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Using Concepts to Frame History Content

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ABSTRACT. Two groups of middle school students were taught U.S. colonial history during a 5-week period using 2 different instructional strategies. In the experimental group, concepts and problem-solving strategies were explicitly taught; in the control group, content was presented using lectures and reading. All students took a pretest and several posttests. Declarative knowledge tasks measured factual content knowledge and domain vocabulary acquisition; procedural knowledge was measured with problem-solving essays. Whereas performance was not statistically different between the 2 groups on the fact tests, significant differences were found on the vocabulary tests and problem-solving essays. These findings support using direct instruction for relational thinking and problem solving with explicit reference to concepts and attributes.

Key words: concept learning, middle school education, U.S. history

HISTORY INSTRUCTION often has been stereotyped as focusing on students memorizing names, places, dates, and so on, with the idea that they can automatically learn the important ideas and concepts, as well as develop the critical- thinking skills expected by state standards. Unfortunately, this type of learning is largely unsuccessful; more than half of high school students do not meet basic proficiency standards by Grade 10 (National Center for Education Statistics, 2002). In this study, we proposed to bridge the goals of standards-

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based history content and problem-solving skill standards with the reality of poorly written social studies textbooks (and corresponding instruction) that impede students' access to and understanding of the important, but all too often, underlying ideas and concepts. We believe that a bridge is necessary to effectively solve the conundrum of learning in a manner that reflects transfer from a limited set and type of problems to general case issues and from a narrow understanding of content mastery to a broader inference of domain expertise. We specifically used concept-based instruction (CBI) (see Hollenbeck & Tindal, 1996; Ketterlin-Geller, Twyman, McCoy, & Tindal, in press; McCleery & Tindal, 1999; Nolet & Tindal, 1994; Tindal & Nolet, 1996a, 1996b; Twyman, 2003; Twyman, McCleery, & Tindal, 2005; Twyman, McCoy, Ketterlin-Geller, & Tindal, 2003; Twyman & Tindal, 2005) as this bridge to develop content and skill expertise in students.

Instruction on Historical Thinking and Problem Solving

Successful instruction in history not only emphasizes memorizing names, places, and dates of historical events but also facilitates understanding of underlying broad concepts and their use to interpret data. As suggested by Leinhardt, Stainton, and Virji (1994), the study of history is the process of "constructing, reconstructing, and interpreting past events, ideas, and [using] inferential evidence in order to understand and make meaningful who and what we are today" (p. 86). This process involves students analyzing and interpreting those data in the search for "truth and understanding" (Ravitch, 1989, p. 68). Attaining truth and understanding, however, requires a person to be informed and concerned with the *context* in which significant events take place, and have a developed sense of general case historical thinking as well as the ability to see patterns among apparently dissimilar events or problems.

We define *general case historical thinking* as the ability to analyze problems within time-stamped periods and generalize interpretations by articulating patterns of similarities and differences as well as cause and effect. This definition is supported by the major historical interest groups. The National Council for the Social Studies (2000), for example, encourages educators to help students develop problem-solving skills in an effort to make informed and reasoned decisions as citizens in our culturally diverse and globally interdependent society. Similarly, the National Center for History in the Schools (1999) advocates that teachers emphasize that children develop the ability to raise questions, seek and evaluate evidence, compare and analyze historical stories, and understand the social, political, economic, and cultural spheres of human activity. Business leaders also recognize the need to teach students to learn and understand important concepts in world history and geography to succeed in the 21st century of global trade (Cameron, 2000).

The challenge to developing general case historical thinking lies in the fact that history uniquely represents inductive logic in moving from known events to explanations of their occurrence within their contextual boundaries. Historical problem solving begins with students being provided outcomes and working backward to explain why various solutions happened (Wineburg, 1991). Furthermore, historical problems are ill structured by nature. The complexities of even the most basic problem in history also require knowledge of a broad range of subject domains, such as economics, geography, sociology, political science, and even math, to explain solutions that likely have no universal agreement. In other words, developing historical thinking is neither linear nor necessarily cumulative.

Poorly Written Textbooks

Unfortunately, the textbooks on which history teachers primarily rely have at least two major drawbacks that impede developing historical thinking: (a) They assume too much knowledge on the part of the students, and (b) the content reflects a shallow and nonhierarchical coverage of information (Schug & Western, 1997). These two features combine to prevent students from accessing and actualizing the deeper understanding being promulgated by state standards and professional groups. In effect, the texts preclude the measurement of transfer of learning (generalizing interpretations), as they do not reflect development of expertise in referencing similarities, differences, or cause–effect.

The first barrier is one of prior knowledge. Often, students do not have the prerequisite background knowledge to comprehend global concepts embedded in the text. In more than 20 years of research, prior knowledge of a domain under study has been shown to be a highly important variable in comprehending and understanding text (see Pearson, Hansen, & Gordon, 1979; Spilich, Vesonder, Chiesi, & Voss, 1979). Prior knowledge is an issue of depth, interconnectedness, and access to knowledge that provides one's rules, or misrules, of the topic under study. For our purposes, two aspects of prior knowledge directly affect student interaction with text. First, the type and amount of prior knowledge affect how one constructs meaning. Second, prior knowledge influences processing new information from the text.

How one approaches reading a text is influenced by what one expects based on previous experience. For example, if one is experienced and facile with the major concepts of a domain, then one would sample the text for supporting or consistent details. On the other hand, if one does not have experience, the reader might decode the words and build a conceptual framework from the ground up (Garner, 1990). No matter the strategy used to read a text, without proper background knowledge, students have difficulty developing the contexts for historical thinking.

The second barrier lies in the expository nature of social studies textbooks, which often fail to emphasize important content and instead primarily present factual information (Tindal, Nolet, & Blake, 1992) without a "coherent chain of events . . . [or] connections between events and ideas" (McKeown & Beck, 1994, p. 5). Relying on expository organizational patterns that in effect hide the complex and abstract nature of facts, concepts, and generalizations, textbooks make strong cognitive demands on inexperienced students because learners do not have sufficient mental schema or structured representations of knowledge to access the expository structures of the text (Rumelhart & Norman, 1980). Of course, textbooks do not stand alone; middle school social studies teachers generally do not teach reading comprehension strategies as part of the regular coursework. Such textbooks and instruction substantially jeopardize students' success in the acquisition and expression of subject matter knowledge and development of expertise. When combined with low prior knowledge, textbooks become ineffectual, in both conveying critical contexts necessary for historical thinking and solving important problems. The content of textbooks becomes situated onto itself, with few possibilities for developing generalized interpretations (expertise) in students.

Developing Expertise

"A critical aspect of expertise is the ability to extend the knowledge and skills one has developed beyond the limited contexts in which they were acquired" (National Research Council, 2001, p. 87). Indeed, one of the major differences between experts and novices is that experts can view and transfer new problems or situations onto an already existing schemata. Voss (1987) has argued that transfer is "a function of how the information is acquired rather than of what was learned" (p. 609). In his conceptualization, learning consists of relating and integrating prior knowledge with incoming information, and an expert learner is flexible enough to use directly related concepts, as well as a range of subordinate concepts, in processing information related to an ill-structured problem. Recognizing information as different forms of knowledge (e.g., facts, concepts, and principles) plays a vital role in transfer in that information "stored" in long-term memory interacts with new information, or "working" knowledge, based on retrieval cues. When the proper retrieval cues are taught, knowledge can be simultaneously acquired and used. If knowledge is to be transferred successfully, learners must develop an understanding of when, and under what conditions, it is appropriate to apply information that has been learned.

Given the divergence between goals of social studies and the reality of poorly written textbooks and corresponding instructional paradigms, the question remains: How do educators better develop expertise in students? Clearly, teaching memorization routines does not work; teaching the underlying principles alone,

however, also may not promote conceptual understanding (Leinhardt, 1992). Concentrating on how information is structured and acquired, we suggest teaching different knowledge forms together and explicitly acknowledging their interrelationships (e.g., how facts can be organized within concepts and, in turn, how concepts can be hierarchically interrelated within broad principles).

Two critical features for increasing conceptual knowledge and problem-solving skills necessitate adapting curricula, with particular attention paid to principles without jeopardizing facts and using measures that provide a stable judgment of expertise (reflecting the potential for transfer and generalizations of interpretations). We propose using CBI to accomplish this outcome by (a) broadening the information base presented in historical textbooks to reflect more structure, and (b) providing students general case situations for using this information in solving generalized problems. Adapting social studies textbooks in a conceptual manner emphasizes only critical information and develops organizational clarity of the subject matter to improve student access in making connections between key principles and their supporting argument (Woodward, 1994).

A concept-based focus provides the teacher with a template for specifying the domain-specific conceptual knowledge with corresponding explicitly identified attributes and examples and nonexamples. This framework systematically organizes information in a logical and strategic manner so that all information within the text can be interconnected. *Concepts* serve as anchors for cognitive structure and are defined as abstractions that share a common set of defining characteristics or concept attributes that are not constrained by time or setting, from which contextual examples (and nonexamples) can be applied (or ruled out; Klausmeier, 1992; Tindal et al., 1992). *Attributes* are critical in structuring information conceptually because they represent the rule that defines the relevant category and communicate proper values and relationships to distinguish examples from nonexamples (Martorella, 1972; Tennyson & Park, 1980). Concept attributes provide the structure that enables students to apply information from the text to an unlimited number of circumstances that span time or setting. In other words, CBI provides students an organized record of the past and discipline-specific vocabulary within a conceptual structure while minimizing the irrelevant details. Linking a limited selection of concepts and their attributes enhances student access to both information and the strategies to apply that information. Especially for students with disabilities or low-achieving students, this concept focus highlights the critical content information and reduces the confusion often associated with attempting to make sense of numerous unconnected pieces of factual information.

The following example provides the context to CBI for addressing state standards that require students to "understand the major characteristics and historical influence of the early civilizations of Mesopotamia, Indus River Valley, Egypt, the Americas, and Greece" (Oregon Department of Education, 2003). Memoriz-

ing specific facts about the Olmecs, Mayas, Aztecs, and Incas, or other specific early civilizations, will not promote an understanding of the major characteristics of civilizations—both common and uniquely defining. Using *civilization* as a concept, however, can achieve this outcome when considered in terms of the underlying attributes: (a) an economic base, (b) a set of religious beliefs, (c) a means of formal communication, and (d) a social structure. Placing individual facts into this common set of attributes of civilization helps the learner (a) distinguish the important commonalities between civilizations and (b) better use that information when explaining their influence on the Americas. Students can then apply those same attributes to a new context when evaluating any other civilization in other times or eras (generalize interpretations to reflect expertise).

In sum, the study of history requires simultaneous acquisition of content knowledge and substantial learning of transfer skills to succeed in problem solving. To improve transfer skills, students not only need to be able to comprehend a mass of historical information but also access methods for categorizing and recalling information in order to understand appropriate relationships within situated contexts. To solve problems, students also need to use cognitive strategies to clearly connect the units of knowledge (Chi & Koeske, 1983).

Our purpose in this study was to extend a developing program of research that has investigated concept-based instruction to promote student content knowledge and problem-solving skills of at-risk students and students with learning disabilities. Using a two-group repeated-measures design, students in the experimental group were taught a unit of U.S. history that emphasized concepts; students in the control group were taught the same unit, emphasizing content with a more traditional textbook-based instructional method of lecture and discussion. Two factual knowledge and three vocabulary tests were given to measure student content knowledge, and five performance tasks were administered to measure student problem-solving skills.

Method

Participants

This study took place in a suburban middle school within a Pacific Northwest public school district serving 18,000 students. The school was considered average in size and socioeconomic status, with a student population of just over 500 and ranked in the 46th percentile for free- or reduced-lunch eligibility.

Students were comparable on several achievement measures. First, on curriculum-based measures (CBM) of oral reading fluency, in which the student reads a level-appropriate passage and the number of correct words per minute is totaled, both groups in this study were comparable, $t(52) = .281$, $p = .78$. On a measure of student written expression scored using the statewide rubrics (1–6 scale)

in ideas and content and organization, the experimental group averaged 3.0 and the control group averaged 3.1, respectively, reflecting comparability, $t(51) = .046$, $p = .96$. Third, students were comparable on social studies grades, $t(51) = 1.87$, $p = .07$. Fourth, the groups were nearly equivalent in (a) the number of boys and girls, (b) absences during the study, (c) ethnicity, and (d) educational status (3 additional special education students in the experimental group). Demographic statistics are provided in Table 1.

Experimental group. A total of 26 students from an intact eighth-grade social studies class participated in the experimental group. Demographics for this group included the following: (a) an even distribution of girls and boys, (b) a slightly higher than average number (19%) of students receiving special education ser-

TABLE 1. Demographic Statistics of Student Participants

Statistic	Group	
	Experimental	Control
Total	26	28
Female	13	16
Male	13	12
Educational status		
General education	20	23
Talented and gifted	1	3
Special education	5	2
Ethnicity		
Caucasian	19	26
Asian–Pacific Islander	1	1
Hispanic	6	1
Mid-trimester social studies grades		
A	2	9
B	8	8
C	13	8
D	3	3
Study absences		
0	16	17
1	3	5
2	5	5
3	2	1
Oral reading fluency		
M	144.54	147.54
SD	34.29	43.15
Written expression—ideas		
M	2.93	2.92
SD	.66	.72

vices, (c) a predominantly White (73%) population, (d) the majority (62%) of students receiving mid-trimester social studies grades of C or below, and (e) an average in oral reading and written expression similar to the district means.

Control group. A total of 28 students from an intact eighth-grade social studies class participated as the control group. Demographics for this group included the following: (a) a slightly higher number of girls than boys, (b) an average number (11%) of students receiving special education services, (c) a predominantly White (93%) population, (d) a minority (39%) of students receiving mid-trimester social studies grades of C or below, and (e) an average performance in oral reading and written expression similar to the district means.

Measures

Factual knowledge tests. Two end-of-chapter factual knowledge tests from the textbook publisher were administered by the participating teacher. Although we had no information on the technical adequacy of the tests, we reviewed the items by relating them to the chapter themes and subheadings. We found that several questions failed to focus on the chapter themes or section subheadings. Instead, they highlighted insignificant or esoteric information, and we eliminated them. In the end, the test comprised 10 multiple-choice and 10 matching items. Both factual knowledge tests were scored by trained graduate students using a key developed by the participating teachers. Correct responses received 1 point, and incorrect responses received 0 points. The total number of possible points for each task was 20.

Vocabulary tests. Three vocabulary tests were administered by the participating teacher prior to the beginning of the study and once after each chapter to assess students' content vocabulary acquisition. Each test followed protocols field tested by Caros (1996), in which students were given randomly chosen definitions and then asked to match them to the correct word. Twenty definitions were randomly chosen from a pool of examples related to the chapter concepts for each administration. Each vocabulary test was scored by a trained graduate student using a key developed by the participating teachers, with correct responses receiving 1 point and incorrect responses receiving 0 points.

Problem-solving essays. Five problem-solving essays linked to the chapter concepts were developed by the first author and a participating teacher. Each task required students to synthesize and apply information to answer a unique, non-taught problem. Construction of each essay focused on student skill in evaluating a decision or outcome. We defined *evaluation* as a careful analysis of a problem to identify and use appropriate criteria to make a binary decision and then defend it (Tindal et al., 1992). For each essay, an introduction established a context for the problem, and then a specific problem was described that required the

student to take a position and evaluate how the problem might affect daily life. For example, students were asked to respond to the following prompt:

> Below is a map of the English colonial regions you have been studying. Pretend that it is now 1700, and all trade has stopped between the colonies and between the colonies and Europe. Think about how that stop in trade might affect the colonies. You must write a report evaluating which colonial region, Middle Colonies or Southern Colonies, you believe would be most affected by this stop in trade.

The first two essays were administered by the participating teacher during the first chapter, and the second two essays were given during the second chapter. A fifth essay was administered as a maintenance check 2.5 weeks after the end of the study.

Student performance on the essays was scored by two trained graduate students using a guide designed specifically for this study, evaluating both students' content knowledge and problem-solving skills (see Figure 1). This guide had three parts. Part 1 focused on the presence of an evaluative choice made from the task options and was worth 1 point. Part 2 addressed the inclusion of a rationale for the evaluative choice made and also was worth 1 point. Part 3 considered the supporting facts used in the response and employed a scale from 0–5 for the choice and the nonchoice, resulting in a total of 10 points. Because this method guided the scorer through a series of decisions, disagreements in scoring judgments were minimized, allowing us to attain 100% agreement.

Reliability of Problem-Solving Essays

Prior to scoring any essay, the identity of students and groups was secured and made confidential by replacing names with an identification code number and shuffling together the protocols from both groups. Two trained graduate students initially scored all essays. Both graduate students were completing educational graduate degrees at a local university that included training in a preservice teacher preparation program. We estimated interrater reliability of performance by giving a value of 1 to each matching score from the two judges and a value of 0 to those not matching. A reliability coefficient was calculated by dividing the total number of matches by the total number possible. A total of 121 (49%) samples of the five administrations of the problem-solving task were rescored. We reached agreement on an average of 83% of the essays, which was quite consistent across all five of them: 83%, 84%, 85%, 80%, and 86%, respectively.

Procedure

Students met for 21 class sessions, with 4 full sessions used to administer the problem-solving essays. In the remaining 17 sessions, students were given either a factual test or one of the vocabulary tests, which was administered with equal

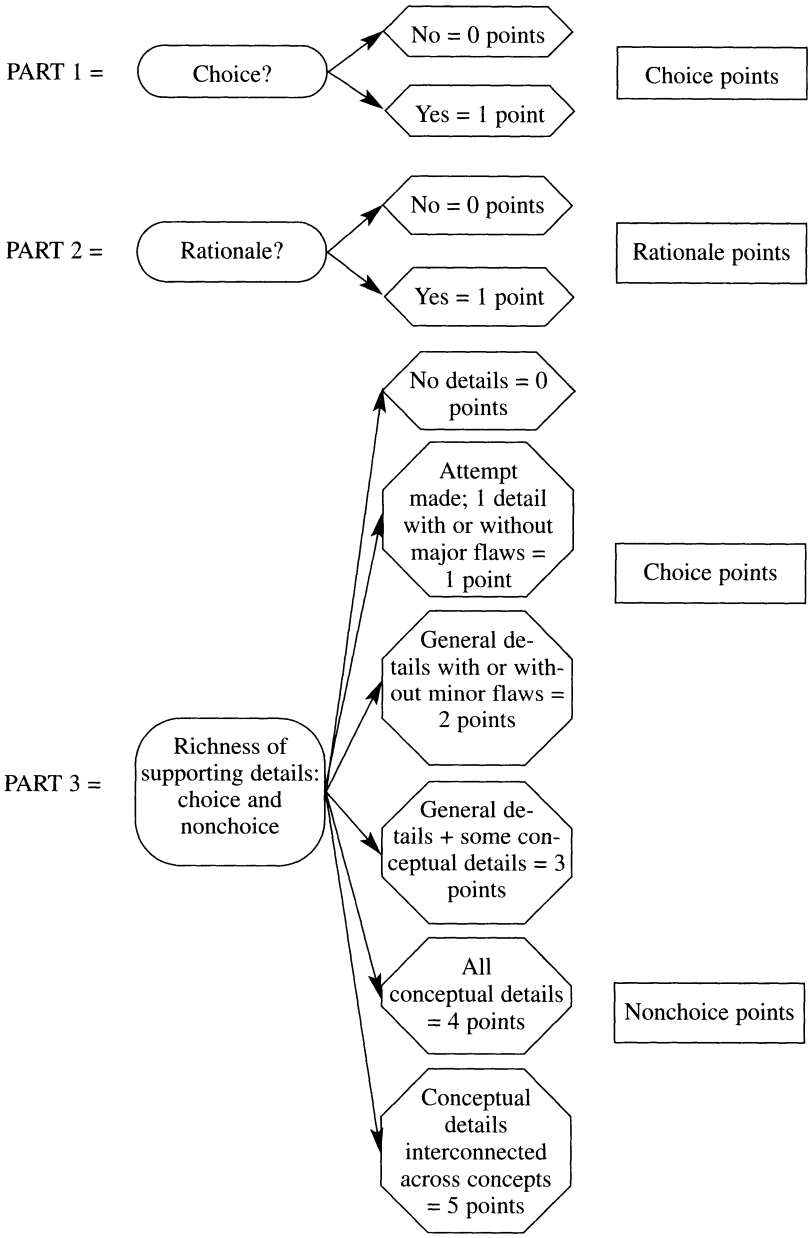

FIGURE 1. Problem-solving scoring guide.

intervals between each test. To ensure fidelity of treatment, the participating teacher and second author delivered instructions to both groups. A chapter on early colonial America was taught during Days 1 through 10, and a second chapter about the growth of the colonies was taught during Days 11 through 21. Each day, instruction focused on a specific section of the text for both conditions.

Classes met daily for 46 min during the school's sixth period. For 5 weeks, we explicitly taught the concepts to students in the experimental group. In each lesson, previous concepts and attributes were reviewed. After completing an instructional activity, students used their notes to fill in examples of each attribute covered by the activity. As a closure activity, the teacher reviewed the concepts and attributes with a formative question-and-answer session. They also reviewed student notes periodically to monitor individual and class progress.

Students in the experimental group were explicitly taught content and practiced problem solving using concepts as a framework for introducing, delivering, and discussing colonial U.S. history. Factual knowledge included examples and nonexamples of the concepts that were extracted from the textbook, resource documents, newspapers, and student experiences. Problem-solving practice focused on explicitly teaching students to think out loud and write in an evaluative manner as well as assessing their success with a qualitative scoring guide. For both factual and problem-solving instruction, we (a) began each day with a review of the previous lesson, (b) scaffolded the instruction of new lessons incrementally, (c) provided opportunities for guided and independent practice (with corrections and feedback), and (d) conducted weekly reviews.

Students in the control group were provided a more traditional, textbook-based approach to instruction that included (a) introducing the lesson and day's task, (b) group and teacher reading of a portion of the day's text passage, (c) individual silent reading of the remaining day's text, and (d) completing text comprehension questions. Each lesson was outlined for the teacher to be consistent with instruction that occurred for the students in the experimental group. The concepts were embedded within each phase of instruction, with students prompted to "think about" the unit concepts and their examples within the reading.

Fidelity of Implementation

To check for fidelity of concept focus, 6 of the 17 lessons were audiotaped for both groups. For this analysis, a graduate student was trained to review the first 15 min of each tape and record concept data in two ways. First, the reviewer recorded the amount of time that elapsed until the first predefined concept statement occurred. Second, the reviewer used a checklist to record the number of concepts and attributes explicitly presented. In this case, only exact matches of concepts and attributes were counted. No synonyms were accepted. Concept use across the 6 lessons averaged 48 s, with an average of 58 concepts and attributes

used for students in the experimental group. For the control group, concept use averaged 194 s, with an average of 9 concepts used.

Results

Analyses

We analyzed all measures using a repeated-measures analysis of variance (ANOVA), with alpha set at .01. All data were initially examined using Mauchley's test of sphericity: For two of the three measures (factual knowledge and vocabulary tests), the assumption of sphericity was met. Means and standard deviations for both groups across all measures are presented in Table 2.

Factual knowledge and vocabulary tests. Factual knowledge data were analyzed using a 2 (group) × 2 (time) repeated-measures ANOVA, which revealed a statistically significant main effect for time, $F(1, 46) = 24.82$, $p < .01$, $d = 1.6$, but no statistically significant interaction effect ($p = .81$). As the means table and the large effect size show, the improvement of both groups may be attributed to instruction.

On the other hand, results for the vocabulary tasks (2 × 3 repeated-measures ANOVA) showed a statistically significant interaction effect, $F(1, 44) = 46.76$, $p <$

TABLE 2. Descriptive Statistics for Each Group, by Task

	Group						
	Experimental			Control			
Task	*n*	*M*	*SD*	*n*	*M*	*SD*	99% CI
Declarative							
Time 1	21	10.14	4.48	27	9.78	3.78	7.72, 12.54
Time 2	21	12.19	3.20	27	12.04	2.44	10.55, 13.83
Vocabulary							
Time 1	20	15.65	2.46	26	15.19	2.77	14.06, 17.24
Time 2	20	16.15	3.13	26	14.77	3.60	14.10, 18.20
Time 3	20	18.55	1.23	26	14.19	2.15	17.46, 19.64
Problem solving							
Time 1	19	2.89	0.94	22	3.14	1.17	2.23, 3.56
Time 2	19	4.16	2.03	22	2.55	0.74	3.24, 5.08
Time 3	19	5.00	1.45	22	3.00	0.98	4.24, 5.76
Time 4	19	6.95	2.12	22	3.82	1.26	5.88, 8.01
Time 5	19	6.44	1.75	22	3.46	1.35	5.98, 7.46

Note. CI = confidence interval.

.01, $d = 1.94$ (Table 3). A visual inspection of the means table indicates a steady slope of domain vocabulary word acquisition improvement for students in the experimental group, whereas the scores for students in the control group remained steady. This confirms the large effect size.

Problem-solving essays. On the problem-solving essays, Mauchley's test of sphericity was significant (Mauchley's $W = .404$, $df = 5$, $p < .01$), thus we used the Greenhouse–Geisser test. We found a statistically significant interaction effect using a 2×4 repeated-measures ANOVA, $F(1, 39) = 16.82$, $p < .01$ (see Table 4). These results also are consistent with the large calculated effect size ($d = 2.2$). Paired t tests for all possible combinations across time were conducted. All performance task analyses revealed statistically significant results (Table 5). An independent-samples t test also was conducted to compare mean differences for a maintenance task that was given 2.5 weeks after the end of the study. Results also were statistically significant, $t(46) = -16.50$, $p < .01$. See Figure 2 for a graphic display comparing trend data between groups on the problem-solving measures.

TABLE 3. Repeated-Measures Analysis of Variance for Vocabulary Tests

Interaction	*df*	*SS*	*MS*	*F*	*p*	η^2
Between subjects						
Group	1	144.67	144.67	8.82	.005	.168
Subject (Group)	44	716.65	16.29			
Within subject						
Time	1	20.40	20.40	11.09	.002	.201
Time × Group	1	85.97	85.97	46.76	.000	.515
Time × Subject (Group)	44	80.90	1.84			

TABLE 4. Repeated Measures Analysis of Variance for Problem-Solving Essays

Interaction	*df*	*SS*	*MS*	*F*	*p*	η^2
Between subjects						
Group	1	107.69	107.69	25.71	.000	.397
Subject (Group)	39	163.38	4.19			
Within subject						
Time	2.063	134.00	64.94	37.54	.000	.490
Time × Group	2.063	60.03	29.09	16.82	.000	.301
Time × Subject (Group)	80.47	139.21	1.73			

TABLE 5. Paired *t*-Test Results for Problem-Solving Tasks

Pair	*M*	*SD*	*t*	*df*	*p*	99% CI
1	2.53	1.23	14.10	46	.000	2.05–3.01
2	2.68	1.49	12.71	49	.000	2.12–3.24
3	3.31	1.29	18.37	50	.000	2.83–3.80
4	4.64	1.29	16.68	49	.000	3.89–5.39
5	4.43	1.84	16.50	46	.000	3.70–5.15

Note. CI = confidence interval.

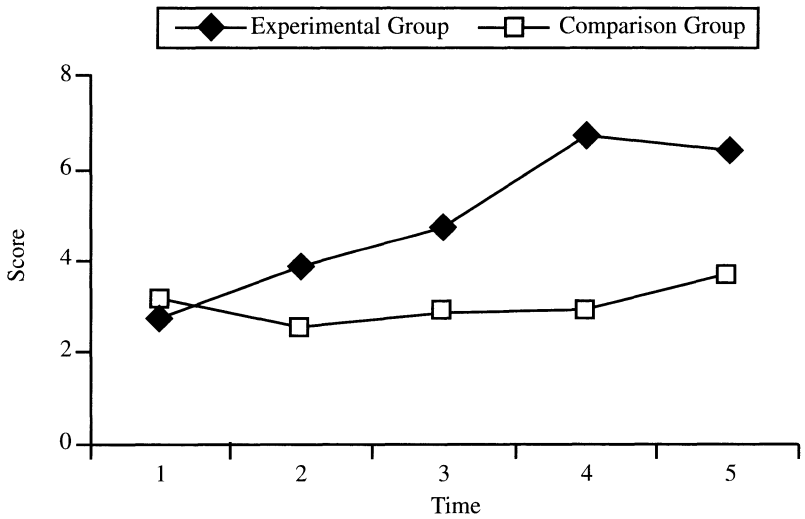

FIGURE 2. Problem-solving task trend data.

Discussion

Our primary purpose in this study was to develop general case historical thinking for students by increasing domain conceptual knowledge and developing problem-solving skills. We used CBI to foster this focus on concepts.

Although there was no statistical difference between the two groups on the factual knowledge tests, both groups increased their factual knowledge. The findings were consistent with Voss's (1987) problem-solving model. On the surface, CBI is at least as effective as a traditional model in teaching facts. Be-

cause facts are integral to providing a historical record, it appears that CBI focuses on the critical facts at least as appropriately as traditional models.

The results from the vocabulary measures tell a different story, with greater performance attained by students receiving CBI. It may be that the organizational structure of CBI allows teachers to devote more quality instructional time to introducing, defining, and putting a context to new vocabulary words. For example, the difference between groups in domain vocabulary acquisition may have been related to the significantly higher number of concepts and characteristics used in the experimental intervention than in the control intervention (a ratio of nearly 6.5 to 1). This may be due to the extension of words as definitions into contextual words as concepts. When students were able to "hook" these definitions into a framework with rules, the words may have begun to take on deeper conceptual meaning. Despite this significant difference, the percentage of correct items for both groups ranged between 70% and 93%. The relatively high level of vocabulary performance by the control group may indicate that even a minimal use of well-organized concepts (without explicit attributes) within an instructional format can provide an accessible framework of information.

The results from the problem-solving essays support the effectiveness of CBI in enhancing student skill in applying conceptual knowledge by integrating information allowing teaching and learning to be equally represented. Students do not learn words and ideas in isolation but as a cluster of information. For example, one of the significant mean differences appeared on the third performance assessment. This specific task required students to think about what it would have been like to immigrate to the American colonies. The question presented them with the problem of having to make a decision with respect to which American colonial region (middle or southern) they thought would most improve their lives if they had been an early settler. Students in the experimental group showed significant improvement in transferring their conceptual knowledge in their responses. These responses included details for evaluative choice and nonchoice, as well as considerable density of concepts and their characteristics.

Students in both conditions generally performed well on the vocabulary tasks, yet diverged in their capacity to solve the historical problems. Although students in the control group scored sufficiently well (70% of items correct) on the final vocabulary task, only 13% of their responses on the final performance task represented conceptually focused supporting details, whereas nearly 83% of experimental student responses contained conceptually focused supporting details.

Limitations

These positive results also must be interpreted with respect to three important limitations. First, the primary teacher and the second author cotaught both con-

ditions to both groups. They may have inadvertently manipulated conditions to work in favor of the experimental group and against the control group. In fact, when counting concept use via the audiotapes, we found that students in the experimental group were exposed to more concepts than students in the control group. This notwithstanding, we attempted to control for potential diffusion effects by using the same number of lessons, textbook chapters, measures, and instructional efforts, such as preparation, enthusiasm, consistency, and behavioral management routines, across both conditions.

Second, the outcomes on the factual knowledge and vocabulary measures may have been due to the measures themselves. Generally, it is difficult to match the domain of instruction with the domain of assessment when using facts as the basis for alignment because many facts are taught and not tested, and some of those tested may not have been taught. We did not determine the validity of our declarative knowledge measures prior to the study to determine the alignment with instruction. The statistically nonsignificant findings may reflect this lack of alignment.

Third, a novelty effect could have been present because the intervention was relatively brief (only 5 weeks, with essentially only 17 days of direct instruction). It is likely that students in the experimental group increased their ability to provide more supporting details in evaluating concepts, and their characteristics were connected because they were taught to do so. A lengthier intervention may minimize the novelty and allow researchers to investigate whether CBI indeed provides greater benefit to those students with weaker reading and writing skills. Given the complexity involved in receiving, filtering, sorting, and applying knowledge, a greater number of instructional lessons would enhance the potential of those students to solve problems if they focused on defining and structuring concepts while organizing and teaching them within a problem-solving paradigm.

Interpretations

We believe this study provides empirical support to our emphasis on concepts within a situated problem space. Students can learn to evaluate complex problems using concepts when they are explicitly taught. And these results should come as no surprise.

Given that social studies teachers teach mainly from texts that are heavily dependent on reading skill and factual memorization, CBI is a model that can bypass this traditional teaching and learning paradigm in two important ways. First, student performance may have been an outcome of an inherent logic or explicitness to the organization of the concepts. Explicitly organizing content with a concept–attribute structure uncovers the connections of concepts implicit in the textbook. With the attributes providing a rule set for the concept, potential relationships are clearer to the learner, especially students who have

reading difficulties. When these relationships are made clear to students, the concept–attribute structure serves as a schema that enables the learner to more easily connect the information. The clearer the connections or links between elements of the knowledge base, the easier it becomes for students to both acquire and access that information (de Jong & Ferguson-Hessler, 1986).

Second, although problem solving requires the possession of a critical knowledge base of connected information, learners also need strategies about how to think and specific techniques to analyze, interpret, and apply content (Newmann, 1990). As Alexander, Schallert, and Hare (1991) aptly put it, "It is certainly possible to know the what of a thing without knowing the how or when of it" (p. 323). And, unfortunately, teachers usually teach the "what" of a thing and ask students to perform to the best of their ability, rather than providing them the opportunities to practice performing a given skill (Beyer, 1984). Our CBI focus addressed both a knowledge base of (conceptual) information and strategies for using it.

Rarely do textbooks include instructional guidelines about how to think about the information presented. Because of these omissions, students often are asked to answer problem-solving questions without having been provided any instruction on how to think about and answer such questions. As such, many students must guess, using incomplete or incorrect strategies. Concept-based instruction reduces the amount of guessing the student needs to make by teaching the knowledge forms together and providing opportunities to practice strategic thinking. To truly promote student problem-solving skill, congruence must exist between the teaching of concept-level knowledge and strategic thinking and application skills.

Because acquisition of content in one domain does not automatically translate or transfer into acquisition into the other, we must remain cognizant of the need to design curricular and instructional methods focused on both. The results of this study confirm the need to teach students using conceptual knowledge, as well as procedures for thinking about and applying information to solve problems. If developing historical problem-solving skills requires conceptual knowledge in a breadth of domains, then to succeed in learning transfer activities, students need to be taught how to relate and integrate knowledge flexibly enough to apply those concepts across unique scenarios.

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