

## DOCUMENT RESUME

ED 438 238

SO 031 515

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TITLE Student Reasoning about Ill-Structured Social Problems in a  
Multimedia-Supported Learning Environment.  
SPONS AGENCY Corporation for Public Broadcasting, Washington, DC.; Auburn  
Enlarged City School District, NY.; Auburn Univ., AL. Coll.  
of Education.  
PUB DATE 1999-11-19  
NOTE 20p.; Paper presented at the Annual Meeting of the National  
Council for the Social Studies (79th, Orlando, FL, November  
19-21, 1999).  
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)  
EDRS PRICE MF01/PC01 Plus Postage.  
DESCRIPTORS Black History; Comparative Analysis; High Schools;  
\*Instructional Effectiveness; \*Multimedia Instruction;  
Social Studies; \*Student Reaction; Teacher Role; \*United  
States History  
IDENTIFIERS \*Learning Environments; Teaching Research; Technology  
Integration

## ABSTRACT

This paper summarizes findings from a case study exploring high school students' responses to a technology-supported, problem-centered U.S. history unit. A team of teacher educators and secondary school social studies teachers conceptualized "Decision Point!" (DP), an integrated set of multimedia content resources and investigatory tools for exploring the African American civil rights movement. In hope of developing a model that could be implemented in typical classrooms, an idealized case setting was avoided. The case study teacher had little experience in student-centered inquiry, problem-based instruction, and technology use. Student participants were enrolled in two sections of a U.S. history course required of all 11th graders not taking honors history. The teacher taught the 6-day DP unit to one of her classes. The same teacher taught the comparison class on the same topic, using her preferred instructional method. Observations suggested that students in the two classes encountered the unit topic in quite different ways. Students in the non-DP class encountered a very teacher-centered unit with over three-fourths of the time devoted to lecture, recitation, individual seatwork, and videotape viewing of movement events. The DP unit was very student-centered, with many procedural and organizational decisions left to students; individual roles and responsibilities were not sharply defined. Observers in both classes agreed that the DP group exhibited greater levels of enthusiasm, involvement, dialogue, questioning, and persistence in unit activities. Comparative outcomes data also suggest that the two classes developed different understandings about historical events and issues involved in the phenomenon of the civil rights movement. Differences were evident in factual recall and higher order reasoning. Contains a table and 25 references. Appended is a sample post-unit essay. (BT)

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# Student Reasoning About Ill-Structured Social Problems In a Multimedia-supported Learning Environment.

by

John W. Saye  
and  
Thomas Brush

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Paper Presented at the Annual Meeting of the College and University Faculty Assembly of the National Council for the Social Studies, Orlando, Florida, November 19, 1999.

# **Student Reasoning about Ill-structured Social Problems In a Multimedia-supported Learning Environment**

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Presented at the annual meeting of the College and University Faculty Assembly of the National Council for the Social Studies. Orlando, Florida; November 19, 1999. Portions of this research were supported by grants from the Corporation for Public Broadcasting, Auburn University College of Education, and Auburn City Schools.

This paper summarizes findings from a case study exploring high school students' responses to a technology-supported, problem-centered U.S. history unit. Problem-centered learning is particularly important to the social studies because most social educators emphasize civic competency as a central goal (NCSS, 1994). Citizen actors must make decisions about a wide variety of ill-structured social problems. Competent resolutions of such problems demand civic reasoning: the ability to form persuasive and dialectical arguments that demonstrate a genuine, informed consideration of alternatives (Newmann, 1990, Parker, Mueller, & Wendling, 1989). Efforts to develop competent civic problem-solvers have been complicated by obstacles originating within organizational structures (e.g., Cuban, 1984; McKee, 1989), teachers (e.g., Saye, 1998; Onosko, 1991), and learners. Our project focused on learner difficulties that impede competent problem resolution.

A team of teacher educators and social studies teachers conceptualized *Decision Point!* (DP), an integrated set of multimedia content resources and investigatory tools for exploring the African-American civil rights movement. We wished to explore whether a multimedia-supported learning environment might mitigate some of the identified learner obstacles to problem-based instruction: (1) failure to become immersed in and persist with exploration of the topic (Newmann, 1991; Onosko, 1991; Rossi, 1996), (2) lack of domain-specific and metacognitive knowledge necessary for effective problem-solving (Parker et al., 1989; Rossi, 1996; Scheurman & Newmann, 1998; VanSickle & Hoge, 1991; Voss, Greene, Post, & Penner, 1983; Wineburg, 1991), and (3) egocentric reasoning that fails to account for competing perspectives (Newmann, 1991; Parker et al., 1989).

Some researchers suggest that the authenticity and richness of multimedia learning environments provide qualitatively different experiences that motivate students to persist, immerse themselves in the content, encounter diverse perspectives, and develop more complex views of issues (Dwyer, 1994; Cognition & Technology Group at Vanderbilt, 1992; Kinzie & Sullivan, 1989). Other work suggests that hyperlinked media may provide scaffolding support for more disciplined inquiry into ill-structured problems (e.g., Hannafin, Land, & Oliver, 1998; Perfetti, Britt, Van Dyke, & Gabrys, 1999). However, the research base on technology-rich, student-centered classrooms is limited, especially in social studies (Berson, 1996; Ehman, Glenn, Johnson, & White, 1998; Saye, 1997). Our investigation focused on how participants used the multimedia environment, on what meaning this learning experience had for participants, and on how their

responses and culminating understandings compared to students who studied the same topic without using the multimedia resources.

## **Study Design**

### Study Participants

Because we hope to develop a model that can be implemented in typical classrooms, we sought to avoid an idealized case setting. The case study teacher had little experience in student-centered inquiry, problem-based instruction, or technology use. Student participants were enrolled in two sections of a U.S. history course required of all 11<sup>th</sup> graders not taking honors history. The study teacher taught the six-day DP unit to one of her classes. We compared that case to a second class studying the same topic with the same teacher but using that teacher's preferred expository instructional methods and her normal resources. We hoped to gauge how experiences in the DP unit might differ from social studies topics as they were usually experienced in this classroom and to determine whether student outcomes in the two classes appeared to differ. A diverse group of five DP students were selected for follow-up interviews.

### Description of Decision Point Unit Design

The study teacher identified the topic. She and the other team members collaboratively designed the unit problem, the culminating activities, and a jigsaw group strategy. In consultation with the teacher, the university team members developed the DP hypermedia environment that provided (a) multimedia civil rights content resources in an interactive database and (b) scaffolding tools for collecting, analyzing and evaluating historical evidence and presenting conclusions (See Appendix A).

The unit scenario placed students in the roles of civil rights leaders following the death of Martin Luther King, Jr. Student teams investigated the events of the Civil Rights Movement from 1954-68 and developed a solution for the unit problem: What strategies should be pursued in 1968 to continue the struggle for a more just, equal society? Students first joined expert groups to research a particular strategy used in the Movement. Then, experts from each group formed decision-making teams who weighed alternative solutions and developed a multimedia presentation that used evidence from the database to present possible actions and to defend their solution as the wisest choice. Finally, students composed individual essays that required them to use unit understandings and competencies in a new context (Appendix B).

The teacher made all decisions about the structure of each day, the creation and management of collaborative groups, the degree of teacher direction, and determination of unit grades. The university collaborators built scaffolding devices into the DP environment and discussed with the teacher possibilities for how they might be used. For example, we organized primary documents into conceptually related menus and provided an introductory essay to each event that set the documents into a unifying context. A second example of support available within the hypermedia environment was a strategic scaffold (Hannafin et al., 1998) that posed categorizing questions that an historian might use to organize and synthesize evidence about an event. We tried to answer questions that the teacher had during unit design and teaching in ways that were informative but not directive. We view our collaboration as educative research: the idea that deeper knowledge about teaching and learning can arise from dialogues between university researchers and teachers (Clark, Moss, Goering, Herter, Leonard, Robbins, Russell,

Templin, & Wascha, 1996; Gitlin, 1990). A future report will focus on the teacher's perspective as unit development evolves over the next several years.

### Research Design

We conceptualized this project as an evaluative case study (Merriam, 1988; Patton, 1987). We adopted a hybrid design that incorporated both qualitative and quantitative elements in data collection and analysis. Given the theoretical premises that undergirded the design of our multimedia environment, we could describe in advance some desirable outcomes and develop evaluations to see if they seemed to occur. Qualitative methods allowed us to explore plausible explanations for any observed effects.

For both classes we collected comparative data from daily classroom observations, parallel pre- and posttests of factual recall knowledge, and end-of-unit essays. The essay required students to use unit knowledge to make a judgement about an issue related to the unit problem. Building on work by Newmann (1990) and Parker, et al. (1989), a four-paragraph essay was scaffolded to assist students in constructing an reasoned argument that was both persuasive and dialectical (Appendix B). We defined a persuasive reason as one that stated a general principle to support a position or gave a specific example from which a general principle could be inferred. Dialectical reasoning required that the reasoner suspend judgment and genuinely explore competing points of view.

In addition to comparative data, we collected DP group data from group presentation rubrics, attitudinal surveys, and post-unit interviews. The teacher also participated in informal daily debriefings and a formal post-unit interview.

## Findings

Observations suggested that students in the two classes encountered the unit topic in quite different ways. Students in the non-DP class encountered a very teacher-centered unit with over three-fourths of the time devoted to lecture, recitation, individual seatwork and viewing videotape of movement events. The DP unit was very student-centered. After an introductory lecture, the teacher left many procedural and organizational decisions to students. Individual roles and responsibilities were not sharply defined. The teacher answered questions when asked, but did little to probe student thinking or provide intermediate feedback on student progress toward problem solutions. As a result, groups groped for direction and appeared disoriented and overwhelmed as they attempted to launch each phase of the investigation. As the unit proceeded, groups gradually developed strategies for accomplishing tasks, but time and resources were often used inefficiently. Although the teacher made adjustments each day and gradually began to provide more organizational direction, she continued to provide little input to guide students toward more expert thinking about the problem. She acknowledged that she was having difficulty conceptualizing her role: "I am going to have to find ways to hold them more accountable. I'm not sure how much to let them guide themselves."

Despite such organizational problems, observers in both classes agreed that the DP group exhibited greater levels of enthusiasm, involvement, dialogue, questioning, and persistence in unit activities. Comparative outcomes data also suggested that the two classes developed different understandings about historical events and issues involved in the phenomenon of the civil rights movement. Differences were evident in factual recall and higher order reasoning.



### Differences in Factual Recall

Both classes completed pre- and posttests that measured recall of discrete items of factual information about the Civil Rights Movement. During the course of the unit, only the non-DP group received direct instruction for the information included in the test. The teacher was concerned that the DP class would suffer a disadvantage on that measure. However, no significant differences were found between groups on either pretests,  $\chi^2(1, N=44) = 1.22, p = 0.27$ , or posttests,  $\chi^2(1, N=44) = 0.00, p = .99$ , of factual recall. In addition to this discrete item test, a portion of the post-unit essay (Paragraph 1) asked students to summarize substantive content knowledge that was relevant to deciding the social issue posed in the essay. When the need for unit information was contextualized in this manner, the DP group recalled significantly more substantive information than the non-DP group (See Table 1, Paragraph 1).

### Differences in Higher Order Reasoning

Paragraphs 2 through 4 of the essay measured persuasive and dialectical reasoning about an issue related to the unit problem. Results suggested that the DP group was able to apply a more complex understanding of civil rights content towards reasoning about social issues than were their peers. Each paragraph yielded a finding about a specific competency:

Persuasive Reasoning. We measured students' general ability to construct a persuasive argument and their ability to construct a persuasive argument using unit understandings. We judged a reason to be an instance of a persuasive argument if it stated a general principle in support of a position or the general principle could be reasonably inferred from a discussion of a specific example.

Paragraph 2: Students were asked to construct a persuasive written argument using information provided in the essay about a topic (American Revolution) that was independent of the topic studied in the unit. No significant differences were found in the general persuasive reasoning abilities of the two groups as measured by Paragraph 2 (Table 1).

Paragraph 3: Students were asked to make a persuasive argument using unit content knowledge. Significant differences were found in favor of the DP group (Table 1).

Dialectical Reasoning. We measured students' dialectical reasoning in two ways. Students could demonstrate simple dialectical reasoning by fairly representing opposing views. Complex dialectical reasoning required students to not only acknowledge a counterargument to their chosen position, but to address the reasoning behind that argument in defending their choice.

Paragraphs 2 & 3: Students were generally successful in making arguments that were free of bias toward their chosen position ( 23 of 24 in non-DP, 18 of 20 in DP group).

Paragraph 4: In an essay segment measuring complex dialectical reasoning, significantly more students in the DP group addressed at least one line of support for the counterargument in defending their decision about the posed issue,  $\chi^2(1, N=44) = 4.77, p < .05$ .

Thirty-five percent of the DP students made such an argument compared to eight percent of the non-DP group.

Table 1. Summary of Quantitative Analysis of Essay Tests

Paragraph #	Data Description	Group	N	M	SD	$\chi^2$
1	# of Factual Statements	DP	20	5.5	2.4	4.23*
		non-DP	24	3.9	2.4	
2	# of Persuasive Arguments	DP	20	1.7	1.1	3.46
		non-DP	24	1.5	1.0	
3	# of Persuasive Arguments	DP	20	2.5	1.2	6.08*
		non-DP	24	1.6	1.0	

\*p&lt;.05

DP Student Perspectives

We cannot claim that our intervention caused the differences evident between groups. However, we can combine our observations with the perspectives of participants to generate hypotheses about plausible explanations for observed effects. Some students in the DP group perceived their experiences with history in this unit to have given them different understandings from those gained in previous studies. The great majority of the DP group enjoyed the unit (86%) and wished to study other topics in a similar way (76%). Interviews provided deeper insight into student perceptions. Most respondents endorsed the greater levels of student empowerment and collaborative learning in this unit because they believed that these activities helped them construct more complex knowledge while also making learning more enjoyable. More importantly, responses suggested that interviewees found the DP resources and the problem-driven unit focus: (a) provided a more authentic context for encountering historical content, (b) personalized history and provoked a more empathetic view of the dilemmas of historical

figures, and (c) encouraged meaningful encounters with historical issues that students believed would lead to greater retention.

One student's remarks exemplify elements of all of these themes:

"You can learn more, maybe, in . . . a book, but will you want to know more? I mean . . . next year will I remember what I read in this book?

Probably not, but I will remember those pictures that I saw because they'll stay in my mind. . . [W]hen you say 'learning,' I can learn the facts, but I won't learn, you know, the experiences. . . and that's what a lot of people remember and those experiences help them learn other things. . . Even though you don't learn more facts, just the fact that you learn more about real things, and, like, actuality itself--that just sticks in your mind more than facts. . ."

Despite these positive findings, multimedia presentations of group resolutions of the central unit problem were superficial. Our presentation rubric measured seven standards, including accurately identifying relevant information, identifying the reasoning behind opposing positions, and defending a clear position with sufficient and appropriate evidence. Each standard featured descriptors for scoring at four levels of performance: Exemplary (4), Competent (3), Marginal (2), and Poor (1). None of the observers rated any of the five group presentations above Marginal on any of the standards closely related to complex reasoning or historical understanding.

In part, this result may stem from the problem of bounded rationality, cognitive limitations that cause individuals to construct simplified models of reality (Simon, 1957). The individual essays presented students with a more circumscribed problem. In contrast,

the unit problem demanded consideration of many more variables. Even with the advantages of collaboration, the complexity of the problem made model construction much more difficult. Furthermore, while the essay task was tightly structured, scaffolding supports were either underutilized or missing in student group tasks. Due to the novelty of this experience, the teacher was reconceptualizing and adjusting her role as the unit unfolded. She regarded her first time teaching this unit as a “learning time” for her. In her inaugural effort, definition of group roles and responsibilities and guided discovery were minimal. For instance, she did not monitor closely each small group's progress during their investigations and provide timely probing questions and feedback to focus their thinking. Although they appeared more engaged with their learning than the non-DP group, DP students were often confused about the process of inquiry during their investigation. Actions and comments by both teacher and students suggested that in this initial implementation, all parties struggled to manage the cognitive demands of disciplined inquiry.

Finally, it should be acknowledged that although the DP group essays demonstrated more civic reasoning than those of the non-DP group, most did not reach the level required for competent decision-making. For example, sixty-five percent of the DP class was unable to form a complex dialectical argument. The fact that substantially more DP students could construct such an argument than their non-DP peers is encouraging, but social educators must be successful with a much greater portion of students to meet the goals of civic competence.

## Conclusions

In this case study we deliberately chose a classroom where participants had little experience with technology-supported, problem-based learning so that we could examine the challenges of this type of learning in a typical setting. We hope to follow how this unit in this classroom setting evolves over time. Particularly, we hope to learn what enhancements to the model unit might be made to assist the development of civic competence.

Study findings should not be generalized. Research in other sites is needed. In particular, other studies need to test the potential of these and similar resources in settings where teachers are already engaged in problem-based learning with their students.

This case study suggests promises and difficulties with technology-supported, problem-based environments. The greatest contributions of multimedia may be in supporting the prerequisites to disciplined thought. Multimedia may afford a more authentic context for learning that raises student interest, encourages deeper encounters with knowledge, and makes that knowledge more available for application to social problems. The realism of such environments may cause students to confront alternative perspectives in a more genuine fashion. However, without all of the elements of an thoughtful problem-based learning environment in place, it is unrealistic to expect engagement to translate into genuine disciplined inquiry into social issues. Expert guidance built into a multimedia-supported environment may help students achieve modest gains in the disciplined inquiry necessary for addressing social problems critically. But study findings highlight the importance of expert guidance by the teacher and the need for more grounded investigations of how guided discovery may be

effectively implemented to support individual and group decision-making. When integrated into a cohesive vision for learning, the strengths of multimedia environments might enhance the prospects of building thoughtful classrooms where problems are rigorously examined. The potential of embedded scaffolding for supporting teachers in the difficult task of guiding thought may make the investigation of problems more feasible for more teachers and learners.

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This will take you to the strand menu (Legal System, Non-Violent, Black Power).

This will take you to menu of the event you are currently exploring.

Click and hold this button down to either set a personal bookmark or follow a bookmark you already set.

Click and hold this button down to get a list of the places you've visited in the database.

Use these buttons to back and forward through the list of areas visited.

This is where pictures and movies will appear.

This is where menus and text will appear.

Click and hold the mouse button down to preview explore any event.

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Print notes

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These features don't work yet!

The screenshot shows a window titled "Non-Violent Direct Action: Selma March". The left sidebar contains buttons: Main, Strand, Event, Emul, HIG, Find, Cont, Not, Prev, Print, Logon. The main content area lists "CONTENT DOCUMENTS" under "NEWS REPORTS" and "NEWS ACCOUNTS", including items like "Mont. Adv. Clubs Tear Gas Scare (3-8-65)" and "Mont. Adv. Minster Dbs - Beating (3-12-65)". Below this is a "PUBLIC OPINION" section with "Wash. Post Editorial (3-9-65)". At the bottom, a timeline from 1964 to 1970 shows various events like "D.C.R. Ant", "D.Voting Rights", "D.Selma", "D.MLK Killed", "D.SNCC Revolt", "D.Black Panth.", and "D.Aband. Integ.".

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## **Appendix B. Post-Unit Essay**

### **Comparing Efforts to Bring About Social Change-- The American Revolution and the African-American Civil Rights Movement**

In 1776, the American colonists revolted from their mother country, Great Britain. Tensions had been growing for some time as the colonists accused Britain of violating their rights. In 1763, colonists were banned from living beyond the Appalachian mountains. Settlers already living there lost their property. The British Parliament imposed a series of taxes on sugar, tea, paper and other necessities. Colonists were not allowed to vote on these taxes. The colonists reacted by writing petitions to the government, by boycotting taxed goods and by threatening and assaulting tax collectors. In 1770, five colonists were killed in Boston when British troops were called out to quiet a mob. When a group of colonists destroyed cargoes of tea on British ships in Boston Harbor in 1773, large numbers of British troops were sent to Boston to enforce the law and keep order. Since there was not enough barracks space for all of the troops, some colonists were required to house troops in their homes. When troops traveled into the countryside in 1775 to seize a supply of weapons and ammunition, shots were fired, people were killed on both sides and the American Revolution had begun.

You have studied efforts in the 1960s by African-Americans to gain their full rights as U.S. citizens. Based upon your understanding of the events in that struggle, **who do you think had greater justification for revolution: American colonists in the 1770s or African-Americans in the 1960s?**

To answer this question, you should write four paragraphs:

- Paragraph 1: Summarize the relevant events of the Civil Rights movement in much the same way that the American Revolution is done above. Be careful to avoid in this paragraph revealing your position and reasons for your position. That is what paragraph 4 is for.
- Paragraph 2: Make the strongest argument you can that the colonists were more justified in revolting than African-Americans would have been. State this position and support it with two or three different, good reasons.
- Paragraph 3: Make the strongest argument you can that African-Americans would have been more justified in revolting than the colonists. State this position and support it by responding to the reasons you gave in your Paragraph 2 argument.

**BOTH PARAGRAPHS 2 & 3 SHOULD READ AS THOUGH THEY ARE THE SIDE YOU ARE TRULY TAKING.**

- Paragraph 4: Choose which group you believe had the stronger justification for revolution.
- (1) Be sure your conclusion shows that you have considered the arguments against your position as well as arguments for your position.
  - (2) State what conditions must be present before people are justified in using force to bring about change.
  - (3) Do you believe those conditions were present for both groups, for neither group or for only one group?



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