Implementation and Evaluation of a Student-Centered Learning Unit: A Case Study

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The purpose of this case study was to explore the issues involved in implementing a technology-enhanced student-centered unit in order to provide recommendations to improve and enhance these types of learning activities. Specifically, the study examined problems students encountered in completing the unit activities, problems the teacher encountered in facilitating the delivery of the unit to her students, and strategies to improve and enhance these types of learning activities. One teacher and the 21 students in her intact United States history class participated in the study. The central unit problem required students to determine the strategies that should be pursued in 1968 to continue the struggle for a more just, equal United States society. Students worked in teams to gather data from an electronic database of primary- and secondary-source materials, and use the data to develop solutions to the unit problem. Results of this study suggest that a variety of factors impact the success or failure of student-centered activities, including student orientation to the unit problem, student collaboration, teacher management strategies, and student accountability mechanisms. These results also provide insight into how the design of these types of activities can be improved. Perhaps the most important considerations that need additional attention are the additional aids required by teachers as they struggle to implement these types of activities in their classrooms.

☐ Student-centered learning environments are designed to provide students with opportunities to take a more active role in their learning by shifting the responsibilities of organizing, analyzing, and synthesizing content from the teacher to the learner (Means, 1994). These environments allow students to examine complex problems using a wide variety of resources, develop their own strategies for addressing these problems, and present and negotiate solutions to these problems in a collaborative manner (Hannafin, Hill, & Land, 1997).

Although there is growing evidence that student-centered learning activities promote the development of higher-order skills such as critical thinking and problem solving (e.g., Alper, Fendel, Fraser, & Resek, 1996; Barab & Landa, 1997; Gallagher & Stepien, 1996; Savery & Duffy, 1995), there are difficulties associated with supporting student-centered learning. The content and activities used to promote student-centered learning often do not provide enough structure to adequately guide students toward successful completion of classroom activities, thus increasing student disorientation and frustration (Brush, 1998; Hannafin, Land, & Oliver, 1998). Furthermore, in order for students to actively participate in their own learning they must possess self-monitoring and other metacognitive skills that are not necessarily inherent in every individual (Hannafin, Hill, & Land, 1997; Palincsar & Brown, 1984).

The development and implementation of a student-centered environment within a classroom context requires different roles and responsibilities for teachers. Often teachers find themselves ill-equipped to deal with the requirements for managing student-centered activities,

and thus have difficulties implementing student-centered learning in their classrooms (Glasgow, 1997; Hannafin, Hill, & Land, 1997; Saye, 1998). Teachers who are not intimately involved in the design, development, and implementation of student-centered learning activities may either provide too much structure for students or provide no structure at all for students and disengage themselves from the activities (Brush, 1997; Brush & Saye, 1999).

Successful implementation of student-centered learning requires enhancements to the learning environment that teachers and curriculum developers must integrate into existing curricula (Hannafin & Land, 1997; Hawley & Duffy, 1997). These include problem contexts, evaluation mechanisms, and tools or scaffolds to support both student learning and teacher management (Hannafin et al., 1999; Brush & Saye, 1999). While student-centered learning activities provide opportunities for addressing different types of learning goals, successfully implementing student-centered learning requires skills and resources that are very different from those required by more traditional, teacher-centered classroom activities.

There is a wealth of literature that details models for implementing student-centered learning activities and provides examples of student-centered activities (e.g., Glasgow, 1997; Hannafin, Hannafin, Land, & Oliver, 1997; Hannafin & Land, 1997; Hawley & Duffy, 1997; Hill & Land, 1997; Land & Hannafin, 1994; McCombs & Whisler, 1997). However, there is little research that evaluates the implementation of student-centered learning and provides data-based guidelines for improving the design and implementation of these types of activities. The purpose of this paper is to present the results of a case study examining the implementation of a technology-enhanced student-centered unit for a high school social studies class.

Foundations of Student-Centered Learning

According to Glasgow (1997), student-centered learning is defined as a method in which:

> students learn to decide what they need to know to find success within the class and educational format. Although the teacher may have considerable responsibility in facilitating investigative and discovery activities, it is expected that the student will gradually take responsibility for their own learning. (p. 34)

Student-centered learning has been promoted as an alternative to more traditional, teacher-centered instruction for many years. Dewey (1938) advocated the need for providing in school activities that gave students opportunities to test theories and explore issues more critically. Vygotsky (1978) believed that learning was a social process in which learners developed understanding through interaction with the environment around them. He argued that the most effective learning environment would provide learners with the ability to explore concepts that were of interest to them, and discuss and negotiate the meaning of those concepts with other learners.

More recently, advocates of the constructivist epistemology of learning have promoted the need for more student-centered learning activities (Jonassen, 1991; Duffy & Jonassen, 1991). To the constructivist, identifying a problem and providing students with resources to help solve it are important considerations in designing an instructional activity (Bednar, Cunningham, Duffy, & Perry, 1992). Thus student-centered learning activities would engage students in challenging, real-life tasks, with technology as a tool for learning, communication, and collaboration. These activities would provide students with opportunities to view problems from a variety of perspectives, allow students to collaborate and negotiate solutions to problems, and test those solutions within a real-world context (Bednar et al., 1992; Brown, Collins, & Duguid, 1989; Duffy & Jonassen, 1991).

Assumptions and Issues with Student-Centered Learning

There are numerous examples and strategies for implementing student-centered learning, including situated cognition and cognitive apprenticeship (Brown et al., 1989; Choi & Hannafin, 1995), anchored instruction and macrocontexts (Cognition and Technology Group at Vanderbilt [CTGV], 1992, 1993; Young, 1993), problem-based learning (Savery & Duffy,

1995; Scott & Brush, 1998), and open-ended learning environments (Hannafin et al., 1999; Hannafin & Land, 1997). While each of these examples has unique characteristics, they also identify some general assumptions that must be addressed in order for student-centered learning activities to be successful. These assumptions involve the student, the teacher, and the environment.

Assumptions about the student. Within a student-centered learning activity, it is assumed that student skills and responsibilities will need to be very different from those in more teacher-centered activities (Glasgow, 1997; McCombs & Whisler, 1997). One such assumption is that students will be actively engaged in aspects of their learning that are generally the duty of the teacher in most traditional learning activities. Students need to set meaningful goals for completing the activity and assume more responsibility for meeting those goals (Hannafin, Hall, Land, & Hill, 1994). This involves analyzing the problem presented to them and identifying goals that will lead them to a solution to the problem.

A second assumption about the student involves self-management, monitoring, and evaluation. In student-centered activities, learners are expected not only to set goals but also to monitor their progress in order to determine if the strategies they are using to accomplish their goals are effective (Glasgow, 1997; Hannafin, Hill, & Land, 1997; Palincsar & Brown, 1984). Thus students who are not effective self-managers many times find themselves "lost" or overwhelmed by the scope of the activity, not knowing what information they need or if the strategies or processes they are using to complete the activity are appropriate (Glasgow, 1997; McCombs & Whisler, 1997).

Finally, in a majority of student-centered tasks, collaboration among students is an integral component of the activity. It is often assumed that students have the skills necessary to work together effectively. However, much of the research on cooperative and collaborative learning suggests that students cannot be grouped together without specific structures in place. These structures include positive interdependence, individual accountability, group goals and rewards, and, most importantly in the case of student-centered learning, methods for providing students with opportunities to learn and practice group management and decision-making skills (Brush, 1998; Johnson & Johnson, 1991; Slavin, 1995). Students cannot be expected to work together effectively without proper training and experience in cooperative and collaborative skills (Johnson & Johnson, 1991).

Assumptions about the teacher. One of the central assumptions of student-centered learning is that the role of the teacher will shift from that of a classroom director–knowledge deliverer to that of a classroom facilitator–knowledge resource (Felder & Brent, 1996; Hannafin et al., 1994; Scardamalia & Bereiter, 1991). However, the process by which teachers learn to relinquish some control over the classroom and learn the various responsibilities of a facilitator is not readily apparent. As Hannafin et al. (1994) state, "Precisely how teachers and students make this transition [to increased student responsibility] is not at all clear" (p. 53).

A second assumption is that teachers will be able to develop different kinds of accountability measures that more closely match the assessment criteria for student-centered learning activities. In student-centered learning, both the final product (whether it be an essay, presentation, strategy, or solution to a problem) and the processes associated with completing the product are important (Hannafin & Land, 1997). Thus the teacher not only needs to have methods for assessing student performance on the central task or problem, but also must establish accountability measures for the activities students perform while in the process of completing the task. These accountability measures can range from group progress reports to teacher-student meetings to student outlines or storyboards of presentations.

Assumptions about the environment. It is assumed that some enhancements to the classroom environment will need to be established in order for student-centered learning activities to be implemented successfully. These may include technological resources such as computerized

databases, data collection and analysis tools, or Internet-based resources (Brush & Saye, 1999; Hannafin et al., 1999; Saye & Brush, 1999). Resources may also be available to assist the teacher with establishing a context for the student-centered activity, or for developing a framework or rubric for assessing student performance on the activity.

Often these enhancements take the form of learning aids, or *scaffolds*, designed to assist students engaged in student-learning activities (Krajcik, Soloway, Blumenfeld, & Marx, 1998; Roehler & Cantlon, 1997; Vygotsky, 1978). Scaffolds are tools, strategies, and guides that support students in attaining a higher level of understanding; one that would be impossible if students worked on their own (Jackson, Stratford, Krajcik, & Soloway, 1995; Linn, 1995). Examples of scaffolds include guides that help students focus on relevant information in a database, summarizing documents that enable students to gain some insight into an event or process in order to develop a plan for further exploration, models or rubrics that help students determine the requirements of an activity and assess their success in completing the activity, or teacher conferences and progress reports that help students evaluate their progress.

Purpose of the Current Study

Although there are several examples of technology-enhanced, student-centered learning activities covering numerous content areas, the research base on these types of activities is limited, especially in content domains such as social studies and literature (Berson, 1996; Ehman, Glenn, Johnson, & White, 1998; Jacobson & Spiro, 1994). This is particularly the case when examining how to implement student-centered activities from the perspective of both the student and the teacher. In addition, most of the research has been conducted in settings where teachers are already oriented toward student-centered learning (Saye, 1997). Studies should examine what happens when student-centered activities are implemented in more typical classrooms.

The purpose of this study was to explore the issues involved in implementing a student-centered unit in a typical social studies classroom. Specifically, the study attempted to examine: (a) student perceptions of the unit, their use of the tools and resources built into the unit, and the problems they encountered in solving the unit problem; (b) teacher perceptions of the unit and the problems she encountered in facilitating the delivery of the unit to her students; and (c) methods and strategies to improve and enhance these types of learning activities based on analysis of this unit's initial implementation.

METHOD

Participants and Setting

One teacher and the 21 students in her intact United States history class participated in the study. The class was part of the required program of study for all 11th grade students not enrolled in honors history. The teacher was a 17-year teaching veteran who described her teaching style as ". . . teacher-oriented and . . . very structured . . . ." However, she was open to trying student-centered activities in her classroom, although she believed that students would have difficulty working in groups and staying on task during self-directed work.

The setting for the study was a high school located in a small southeastern city. Approximately 1,160 students were enrolled at the school. Of these, 68% were White, 28% were Black, and 4% were Asian. The median family income for the school district was $35,876.

Each classroom in the school was equipped with five networked student computers and a teacher station connected to a video projection unit. However, according to teachers and students there were few classes in which students used the computers for instructional purposes. Teachers expressed frustration in attempting to integrate technology into their instruction.

Description of the Unit and Classroom Environment

In collaboration with several high school social studies teachers, the authors developed a student-centered unit entitled *Decision Point!* In the unit scenario, students assumed the roles of civil

rights leaders, in 1968, immediately following the assassination of M.L. King, Jr. Students were required to work in teams and develop a solution for the unit problem: What strategies should be pursued in 1968 to continue the struggle for a more just, equal United States society? Students participated in two groups. First, each student was part of an information-gathering group whose task was to use the multimedia database to research one of three strategies pursued by civil rights leaders before King's death: (a) working within the legal system, (b) nonviolent protest, and (c) black power. Second, the students were rearranged into new decision-making groups. These groups shared information, debated alternative solutions, and developed a solution to the unit problem. Each of the decision-making groups used multimedia tools to construct a persuasive presentation that explained possible actions, evaluated the likely consequences of each alternative, and defended its solution as the best course of action.

The classroom environment provided several tools and resources for students to use to help them with their task. These are described in the following paragraphs.

The Decision Point! multimedia database. In collaboration with a small team of graduate students and high school social studies teachers, the authors designed and developed both the *Decision Point!* multimedia database and the data collection–analysis tools. The database featured primary print documents (newspaper articles, personal accounts, and artifacts) and period news footage, interviews, and music. These data were organized into three strands representing primary strategies (a), (b), and (c) named earlier. Within each strand, information was organized by major events relevant to that strategy. Information available for each major event included an introductory essay, a detailed timeline of the event, and additional content resources organized by document type (see Figure 1).

Figure 1 ☐ The *Decision Point!* database.

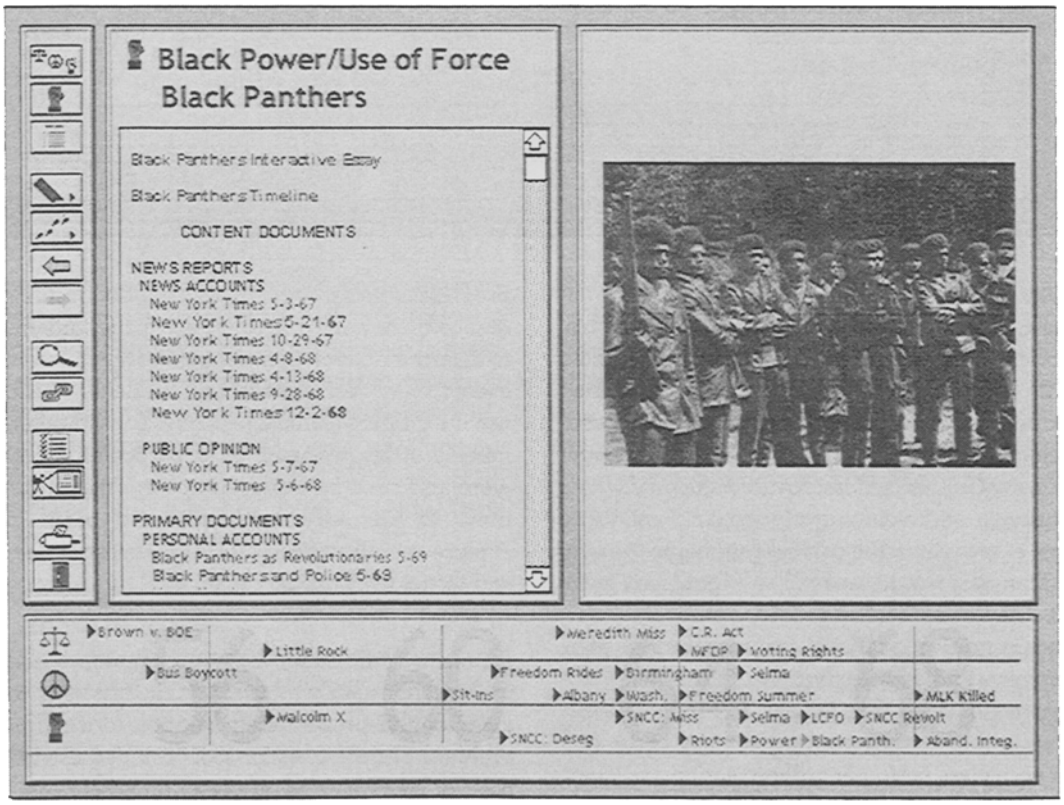
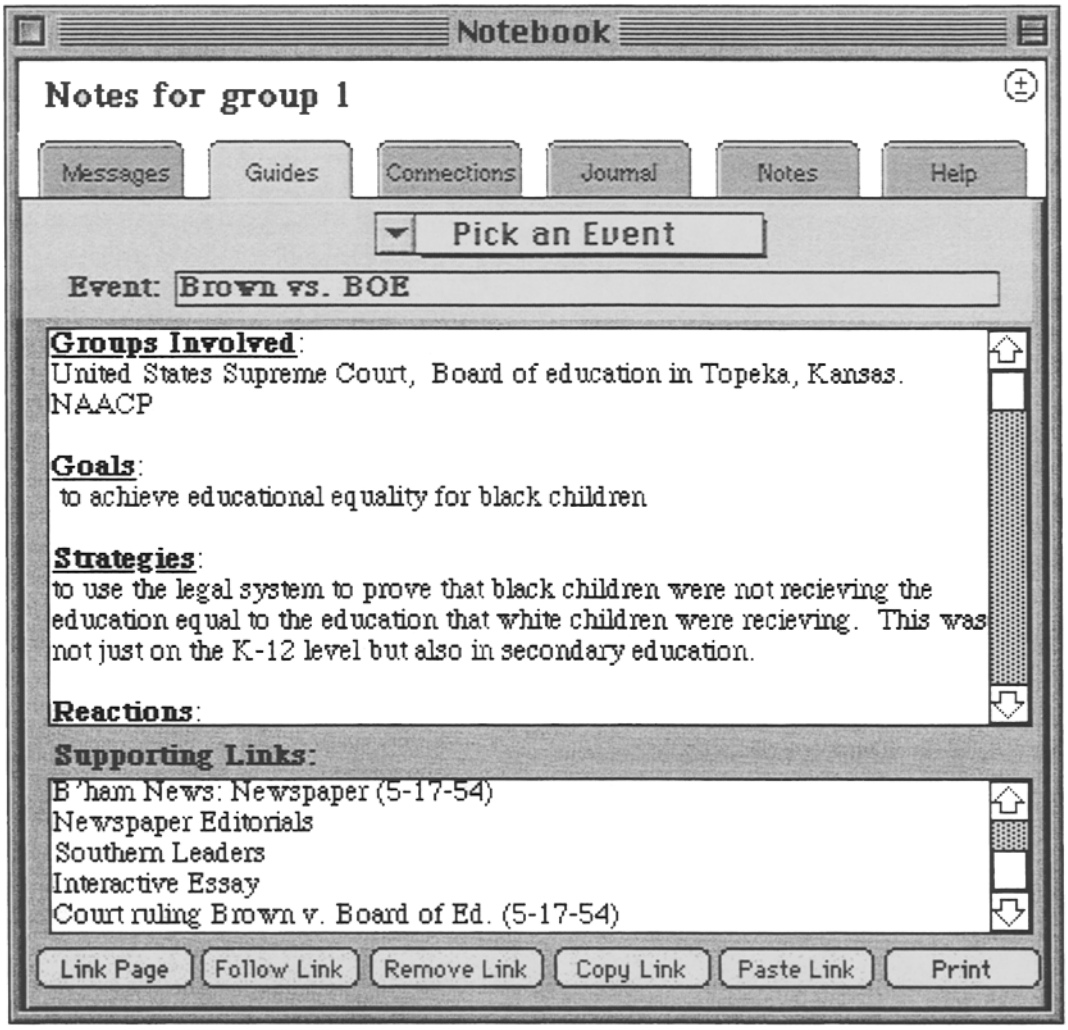


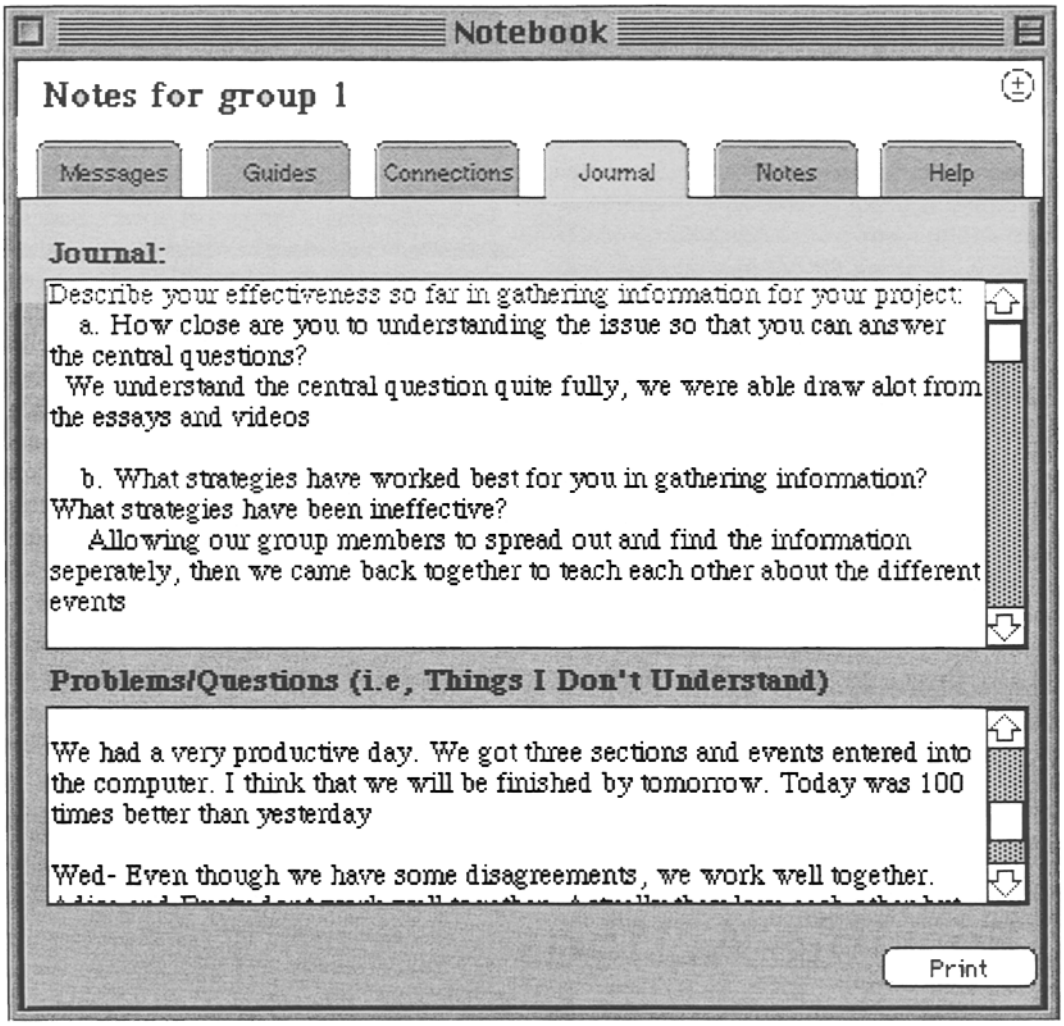
Figure 2 ☐ Guide section of the student notebook.



Data collection and analysis tools. To support investigation, analysis, and evaluation of the historical data, an electronic notebook integrated into the Decision Point! database contained additional conceptual, metacognitive, and strategic scaffolds (Hannafin et al., 1999). For example, the Guides section provided students with a strategic scaffold for exploring and analyzing any event within the database similar to the way a historian would analyze an event (see Figure 2). The Journal section provided students with a metacognitive scaffold for monitoring their progress and the effectiveness of their data-gathering strategies (see Figure 3). Students were required to complete a journal entry at the end of each class period in order to summarize their progress to the teacher. Finally, the Connections section of the notebook was used by the students to determine commonalities among the different events they were researching. Students would use the guiding Connections questions to determine if strategies used by a particular group were also used by other groups in other situations. In this way, students could begin to explore the effectiveness of different strategies and tactics used to effect change.

Information presentation tool. A computer-based presentation tool was used by the students to develop and present their solution to the unit problem. The presentation tool provided a structure for formulating and presenting their argu-

Figure 3 ☐ Journal section of the student notebook.



ments, and provided the ability to link multimedia evidence from the *Decision Point!* database to specific portions of the presentation so that students could access historical evidence to support their argument while they were making their presentation (see Figure 4).

Design and Data Sources

An evaluative case study design was used in this research. An evaluative case study is one that ". . .involve[s] description, explanation, and judgment [of an intervention]" (Merriam, 1988, p. 28), and is particularly useful to explore situations in which an intervention being evaluated has a variety of different outcomes (Yin, 1984). This methodology was used in order to attempt to describe the context in which the *Decision Point!* unit was implemented, to explain the successes and problems that occurred during the unit, and to explore possible changes or modifications that could improve the effectiveness of the unit (Guba & Lincoln, 1981; Yin, 1984).

A variety of data collection and analysis methods was used in order to determine the effectiveness of the unit. The use of multiple methods, or methodological triangulation (Mathison, 1988), helped to increase the reliability and validity of the interpretations. These methods included classroom observations, student interviews, teacher debriefings, teacher interviews, and analysis of student products.

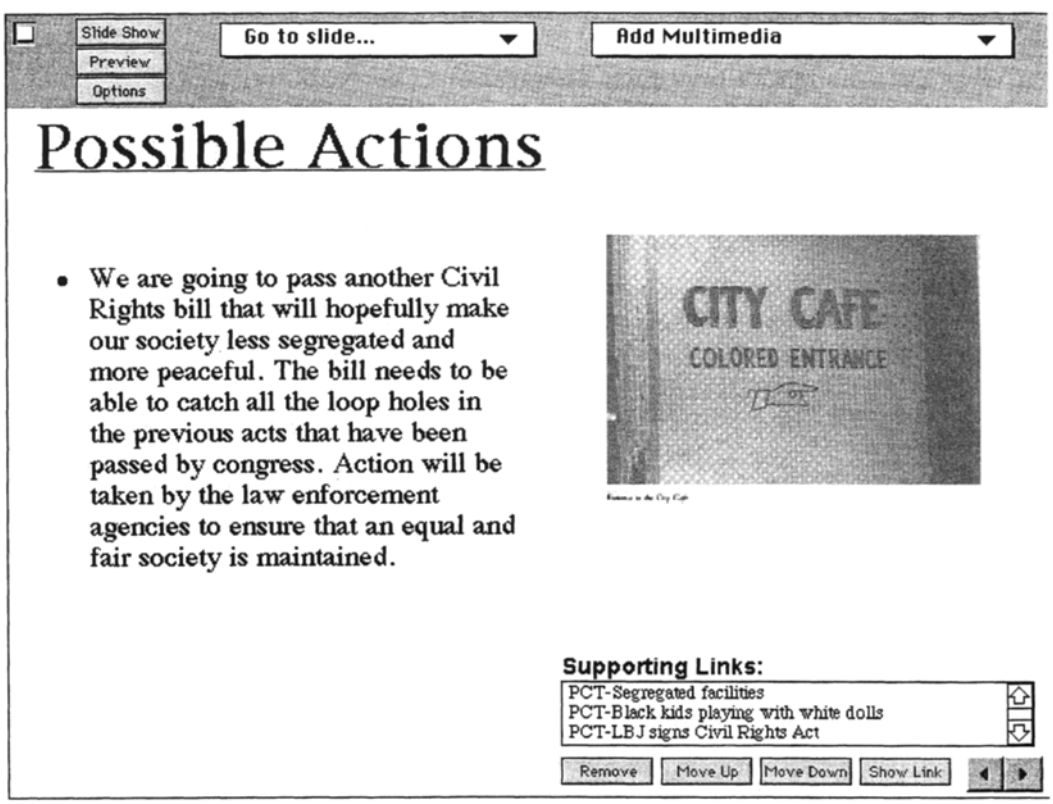
Classroom observations. Throughout the unit, each of the classes was observed by two researchers. The researchers observed from unobtrusive locations within the classroom, and interacted only minimally with the teacher and students during class time. They kept field notes of classroom observations and discussions, including their impressions of teacher interactions with students, student behaviors, and perceptions regarding the progress students were making in completing the unit.

Student interviews. Using a strategy that emphasized diversity in gender, race, ethnicity, and ability, five students from the class were selected for postunit interviews. Student interviews explored respondents' perceptions of the technology-supported unit and its effects on their learning. The interviews were semistructured and asked several common questions including, "What aspect of the unit did you like best or least?"; "Do you prefer to learn in a way that is more teacher directed or student centered?"; and "Compared to other history units, how was this unit different?" Each interview was audiotaped and lasted approximately 45 min. One of the researchers transcribed each interview after it was completed.

Teacher debriefings. At the end of each class session, one of the researchers met with the teacher and asked her to discuss her impressions of the class, including student issues or problems and an assessment of her management of the unit activities. Although the researcher answered specific questions posed by the teacher during the debriefing sessions, he did not volunteer suggestions or seek to impose researcher conceptions of the best way to manage unit activities. Each of these debriefings was audiotaped and transcribed by one of the researchers.

Teacher interview. The teacher also participated in a postunit semistructured interview. The

Figure 4 ☐ Group presentation tool.



interview sought her perceptions about the strengths and weaknesses of the unit and any effects that the changes had on student learning and the classroom environment. As with the student interviews, the teacher interview lasted approximately 45 min and was audiotaped and transcribed.

Analysis of student products. After the completion of the unit, the computer-based notebooks and presentations from each of the groups were collected for analysis. The notebooks included the information students entered into the scaffolding tools to help them solve the unit problem. The presentations were the culminating projects of the unit, and were used to evaluate the success of the student groups in determining a viable solution to the unit problem.

Procedure

Approximately two months prior to the beginning of the *Decision Point!* unit, the researchers met with the teacher and discussed the unit problem and the activities student would be required to complete. The researchers also provided the teacher with the *Decision Point!* database as well as the student tools (notebook, presentation tool). The teacher was asked to explore the database and become familiar with the student tools. The researchers continued to meet with the teacher on a weekly basis in order to answer questions regarding the unit and help her prepare her classroom. They also assisted the teacher with any problems she had with the computer-based resources and installed the *Decision Point!* database on each of the six classroom computers.

The unit was designed to last for six class sessions. Each class period lasted approximately 90 min. On Day One of the unit, the teacher began by introducing the purpose of the unit and the overarching unit problem. She then described the two tasks that the students would need to accomplish to develop a solution to the problem: (a) data gathering and (b) decision making. The authors then provided a brief orientation to the *Decision Point!* database and the data collection–analysis tools.

Once the orientation was completed, the teacher divided students into five data-gathering groups: (a) legal system; (b) nonviolent–desegregation; (c) nonviolent–voting rights; (d) black power–SNCC (Student Nonviolent Coordinating Committee); and (e) black power–abandoning integration. Each of the groups was comprised of either four or five students. Once the groups were established, each group began its data-gathering activities.

During data gathering, the teacher advised the students to use the Guides within the notebook to aid their data collection. She informed them that they should complete a guide for each event they were assigned to explore. She also required the groups to complete a Journal entry at the end of each class session detailing the progress they had made that day and listing any questions or problems that they thought required teacher assistance. The teacher reviewed the student notebooks at the end of each day, and provided feedback to the student groups in the form of messages and comments she included in their notebooks. Although the teacher tried to meet face-to-face with each group during each class session, she did not meet with them as regularly as she had anticipated.

During data gathering, each group was assigned one computer containing the *Decision Point!* database and student tools. In order to provide the groups with more than one copy of the database, each group also had access to all of the textual information contained in the database in three notebooks. Thus each group had access to both computer-based and print-based versions of the database.

Students were given three class sessions to complete their data-gathering activities. At the end of the third class session, the researchers printed all of the information the students had entered in their notebooks. These data were copied and provided to each of the students.

At the beginning of the fourth day, the teacher arranged the students into four decision-making groups. Each group contained at least one member of the five data-gathering groups; thus there was an "expert" for every section of the database in each of the new groups. As with the data-gathering groups, the teacher deter-

mined the composition of the decision-making groups. Students were then asked to use the data they had gathered to (a) determine three potential strategies for solving the unit problem, (b) select one of those strategies as the best method for solving the unit problem, and (c) provide data-based evidence to support their decision. They were then required to develop a presentation detailing their decision. As with the previous groups, each decision-making group had access to a computer with the *Decision Point!* database. In addition, the groups also had the student presentation tool, which assisted them with organizing and creating their presentations. The presentation tool provided students with a predefined structure for the presentation and tools that would allow them to link any supporting multimedia evidence from the database to their presentations to help support their argument. The decision-making groups were given two class sessions to develop their solution to the unit problem and create their presentations. On the final day of the unit (Day Six), each of the decision-making groups gave its presentation to the class (and teacher) using the presentation tool. The teacher and researchers scored each of the presentations using a predefined rubric (see Table 1).

Classroom observations were conducted by the researchers during each of the six class sessions. In addition, at the end of each class session one of the researchers conducted a debriefing with the teacher in order to address any concerns and garner her views regarding the class. Approximately one week after the end of the unit, one of the researchers conducted the postunit teacher and student interviews. The researcher conducted the interviews in the teacher workroom. All of the interviews were completed within one week.

RESULTS

The central unit problem required the student decision-making teams to determine the strategies that should be pursued in 1968 to continue the struggle for a more just, equal United States society. Overall, most of the decision-making groups struggled with the unit problem and developed very superficial solutions. Analysis of the classroom observations, student and teacher interviews, and student products are provided below.

Classroom Observations

Analysis of observation notes from the unit revealed several issues that may have impacted the effectiveness of the unit. Both researchers agreed that students initially felt overwhelmed and frustrated by the open-endedness of the unit. During initial data gathering, students were not sure how to accomplish the task, what information to access, or what to do with the information they were examining. Particularly during Day One of the unit, students expressed their concerns regarding their roles and the use of the resources available to them. Student comments included: "What are we using the computers for?" and "I'm kind of lost as to what we're supposed to do with this information."

Another issue revealed through the classroom observation data was that some of the data-gathering groups had difficulty working together efficiently. The teacher understood that students should have unique roles and responsibilities within the group, but she did not effectively define and establish those roles. After she divided the students into groups on Day One, she asked the students to choose individuals for the roles of reporter, recorder, moderator, and message checker. However, either the students did not understand their roles within the groups, or they did not have responsibilities that required them to remain engaged in the data-gathering activities. This lack of well-defined roles led to unbalanced workloads within the groups, where one or two students tended to spend the majority of time using the computer to gather data while the other members discussed topics unrelated to the activity. Very few of the groups were able to delegate responsibilities so that some members were using the computer to gather data while other members used the print-based documents.

The researchers also observed that the Guides (Figure 2) and Journal (Figure 3) sections of the student notebook were used only inter-

Table 1 ☐ Scoring rubric for student presentations

Group Presentation Assessment Rubric

A. *Accurately identifies what is already known or agreed upon about the past event.*

4. Presents a thorough & correct account of what is already known. Supplies information that may not be commonly known, but that has some bearing on the topic being studied.
3. Presents an accurate account, with no important omissions, of what is already known or agreed upon about the topic being studied.
2. Presents information on what is already known or agreed upon about the topic being studied; however, the information may not be complete in all particulars, or the student may introduce some inaccuracies.
1. Presents little or no accurate & important information about what is already known or agreed upon about the topic.

B. *Effectively interprets & synthesizes information.*

4. Interprets the information gathered for a task in accurate and highly insightful ways. Provides a highly creative and unique synthesis of the information.
3. Accurately interprets information gathered for a task and concisely synthesizes it.
2. Makes significant errors in interpreting the information gathered for a task or synthesizes the information imprecisely or awkwardly.
1. Grossly misinterprets the information gathered for the task or fails to synthesize it.

C. *Identifies opposing positions on an issue & the reasoning behind them.*

4. Articulates detailed positions and the reasoning behind each.
3. Articulates positions and the basic reasoning underlying each.
2. Articulates positions but does not present clear lines of reasoning behind each position.
1. Does not articulate clear positions.

D. *Clearly states a position & provides sufficient and appropriate evidence for claim.*

4. Presents a clear & accurate treatment of all available evidence that addresses the central point of the claim. Considers what evidence is missing and how it should affect the evaluation of the claim.
3. With no major errors, presents all relevant evidence needed to support the claim.
2. Provides evidence for the claim, but may not address all necessary aspects.
1. Fails to provide convincing evidence for the claim.

[Remaining rubric descriptors are only partially shown here. Students received full rubric.]

E. *Expresses ideas clearly.*

4. Clearly and effectively communicates the main idea or theme & provides support that contains rich, vivid, & powerful detail.

F. *Effectively uses a variety of information-gathering techniques & information resources.*

4. Uses the important information-gathering techniques & information resources necessary to complete the task. Identifies little-known information resources or uses unique information-gathering techniques.

G. *Creates a quality product.*

4. Creates a product that exceeds conventional standards.

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mittently by the groups. While some of the groups used the Guides to assist them in summarizing information from an event, other groups simply recorded information they thought was pertinent on a blank notebook page. Group use of the Journal section appeared to be superficial and hurried (perhaps because the teacher tended to remind the students to complete their journal entries when very little time was left in class).

Students tended to have more focus on the final data-gathering day (Day Three); however many of the groups were concerned that they did not have enough time to explore each of the events to which they were assigned. Several students commented that they had not looked at all of the information, and the researchers noted that students were using only one or two documents within each of the events as their basis for summarizing the events. Toward the end of the third day, the teacher reminded the students to meet in their groups and complete the Connections scaffold, which was designed to help them determine similarities in strategies and tactics used by civil rights leaders. The groups reviewed the questions in the Connections section; however only three of the five groups actually attempted to answer the questions in the notebook. The other groups discussed the questions, but did not take any written notes.

The decision-making groups (Days Four and Five) appeared to remain on task and focused to a greater degree than the data-gathering groups. However one problem that arose among these groups was that students had difficulty brainstorming possible strategies to address the unit problem. Many of the groups tended to turn discussions into arguments. Instead of listening to all of the possible ideas generated by group members, the students tended to focus on one idea at a time and discuss the reasons why that particular strategy or solution would not work. This led to some frustration among group members, with one student commenting: "Don't you think they used all [these] ideas back then? There really is nothing else, nothing worked!" Another student, in an attempt to refocus his group on its task, stated: "We're supposed to come up with ideas, not destroy them every time we think of one!"

The decision-making groups also had difficulty determining how to use the information they collected during the data-gathering activity to assist them with the unit problem. Several students commented that they did not understand the link between the decision-making activity and the data-gathering activity; for example, "I'm lost. How do we use this information we have collected?" However, once the groups started discussing specific strategies they might want to pursue, students began tying those strategies to information from the database. For example, in attempting to determine the effectiveness of the protest-march strategy, one group had the following dialogue:

S1: But in the past marching didn't work . . .

S2: The only results were actually found in March on Washington.

S4: Okay, so March on Washington got sympathy, but Selma March got gassed. [But, they] GOT to Washington. They sent people there.

S3: Right, and that's what got the Civil Rights Act passed.

S1: And that's what we can put as [another] option . . .

Thus although some student comments indicated that they were having difficulty synthesizing the information obtained from the data-gathering activity and determining how to use that information, their discussions provided some evidence that they were applying the information to build support for their strategies.

During the final presentations, the teacher did not interact with the students while they were presenting their solutions to the unit problem. Students tended to rush through their presentations. The teacher did not ask any questions related to the strategies each of the groups proposed, and did not ask the groups to justify their strategies or provide additional evidence in support of their ideas. As one of the researchers commented, the presentations were very "one-sided and superficial." Both of the researchers noted their concern that the teacher did not take a more active role in forcing the students to elaborate on the strategies they were presenting and explain the evidence they had collected to support their strategies.

Student Interviews

Analysis of student-interview data tended to corroborate the conclusions reached through analysis of the observation data. As stated above, as the information-gathering groups began exploring the database, many students did not have a clear understanding of what they were supposed to accomplish. In the interviews, this was identified as a problem by several of the students. For example, when asked about problems encountered during the unit, one student stated: "We didn't have much of an idea the first day in [our] groups." Another student commented: ". . . like the first day, we were confused. Because we didn't really know what to accomplish. I know our whole group was . . . confused on what we were supposed to really do." When asked what could be done to alleviate the problem, the student suggested:

> If we had kind of like . . . a roadmap type thing, like, we needed to explore this so that we, you know, come to this conclusion and this is the problem we have to solve or something like that, and that way we have like a clear picture in our mind, like what needs to be done.

When asked for suggestions to improve the unit, one student commented that:

> Another thing that I would rather have done is have like a day to introduce it, because you kind of threw us into it, at least for me, and I was kind of like, the first day I just was so disoriented, I didn't really know what was . . .

A second issue discussed by several of the students was the need for additional guidance. Many of the students felt that there was not enough time for them to both gather data and develop presentations to address the unit problem. Several students suggested additional guides or structure to help them identify pertinent information. When asked for recommendations, one student commented:

> Maybe more structure. Give us some guides about what is most important. "You really need to know this," or "These are the most important. Be sure you look at this." We needed more time to be able to learn as much as possible. We were rushed.

Another student commented:

> I thought the subject itself was very interesting, it was just, there was so much information thrown at us, I think, at once, in the beginning, that we didn't really know how to take it and what to do with it. And if we had, you know, an objective, and . . . we knew what, where we were going with it, then I'm sure some people would have been a little more, like guided, like to where they were going.

One student described his group's frustration with determining what information to examine in the database:

> Well, I mean, we had so much stuff to cover, like with the interactive essay and stuff, that it's just kind of hard to you know, read all that and get to the videos and with the amount of time we had, I didn't know if it was better to watch the videos or read the essays and do the newsletters that they had, so we were just kind of all over the place, wherever we could get to.

It was interesting to note that although students discussed the need for more structure and guidance, most of the groups used the Guides and Journal sections of the notebook very superficially. These scaffolds were designed to provide some of the structure and guidance the students claimed they needed. One student, when commenting about collecting data, stated: "There was one part . . . in the guides that we didn't even get to."

Although students commented that there were difficulties in completing the *Decision Point!* unit, they were also very positive toward the experience. For example, when asked what was different between the *Decision Point!* unit and a normal history unit, one student commented about the need to use the information in the unit to successfully complete a task:

> It wasn't just like the lecture and then take notes and fill out the worksheets and take a test. . . . Reading over everything, you kind of absorb stuff. And knowing you had to know it to do what was coming up next.

Another student commented: "[I learned] more [than in a normal unit]. I got to see things I wanted to see—more than might be assigned. I got what I normally would get and some more."

Finally, some students concluded that by par-

ticipating in the *Decision Point!* unit, they would retain the information longer. As one student commented:

> You can learn more maybe in an encyclopedia or in a book, but will you want to know more? I mean it's like . . . will you carry it on? Like next year will I remember what I read in this book? Probably not, but I will remember those pictures I saw because they'll stay in my mind. And it's more about what I carry with me later . . . I mean when you say "learning" . . . I can learn facts, but I won't learn, you know, the experiences . . . and I think that's what a lot of people remember and those experiences help them to learn like other things. . . . we're doing Vietnam right now and I'm just, like, I'm already tuned out . . . but I still remember lots about the Civil Rights stuff . . . .

Teacher Debriefings and Interview

A majority of the discussions between the researchers and the teacher during the class debriefings dealt with her role in the classroom. During the initial information-gathering phase, the teacher was not sure how to assist the groups or what types of guidance she should provide. As she stated at the end of the information gathering phase: "I am going to have to find ways to hold them more accountable. I'm not sure how much to let them guide themselves." She believed that she needed to provide the groups with more direction. She was also concerned that the groups were not providing her with enough information in their Journals for her to give them useful feedback and guidance. As she stated, "They are not writing enough in their messages to me." However, she was pleased with how well the students were working in their groups and the amount of work they were completing during class time.

In the postunit interview, the teacher was concerned that she did not provide enough direction to the students even though she thought of *Decision Point!* as a student-centered activity. When asked to describe the biggest adjustment she made in her thinking as the unit progressed, she answered:

> I think they needed more direction from my part, especially from the beginning. . . . So I really think the biggest change would be the guidelines that I would give them without doing it for them, without saying . . . step by step this is what you do.

The teacher continued to discuss the dilemma between providing guidance and leaving the activities as open-ended as possible when asked what she liked most about the unit. She responded:

> That's what I liked about it, to have that much [information] at hand, and they could either read it or they could look at the pictures or the videos, . . . and I think if I'd given them more direction, be sure I told them to go to the interactive essay and go to the timeline. Next time I'm going to make sure they understand what I'm saying because that gave them an overview.

Finally, the teacher expressed her disappointment with the quality of the student presentations. She believed that one reason for the lack of quality was that she did not hold the students as accountable for the presentation activity as she did for other activities in her class. She stated that:

> On purpose [I] did not count the presentations as much as I think I should have, because it was the first time through and I wasn't sure. [The] next time I will count it more and I think we'll get better results on that. That surprised me. I expected them to put more effort into that and really care more. It was almost as if, this doesn't really count, it's kind of a test run.

She continued by stating:

> There are several places I can hold them more accountable and I think that will make a better package. It'll also make them think more, work more, and in the long run, I believe, be more creative and have a much better presentation.

Student Products

Student notebooks. Each of the group notebooks used for information gathering was examined to determine the effectiveness of the scaffolds included in the notebooks. These data indicated that a majority of the groups used the scaffolds in the documents only superficially, with the exception of the Guides. All of the groups used the guides to summarize each of the events they were assigned to explore; however the level of analysis varied widely for each group. For example, the black power–abandon integration group tended to provide much more detailed

Figure 5 ☐ Comparison of group notebook entries.

Notes for group 3

Messages | Guides | Connections | Journal | Notes | Help

Pick an Event

Event: Washington

Groups Involved: 200,000 ppl blacks, many whites.
(leaders are linked)

Goals:equal jobs, speed up civil rights.

Strategies: nonviolent marches protest, boycotts.

Reactions:

Supporting Links:

MLK: I have a dream speech
List: Sponsors of the March

Link Page | Follow Link | Remove Link | Copy Link | Paste Link | Print

Notes for group 4

Messages | Guides | Connections | Journal | Notes | Help

Pick an Event

Event: Black Panthers

Groups Involved:Huey Newton and Bobby Seale founded the Panthers in 1966.

Goals:they thought a revolution was necessary to overcome the power structure the US. They felt that the blacks were a colony inside the US and being oppressed. They were ready to wipe out the opressers

Strategies: They set up a free breakfast for African Americans, and handed out free groceries. They made alliances with two other organizations, SNCC, and the PFPThey ran for many public offices in coilation w/ PFP. They kept a close eye on police action, and made sure that they followed

Supporting Links:

New York Times 5-3-67
Bobby Seale proclaims Panthers not anti-white

Link Page | Follow Link | Remove Link | Copy Link | Paste Link | Print

summaries of its events. However, the nonviolent–desegregation group provided only a small amount of information in its summaries (see Figure 5).

The Journal and Connections sections of the notebooks were designed to help student monitor their progress and synthesize the data they had collected for each of their events. However, based on the information in the notebooks, none of the groups spent any significant amount of time completing these sections. The teacher required the groups to complete both sections but, as she stated in her interview, she did not do an effective job of holding the students accountable for the depth of their responses. Thus none of the groups made any substantial effort to complete either journal entries or the connections activity.

Group presentations. The presentations by the decision-making groups of their solutions to the central unit problem were very informal and superficial. None of the five group presentations rated above a "2" on any of the rubric standards (A–D) most directly related to complex historical understanding and reasoning (refer to Table 1). Most of the groups developed three strategies that paralleled the three strands of the database: (a) legal system, (b) nonviolent protest, and (c) black power. Their solution to the unit problem was inevitably either to use a combination of the three strategies or to continue nonviolent measures such as marches, sit-ins, and boycotts. The one unifying theme among all of the presentations was that they believed black power or the use of force was not an effective strategy for bringing about change.

DISCUSSION

The purpose of this case study was to explore the issues involved in implementing a technology-enhanced student-centered unit and to recommend methods and strategies to improve and enhance these types of learning activities. Results of this study suggest that a variety of factors impact the success or failure of student-centered activities. These results also provide some support for continuing to develop student-centered activities for content domains such as history and social studies and provide insight into how the design of these types of activities can be improved.

Results of this study indicate that there are several factors that impacted the effectiveness of the unit. These can generally be categorized into *student issues* and *teacher issues.* A discussion of these issues follows, along with suggestions for improving the design of student-centered units. A summary of this discussion is provided in Table 2.

Student Issues

Difficulty dealing with lack of structure. This study suggested that students needed more structure to succeed at the assigned tasks. Particularly at the beginning of the unit, students stated that they felt lost or overwhelmed. Several factors may have influenced these feelings. First, although the unit problem was presented to the class by the teacher at the beginning of the first day of the unit, the teacher did not provide the students with much detail regarding the data-gathering activity. Students might have benefited from opportunities to review the central unit problem and set learning goals or steps toward solving the problem before they started their information-gathering activities. Although an overview of the central unit problem was provided by the teacher immediately before the students began examining the information in the *Decision Point!* database, there was never an opportunity for students to discuss initial goals, strategies, questions, or responsibilities before they started exploring the database. Several researchers emphasize the importance of goal setting and preassessment of their knowledge before beginning a complex task. Using software designed to help students learn from case- and problem-based learning, Schwartz, Brophy, Lin, and Bransford (1999) have students "look ahead and reflect back" on a problem in order to preview the knowledge domain and formulate learning goals. Linn, Shear, Bell, and Slotta (1999) developed conceptual scaffolds to assist students with initial problem formation and data gathering for science projects. In the *Decision Point!* database, these scaffolds may have

included prompts that guided students to specific information in the database, or suggestions such as "You may want to explore the interactive essay or view the introductory video for the event first." As she mentioned in her interview, the teacher thought that more guidance at the beginning of the data-gathering phase would have helped students garner a deeper understanding of the problem they were attempting to solve.

In addition, during the first day of the unit, the teacher did not emphasize the pivotal role that the Guides should play in assisting students with their data gathering. Thus the groups tended to randomly explore the database without using the Guide scaffolds to help focus their data-gathering efforts. Having the teacher demonstrate and model the use of scaffolds for the data-gathering activity might have provided students with the guidance they needed to begin exploring the database and collecting information.

Finally, student feelings of confusion and disorientation could be attributed to both their limited knowledge of the content domain and their lack of experience with ill-structured problems such as the one presented in the *Decision Point!* unit. As Jonassen (1997, p. 80) states, "Domain knowledge and problem-solving skill develop from experience in solving problems." The teacher described herself as "structured" and "teacher-directed." Content regarding the civil rights movement had not been covered previously in the course, and students had rarely (if ever) experienced activities in which they were expected to take a more active role in their learning. With their minimal experience with ill-structured problems, it is not surprising that students did not feel comfortable with their situation initially. Introducing several smaller student-centered activities prior to implementing the larger unit might have provided students with some experience dealing with ill-structured problems and helped them be more successful with the *Decision Point!* unit.

Difficulty dealing with amount of information. Students also felt overwhelmed by the amount of information they were asked to synthesize. They may have needed time to orient themselves to the computer-based resources and tools available to them, and more tangible examples of how these tools might be used to assist their research and problem solving. Many students suggested having "roadmaps" for the database, or providing them with more structure during the initial phase of the unit. Prior to the beginning of the unit, students did participate in an activity to help orient them to the database. However, this activity focused more on the navigation and synthesis tools, and less on strategies for dealing with the volume of information available. A more structured orienting activity might have helped students feel less overwhelmed at the beginning of the unit and have provided them with some initial guidance for the first day of data gathering. This orientation could have been presented by the teacher or have been in the form of an introductory video. Other researchers have used brief orienting videos to introduce a problem (Hannafin et al., 1994; Sept, 1997).

Lack of metacognitive skills. Results also suggested that students had difficulty managing their time efficiently, monitoring their progress, and identifying areas where they needed assistance. The Journal section of the student notebook was designed as a metacognitive scaffold to help both the data-gathering and decision-making groups reflect on their progress, determine what they still needed to accomplish, and identify areas where they needed help. However none of the groups spent a substantial amount of time using the notebook for this purpose. One reason that metacognitive scaffolding may have been ineffective was that the teacher did not hold students accountable for the quality of their notebook entries. Thus one or two students from each group would generally spend the last five minutes of the class hurriedly completing a journal entry in order to meet the requirement of "writing in their journals." By completing journal entries in this manner, students did not have to meet in their groups and discuss issues and problems they were having, or review the progress they were making toward completing the task. Thus the scaffold was ineffective in supporting the metacognitive skills so important to problem solving (Palincsar & Brown, 1984; Voss, Greene, Post, & Penner, 1983; Wineburg, 1991).

Table 2 ☐ Issues and design recommendations when developing and implementing student-centered learning activities

Implementation Issue	*Design Recommendation*
Student Issues	
Difficulty dealing with lack of structure.	• Additional modeling and orienting activities (video, etc.). • Practice with ill-structured problems.
Overwhelmed by amount of information.	• Additional conceptual scaffolding (summarizing documents or videos, guides or prompts to key information).
Difficulty with metacognitive skills (e.g., time management, progress monitoring).	• Better integrate metacognitive activities into unit. • Increase student accountability for metacognitive activities. • Have students monitor progress more frequently. • Provide more feedback to students on a daily basis.
Teacher Issues	
Difficulty understanding role as facilitator.	• Provide additional modeling/ support for teacher (video cases, dialogue with other teachers or experts).
Difficulty creating and managing groups.	• Assistance with developing and managing cooperative group structures (recommended roles, guides for establishing interdependence).
Difficulty holding students accountable and providing adequate feedback.	• Assistance with developing assessment measures.

This led to inefficient time management, where students said that they felt rushed at the end of the data-gathering phase and needed additional time to analyze all of the events for which they were responsible.

In order to address this problem, students could have been provided a specific time to complete their journal entries. For example, the teacher could have allocated the last 20 minutes of class time for students to reconvene in their groups and complete a journal entry. The teacher could also have provided students with evaluative feedback on the information in their journals. In this study, the teacher reviewed each of the groups' notebooks at the end of every day, but she did not provide any substantive feedback to the groups based on their notebook entries. Most of her comments were more motivational in nature, such as "Keep up the good work!" or "Your group worked very well together today." Finally, it might have been advantageous to have the groups complete journal entries more often than the one time at the end of class. This would have provided them with the opportunity to more closely monitor the progress of their group and make adjustments to their data-gathering strategies during class instead of having to wait until the next class to make any changes. Any of these strategies would have forced the students to utilize the scaffolding tools and held them accountable for completing the summarizing tasks.

Teacher Issues

Difficulty understanding role as facilitator. Many of the problems experienced by the teacher during the implementation of this unit dealt with her difficulty in understanding her role in the classroom. This may have been because she had very little experience with student-centered learning prior to this unit and had limited knowledge of her responsibilities as a classroom facilitator. Particularly at the beginning of the unit, the teacher tended to act more as a nonparticipant observer than as a resource and guide for students. Only after several debriefings with the researchers did she begin to become more engaged in assisting the students with their tasks. It appeared that the teacher saw her role in the unit as either totally hands-on or totally hands-off. Only after reflection did she realize that some guidance and structure on her part was necessary in order for students to become more deeply engaged in the content. However,

she still was not sure *how much* guidance and structure she needed to provide even after the unit was completed.

These problems support the premise that in order to successfully implement student-centered units such as *Decision Point!*, supports or scaffolds are needed for teachers as well as students (Glasgow, 1997; Hannafin et al., 1994; Oliver, 1996). For example, the teacher may have benefited from the opportunity to explore models or examples of other student-centered units being implemented. Case-based scenarios have been used by researchers to introduce teachers to new instructional strategies (Herrington & Oliver, 1999). Children's educational software such as *Millie's Math House* (Edmark, 1999) include video cases and supplemental materials to help provide teachers with models and strategies for integrating the software into their classroom activities. Angeli, Bonk, Supplee, and Malikowski (1998) developed a case-based electronic learning environment to assist preservice teachers with problems they encountered in their initial teaching experiences. These types of support structures might have assisted the teacher in the current study with developing some strategies for managing a student-centered classroom before she began the unit.

The teacher also noted that she thought the discussion sessions with experts (in this case, the researchers) were very beneficial. Although the ability for teachers and experts to have a continuous dialogue while implementing student-centered learning activities is somewhat idealistic, there may be other types of feedback mechanisms that can be implemented for the teacher. For example, implementing a student-centered unit with an entire faculty rather than a single teacher would provide the teachers with their own peer support structure (Glasgow, 1997). The faculty could have daily debriefings much as did the teacher and university researchers in this unit.

Difficulty managing groups. Despite the fact that the teacher demonstrated some understanding of the necessary components of cooperative learning (e.g., unique roles for students), it was obvious to the researchers that she did not have a great deal of experience using cooperative learning in her classroom. She had difficulty establishing well-defined roles and responsibilities for the students and did not provide any opportunities for students to practice cooperative learning skills prior to the beginning of the unit. This led to situations in which there were unbalanced workloads among group members, confusion with individual responsibilities for the group tasks, and a general lack of individual accountability and group interdependence. Once again, additional aids or tutoring provided to the teacher prior to the implementation of the unit could have assisted her in effectively creating and managing the groups (Brush, 1998). However, even if the teacher were skilled in implementing cooperative learning in her class, it might have been difficult for the members of the groups to establish cohesive working relationships because of the limited amount of time they spent working on the task.

Difficulty with student accountability and feedback. The teacher had difficulty with several evaluative aspects of the unit, including requiring more accountability and depth when developing solutions to the unit problem. When the decision-making groups gave their final presentations, the teacher did not engage in any evaluative dialogue with the students, and did not provide any critical comments regarding the depth of their proposed solutions. This was the case even though she stated that she was disappointed with the quality of the presentations. Perhaps the teacher needed some changes in the structure of the unit in order to provide her with more time to meet with students and provide feedback. For example, if the teacher had met more frequently with the decision-making groups while they were developing their presentations, she could have become familiar with the solutions they were developing and been more prepared to provide thoughtful questions and feedback to the groups. In addition, the teacher could have required the students to complete outlines or storyboards of their presentations that she approved before they could begin fully developing their presentations. In this way, the teacher would have included both an opportunity for preliminary feedback and a mechanism for accountability. It also would have

helped the teacher prepare for the student presentations, and be able to provide more thoughtful, probing questions to the students during the delivery of their presentations. Instead, the first time she saw the presentations was when the groups presented to the rest of the class, and she may not have been comfortable facilitating a discussion of the proposed problem solutions without the opportunity to review the presentations first.

CONCLUSION

This paper has presented the results of an initial effort to implement technology-enhanced, student-centered learning activities. It is hoped that the results presented in this study will guide others in developing student-centered units. The knowledge gained from implementing and evaluating this unit should help developers create effective student-centered activities by providing teachers and students with the support they need to be successful within these environments.

Although the final presentations provided by the decision-making groups did not demonstrate a great deal of depth, classroom observation data and student comments made during the postunit interviews provide some evidence that technology-enhanced student-centered activities might promote deeper engagement and enhanced understanding of content. Despite the organizational problems, this class exhibited high levels of enthusiasm, dialogue, and persistence in unit activities. For a more detailed discussion of the learning gains made by students engaged in this unit, refer to Saye and Brush (1999).

The implementation and evaluation of a student-centered unit in this study led to numerous insights and recommendations for improving the unit. Perhaps the most important considerations that need further attention are the additional aids required by teachers as they struggle to implement these types of activities in their classrooms. Much of the literature on open-ended and student-centered learning tends to focus on the needs of the learner (e.g., Hannafin et al., 1999; Hannafin & Land, 1997) rather than the needs of the teacher. By utilizing data gathered from teachers as they implement student-centered units, designers and developers should be able to create activities that are more successful for both the student and the teacher. □

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