel strike module and School B received the Vietnam module. Students were first provided training on the use of the environment and training in sourcing. Students in school A were given the tutorial in groups of five each due to computer malfunctions, whereas students in School B received this instruction individually. Following training, students were given minimal background information on their module. For both schools, this preparation was completed in a single period (forty minutes).

Students from school A worked with their module for the next two forty-minute periods over two days. They read the seven documents and filled in the note cards for each document. Then, they answered several content and source questions using the drag-and-drop procedure (Figure 22.7). Finally, they were given their note cards and asked to write an essay on the controversy for homework.

In school B, students began working on their Vietnam module immediately after tutorial instruction. For most students, this amounted to about twenty minutes of work on the module. They had thirty minutes the next day to complete the module. They read the seven documents, filled in the note cards, and answered several questions. Because this is the first group of students to use the Vietnam module, we needed to get student's open-ended responses to the content and source questions. For this reason, students answered these questions on paper rather than using the drag-and-drop procedure.

Finally, on the last day, all students were given the posttest in their regular classroom. Students were not explicitly told that this posttest was

related to the computer activity on the previous couple days. Thus, any evidence of transfer is due to students' determination that the skills taught and practiced using SA should be used on the task, and not the result of hinting.

### Results

Only the post- minus pretransfer test results are considered here. Scores for these tests were computed by counting the number of source features mentioned in the student's notes for each document and adding this to the number of source questions answered correctly. For both schools, the pretest performance did not differ between groups. Of a possible 70 points, the means for the experimental and control groups at School A were 13.2 and 15.6. The means for the two groups at School B were 13.3 and 16.6. The experimental group improved significantly more than the control at both schools. The mean difference score between pretest and posttest scores was positive for experimental groups (School A mean = 2.9; School B mean = 10.3) and negative for the control groups (School A mean = -2.7; School B mean = -3.4). As the negative control group results suggest, students had more difficulty with the Panama Canal test than with the Lexington-Concord test.

### Conclusion

This study provides preliminary evidence that the Sourcer's Apprentice is an effective tool for teaching regular eleventh-grade history students document-based literacy skills. Even with exposure to an abbreviated form of the program, use of the Sourcer's Apprentice resulted in significantly better performance on a transfer task. We expect that providing a more intense intervention would be even more beneficial for students.

### Discussion

Our study of SA's effectiveness is encouraging but limited. On the one hand, given the brevity of the tutoring (twenty minutes), it is very encouraging to find evidence that students responded to the instruction by making increased use of documents when they took notes. On the other hand, effectiveness should ultimately be measured in a more naturalistic

setting. Our next step in evaluating SA effectiveness is to give students the opportunity to demonstrate their increased document literacy on a literary research paper. We hypothesize that after exposures to the various tutorials, including practice in the environment, students will write papers with more document citations, clearer use of claims and evidence, and more references to primary documents.

In addition to effectiveness, it is important to inquire about SA's usability. Do students find it interesting to use? Too difficult? In a recent classroom study using the SA environment, we had six college students from the University of Pittsburgh and eight high school students (a different class from School B) use SA and then complete a survey, giving their opinions of its usability. More specifically, they rated on a scale from 0 (negative) to 9 (positive) how they felt about different aspects of SA. Students found SA to be easy to use (medians 8.0 and 9.0) and educationally valuable (medians 8.5 and 8.0). Furthermore, they thought the tutorial was useful (medians 7.5 and 7.0), but high school students were less interested in our choice of topic selected—the Homestead steel strike (medians 7.5 and 6.0). These survey results suggested that students find the environment helpful and easy to use. The real questions, however, concern what the students learn about how to approach history texts and questions about history. There remains much to learn about these questions.

These effectiveness and usability results pertain only to SA's sourcing tutorial and practice environment. Our next step in developing the Sourcer's Apprentice is to create tutorials for two additional document literacy skills: content integration and argument comprehension. This will entail creating a component in which students learn to identify important elements of each skill and practice these skills in terms of SA interface. Content integration, for example, is critical to learning from multiple documents, but it is not the type of skill with which high school students have a great deal of practice. In a recent study of eleventh graders, we found that students asked to read a historical narrative from a single integrated text learned better than students who read the same material from two texts.<sup>35</sup> In the two-text condition, the students were required to integrate the events themselves. Students who read two texts with only comprehension instructions made more errors, recalled less information, and provided less integrated answers to questions. More encouraging, however, were the results from students in the two-text condition who were explicitly instructed on how to integrate the material. They performed as well as students given the single integrated

text. This strongly suggests that students will not create an integrated representation of information across texts unless given assistance and instructed to. This is precisely the type of instruction and practice that SA can provide.

Our extension of the Sourcer's Apprentice to teach students to integrate information across documents will certainly be illuminated by other works from this volume. For instance, Lee and his colleagues researched young children's developing awareness of causation in history. They analyzed seven-, eleven-, and fourteen-year-old students' responses to probes about causes and explanation in history. They found that younger students tended to produce single, shallow interpretations of causes, whereas older students tended to produce multiple, complex interpretations.<sup>36</sup> Clearly, limits on students' understanding of important concepts in historical analysis will impact their ability to learn to integrate information across documents. Developmental limits on the ability of students to understand the multiple causation in history will inevitably limit their ability to construct an integrative representation of events based on material from multiple texts. The task, however, may be influential in this integration process. Voss and Wiley, in the study reported in this volume, found that providing students with multiple documents in an argumentative writing task influenced the degree to which they transformed the information, especially if the students understood the task to be requiring integration.

Ultimately, we think that the Sourcer's Apprentice could be used in history class as a "history lab." Throughout the year, students would visit the lab to learn and practice document literacy skills. Each session could include a fifteen-minute interactive tutorial on skill (e.g., sourcing, content integration, argument comprehension). Then, students would be given approximately one hour of practice on the skill in the context of learning in depth about a historical event that corresponds to the period of history they are presently studying in class. This ensures that instruction time, a valuable commodity, is maximally used. To learn and practice each skill for the first time should only take one and a half hours, spent primarily on learning content. When a skill has been practiced once, the student would move on to the next skill. After working through all three skills, students could visit the lab to practice all three skills with the same module. This is important because it is unclear how many exposures are necessary, but we suspect two or three will be more beneficial than one. Thus, for only five blocks out of a school year, students could learn in

depth about five modules and get multiple exposures to three document literacy skills.

A final note about the focus of the Sourcer's Apprentice on multiple short excerpts: We have opted to provide students with very short excerpts so that they can practice literacy skills on a variety of documents of differing types and within the constraints of a high school class setting (thirty- to fifty-minute periods). Additionally, it is a common practice for historians to include embedded excerpts of this length in their books and essays. We acknowledge that selecting text can have a significant impact on the meaning on the text. Furthermore, there is no reason that the Sourcer's Apprentice must be confined to short texts. Nor are we suggesting that a detailed analysis of a single text such as the Declaration of Independence would not be valuable in the classroom. We are merely providing an environment to enhance single-text analysis in the high school history classroom.

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