Cognitive and Affective Outcomes of Varying Levels of Structured Collaboration in a Computer-Based Learning Environment.

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Cognitive and affective outcomes of varying levels of structured collaboration in a computer-based learning environment

Repman, Judith LaVine, Ph.D.
The Louisiana State University and Agricultural and Mechanical Col., 1989

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COGNITIVE AND AFFECTIVE OUTCOMES
OF VARYING LEVELS OF STRUCTURED COLLABORATION
IN A COMPUTER-BASED LEARNING ENVIRONMENT

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
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in partial fulfillment of the
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in

The Department of Administrative
and
Foundational Services

by

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ABSTRACT

This study investigated cognitive and affective outcomes resulting from the use of varying levels of structured peer collaboration (unstructured, structured, and structured with training) in a computer-based learning environment. The study was designed to apply research findings showing a positive relationship between giving explanations and achievement into classroom practice, focusing on a sample of students at-risk of school failure.

The sample consisted of 190 students enrolled in nine sections of seventh grade social studies at two middle schools in East Baton Rouge Parish, LA. The schools were selected because they contained large percentages of students at-risk of school failure.

Intact classes were randomly assigned to receive one of the three treatments for a nine-week experimental period. During this period, students were assigned by the teachers to groups of three to complete computer-based learning activities that focused on critical thinking and problem solving. Collaboration protocols defining the roles and responsibilities to be used during the learning sessions were given to students in both the structured and training groups. Additionally, the researcher conducted three fifty-minute collaborative
learning training sessions with classes receiving the structured collaboration with training treatment.

Several cognitive and affective outcomes were measured through the use of pre- and posttests: content area achievement, critical thinking ability, self-esteem and perception of the learning environment. Frequency of specific verbal interactions (explanations given and input suggestions made) was recorded during classroom observation.

Significant findings include: (a) training was an effective means of increasing the frequency of giving explanations within collaborative learning groups, (b) students who received structured collaboration (with or without training) scored higher on the social studies achievement test than students in the unstructured groups, and (c) students who received training scored higher than students receiving only structure on the posttest of self-esteem. Students in the structured (without training) groups reported that they felt more in control of the processes within their collaborative learning groups and had greater freedom to set their own instructional pace, while students receiving training in the roles and responsibilities within the collaborative learning groups declined in their perception of the amount of freedom they had to control the pace and style of their learning groups.
CHAPTER I
Introduction

One of the most paradoxical problems facing the American public school system today is the emphasis placed on achieving excellence through increased standards while simultaneously reducing the number of students who drop out of school. Numerous reports and commissions have issued calls to raise standards for high school graduation and have recommended an emphasis on the teaching of higher order thinking skills and problem solving across content areas (McDill, Natriello, & Pallas, 1986). Implied in this movement is the notion that higher standards will produce students better prepared for higher education or the job market.

At the same time there is growing concern about the social and economic cost of the large body of students who fail to complete high school. Education officials in Louisiana have already expressed concern that requiring courses formerly seen as college-preparatory for high school graduation will increase the number of dropouts in the state (Pratt, 1985, May 8).

The question that must be answered is how at-risk students can be prepared to meet the higher standards that will be required for high school graduation. "Better testing, improved graduation requirements, and
increased holding power represent comprehensive reform and demonstrate commitment toward helping all our young people learn to become participants in their culture" (Conrath, 1986, p. 50).

The Computer-Assisted Thinking Skills (CATS) Project represents one attempt to provide at-risk middle school students with an enhanced curriculum, promoting increased achievement as well as positive feelings toward school, learning, and self. Funded by a grant from the Louisiana Board of Elementary and Secondary Education, the CATS Project utilized a computer-based learning environment to provide instruction and practice in critical thinking activities in three content areas—math, science, and social studies.

The research described in this document represents an investigation of a particularly promising instructional intervention (peer collaboration) within the social studies focus of the CATS Project. Social studies teachers have been singled out as having a special responsibility "to integrate information, knowledge, and critical understanding into the learning process" (Massialas & Papagiannis, 1987, p. 53). Instructional methodology combining computers and collaborative learning has been identified as one way to promote effective learning of both social studies content and the
skills needed for responsible citizenship (Budin, Taylor, & Kendall, 1987; Vermette, 1988).

**Statement of the Problem**

The purpose of this study was to compare the effects of three levels of structured peer collaboration (unstructured, structured, and structured with training) within a computer-based learning environment on at-risk and regular students in seventh grade social studies classes. A variety of cognitive and affective outcomes have been investigated: critical thinking skills, social studies achievement, self-esteem, and attitude toward the classroom learning environment. The frequency of specific verbal interactions that occur during collaborative learning has also been compared across treatment groups.

**Rationale**

The social organization of classrooms within schools has evolved into patterns of teacher-student interaction that are familiar to all educators. Goodlad (1984) identifies the following characteristics of this organizational pattern:

- **First,** the dominant pattern of classroom organization is a group to which the teacher most frequently relates as a whole.
- **Second,** each student essentially works and achieves alone within a group setting.
Third, the teacher is the central figure in determining the activities, as well as the tone, of the classroom.

Fourth, the domination of the teacher is obvious in the conduct of instruction.

Fifth, there is a paucity of praise and correction of students' performance, as well as of teacher guidance in how to do better next time.

Sixth, students generally engage in a rather narrow range of classroom activities—listening to teachers, writing answers to questions, and taking tests and quizzes. (pp. 123-124)

Collaborative, or cooperative, learning is one technique frequently suggested as an alternative to this traditional pattern of classroom interaction. For the purposes of this research, collaborative learning refers to a situation where two or more students must work together to complete an assigned task or solve an assigned problem (Slavin, 1983).

Numerous research projects, in laboratory as well as classroom settings, have been carried out to investigate the effectiveness of collaborative learning. A number of potentially relevant independent variables have been examined: task structure, reward structure, group size, group composition, content area, grade level, and interaction behavior patterns. Outcomes that have been
investigated include achievement, intergroup relations (race relations in desegregated schools), attitudes toward handicapped individuals (mainstreaming), self-esteem, locus of control, time-on-task, liking of class and classmates, and cooperation or altruism (Slavin, 1983).

From a review of this body of research, Slavin (1980) concludes that cooperative learning techniques frequently result in significant improvement in academic achievement; at worst, they appear to be no worse than traditional instruction. Slavin also found indications that cooperative learning can lead to increased self-esteem and more positive attitudes toward school. Sharan (1980) found similar positive effects for cooperative learning for both cognitive and affective outcomes.

Extending this research into an examination of specific collaborative behaviors related to increased achievement, Webb (1985) found that the benefits of cooperative learning are almost totally dependent on the verbal interaction that occurs in the group setting. Specifically, Webb identified a significant relationship between giving and receiving help, and with the type of help given or received, and achievement. Giving extended, or elaborated, explanations is usually associated with increased achievement for the helper.
These helpers tend to be high ability students. Receiving explanations (as opposed to receiving brief responses or no help at all) is the only category of receiving behavior associated with increased achievement. Similar positive relationships have been found between types of verbal interactions and achievement in students collaboratively learning computer programming (Webb, Ender, & Lewis, 1986) and students engaged in computer-based problem solving (King, in press).

From an analysis of these studies Swallow, Scardamalia, and Olivier (1988) conclude that structure is one key variable in collaborative learning. Structured activities specify roles and behaviors students are to engage in during the collaborative learning session (Dansereau, O'Donnell, & Lambiotte, 1988). Structure can be used to ensure that all group members participate equally in both giving and receiving help, as well as providing students with models of successful thinking and problem solving behaviors (Forman & Cazden, 1985; King, in press).

Swallow, Scardamalia, and Olivier (1988) developed a software program designed to support structured collaboration. Students are assigned the role of actor or director and given a topic to investigate. Students then utilize a software program which provides prompts to be used in the collaborative learning process. An
example of a director's prompt is "find out what is known and not known". These prompts are context and content free. Findings from research conducted using this software-supported collaborative learning method indicate that fifth and sixth grade students are capable of successfully utilizing prompts to learn textual information. Increased achievement has also been reported for college students using scripted peer collaboration in non-computer settings (Dansereau, O'Donnell, & Lambiotte, 1988).

Within the framework of this research project, collaborative learning has been classified as a strategy for learning. Learning strategies are techniques used to alter a student's learning process (Weinstein & Mayer, 1986). Researchers have investigated the effectiveness of training students to use learning strategies in reading, with generally positive effects on achievement (Haller, Child, & Walberg, 1988).

Many formal collaborative learning programs include a training, or "how to do it", component. After comparing programs that included training to those that did not include training Slavin (1980) found no significant differences in outcomes that could be directly attributed to a training effect. Unfortunately, in many studies the possible effects of training and
structure are confounded (that is, structure and training are always provided together).

Training may be especially important for low-ability or at-risk students (Jones, 1984). Previous research (MacGregor & Repman, 1989) has shown that while structured collaboration has a positive effect on the mathematics and computer programming achievement of at-risk students, students rarely engaged in the kinds of elaborated help giving behaviors frequently associated with increased achievement. This finding indicates that at-risk students may need training in both giving explanations (as opposed to simply telling their partner the right answer) and asking for explanations before they will be able to take full advantage of collaborative learning as a learning strategy. A paradigm for learning strategy training within a collaborative learning environment includes modeling, coaching, and fading (Brown, Collins, & Duguid, 1988) of the desired behaviors.

Microcomputers, used for instructional purposes in the majority of schools in the United States (Martinez & Mead, 1988), are an example of an instructional setting where students are often allowed to work in groups. Few schools can afford to provide a computer for every student in each class. As a result, teachers often allow students to work in small groups on the computer tasks.
It has been suggested that collaborative computer-based learning "promotes more and better work, more successful problem solving, and higher performance on factual recognition, application and problem-solving tasks" (Johnson & Johnson, 1985, p. 13).

In practice, this pattern of collaboration involves one student "expert" who takes an active role in entering information or experimenting with different tactics to solve the problem, while the remainder of the group acts as passive observers (Diem, 1986). Use of structured protocols to direct student-student interactions should minimize both off-task and passive behavior while providing more opportunities for all students, regardless of ability level, to give and receive elaborated explanations.

Dropping out of school has been found to be associated with low academic achievement (both grades and test scores), low self-esteem, and with an attitude that "school just isn't for me" (Ekstrom, Goertz, Pollack, Rock, 1986; Peng, 1983). This intervention has been designed to provide at-risk students with directed opportunities to engage in critical thinking activities that will lead to feelings of success and mastery.
Research Hypotheses

Based on the generally positive findings reported in much of the research into collaborative learning, the following directional hypotheses have been investigated:

**Hypothesis 1:** Students who participate in structured collaboration (with or without training) will score significantly higher on cognitive measures of social studies achievement and critical thinking ability when compared to students utilizing unstructured collaboration.

**Subhypothesis 1.1:** Students who receive training in structured collaboration will score significantly higher on cognitive measures of social studies achievement and critical thinking ability when compared to students utilizing structured collaboration without training.

**Hypothesis 2:** Students who participate in structured collaboration (with or without training) will score significantly higher on an affective measure of self-esteem when compared to students utilizing unstructured collaboration.

**Subhypothesis 2.1:** Students who receive training in structured collaboration will score significantly higher on an affective measure of self-esteem when compared to students utilizing structured collaboration without training.
Hypothesis 3: Students who participate in structured collaboration (with or without training) will show the greatest increases in positive attitudes toward their classroom learning environment when compared to students receiving unstructured collaboration.

Subhypothesis 3.1: Students who receive training in structured collaboration will show the greatest increases in positive attitudes toward their classroom learning environment when compared to students receiving structured collaboration without training.

Hypothesis 4: Students classified as at-risk will have significantly greater increases in favorable perceptions of the classroom learning environment when compared to students not considered to be at-risk of school failure.

Hypothesis 5: Students who participate in structured collaboration (with or without training) will have higher rates of verbal interactions in giving explanations following an error or question when compared to students utilizing unstructured collaboration.

Subhypothesis 5.1: Students who receive training in structured collaboration will have higher rates of verbal interactions in giving explanations
following an error or question when compared to students utilizing structured collaboration without training.

**Significance of the Research**

The combination of instructional methodologies investigated in this research promises to provide valuable information for research in several areas: collaborative learning, educational computing, social studies, and at-risk students.

The primary purpose of this research was to examine both cognitive and affective outcomes resulting from the implementation of structured collaboration in a computer-based learning environment for seventh grade social studies students. Although existing research in collaborative learning indicates a clearly positive relationship between specific kinds of verbal interactions (giving explanations) and achievement, the results of this research have not been translated into instructional practice.

At the same time, the research provides some indication of the potential benefit of the integration of computer-based critical thinking activities into the framework of social studies instruction. Very little is known about the effects of computer usage in social studies classes. According to data from the 1986 National Assessment of Educational Progress, only 10.2%
of seventh graders in the United States have ever used a computer for any reason in their social studies classes (Lapointe & Martinez, 1989).

In the field of educational computing, there is growing interest in the use of the computer as a tool to foster thinking and problem solving (Lockheed & Mandinach, 1986), but only limited research to support claims for its effectiveness has actually been conducted (Roblyer, Castine, & King, 1988).

One fear often expressed by educators is that computers will serve to widen the equity gap between students of different races, ability levels, gender, or socioeconomic status (Massialas & Papagiannis, 1987). Evidence of differences in the distribution and instructional use of computers has been found (Lapointe & Martinez, 1988). Black students are more likely to attend schools with fewer computers, and fewer teachers in predominantly black schools use computers. Drill and practice activities are used more often by lower ability students while higher ability students are exposed to a wider variety of computer activities, including problem solving and programming (Becker & Sterling, 1987).

This research has been motivated by a desire to demonstrate that all students can benefit from the unique learning opportunities provided by computer-based
learning, if care is taken to develop structured and supportive learning environments. If opportunities to learn strategies for thinking and problem solving are not provided for all students, the current pattern of underachievement and failure will only be repeated (Marzano & Arredondo, 1986; Pogrow, 1987; Parish, Eubanks, Aquila, & Walker, 1989).

**Definition of Terms**

For the purposes of this study the following definitions apply:

**At-risk students.** Students who met any two of the following criteria were classified as at-risk of school failure:

1. Repeated any grade
2. \( \geq 10\% \) absenteeism for the first 9 week grading period (beginning in August, 1988)
3. IEP (Individualized Education Plan) on file
4. Eligible for free or reduced price student lunches (below Federal Income Poverty Level)
5. \(< 80\% \) mastery criterion on Criterion Referenced Reading Test administered in August, 1988

**CATS Project.** CATS is the acronym for the Computer-Assisted Thinking Skills Project, a project funded by a grant from the Louisiana Board of Elementary and Secondary Education. The purpose of the project was to develop and implement a curriculum to teach critical
thinking skills to at-risk seventh grade students in the content areas of math, science, and social studies. The project included curriculum development and teacher training. The CATS curriculum was designed to enhance and supplement existing curricular objectives.

Collaborative learning. Cooperative or collaborative task structure refers to a learning situation where two or more students must work together to complete an assigned task or solve an assigned problem (Slavin, 1983). In this study, collaborative learning did not involve any group incentives or rewards (such as grades or extra credit points) other than the rewards intrinsic in completion of the task itself.

Critical thinking skills. Critical thinking is defined by Beyer (1987) as a collection of operations that contain analytical and evaluative aspects. As a process, critical thinking involves certain cognitive operations (identified by Bloom (1956) as including higher order operations of analysis, synthesis and evaluation, for example), requires a knowledge base, and also consists of an affective (or attitudinal) component. In a recent policy statement, the National Council for the Social Studies (1984) identified six skills related to organizing and using information that should receive major emphasis in the middle school social studies
curriculum: classifying, interpreting, analyzing, summarizing, synthesizing, and evaluating information (p. 261). Critical thinking skills incorporated in the CATS social studies curriculum were designed to emphasize aspects of these skills.

**Self-esteem.** Self-esteem is a subjective measure of the evaluation a student makes toward him- or herself. It is used to indicate the extent to which students see themselves as capable, significant, successful, and worthy (Coopersmith, 1981, p. 5).

**Treatment conditions:**

Unstructured collaboration: Groups of three students worked together to complete the assigned task with no guidance or instruction related to collaborative roles.

Structured collaboration: Groups of three students were given specific roles (keyboarde, questioner, and checker) and responsibilities to follow to complete the assigned task.

Structured collaboration with training: In addition to being provided with the same information given to students in the structured collaboration treatment, students in these classes participated in three fifty-minute training sessions which included modeling and practice of the roles and responsibilities utilized during the collaborative learning sessions.
Limitations

Although the computer does offer many possibilities as a laboratory setting for investigating human learning processes (Lepper & Malone, 1987) this research was not designed to answer questions that would require a tightly controlled, laboratory-like learning environment. This research was an adaptation of a research model designed by Becker (1988). Specifically, this model recommends addressing "what results typically occur when teachers are given some training about using computers, when they have some knowledge of and access to commercially available software, when they have a reasonable number of computers available to their classes of students (although not perhaps one computer for every student every day of the week), and when they use computers in a certain way" (p. 2).

At the same time, the present study did include elements of observation and control that Becker does not consider to be essential, and which may limit the generalizability of the results. Limited resources (hardware and software) forced the restriction of the study to two sites, both located in the Baton Rouge metropolitan area. The small number of teachers (3) who participated in the study could confound teacher effects with treatment effects (Slavin, 1989).
Some limitations resulting from the sample selected also apply to this study. The two participating schools were selected because they contain a large percentage of students identified as at-risk of school failure. Principals at each of the schools selected participating teachers. Classes were randomly assigned to the three treatments within the pool of classes taught by the participating teachers. While random assignment does not guarantee that the treatment groups are initially equivalent, it does increase the internal validity of a research project (Borg & Gall, 1983).
CHAPTER II

Review of the Literature

In reviewing the theoretical and research literature that serves as the conceptual base for this study, it will be necessary to combine several divergent areas of inquiry. This review begins with an examination of a theoretical framework for the social context of learning, which provides a clear rationale for investigations into the specific effects of various types of collaborative learning environments. This is followed by an examination of research into collaborative learning, focusing on intervening variables (particularly group size and composition) and cognitive and affective outcomes. Significant research addressing collaborative learning within social studies classes will also be summarized.

The next sections are devoted to discussions of the relationship between verbal interactions and achievement in collaborative learning groups and to an examination of the role that training plays in the collaborative learning process.

Finally, other salient features to be considered include the specifics of the tasks (critical thinking), method of instructional delivery (microcomputers), and
the students involved (primarily at-risk youth in middle school).

**Collaboration and Learning**

**The Social Context of Learning**

A Vygotskian perspective. Classrooms are social places where hundreds of interactions take place daily (Nelson-LeGall, 1981; Prawat, 1989). As Vygotsky (1978) states, "Human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (p. 88). Much time and effort in research and theory building has gone into one aspect of the "social nature" of classrooms—the relationship between teacher and student. By focusing exclusively on the relationship between teacher and student the possible importance of peer relationships is ignored (Cazden, 1988; Damon, 1984; VanSickle, 1982). Excessive peer interaction in the classroom may even be seen as an intrusion which inhibits the learning process (Johnson, 1980).

Many studies of student-student interactions focus on a limited range of non-cognitive outcomes or compare levels of social development with Piagetian stages of logical operations (Bearison, 1982). According to Bearison, the contradictory pattern of results from these studies has led to a reevaluation of the place of collaboration in the learning process. This new body of
research is concerned not only with "the development of social knowledge but also the social development of knowledge" (p. 202). The Vygotskian theoretical framework has been identified as particularly promising for two of the major areas of interest in this study: the place of collaborative learning in the construction of knowledge and the development of cognitive skills (Damon, 1984; King, in press; Nelson-LeGall, 1981) and also for research into the use of the computer as an intellectual tool (Salomon, 1988).

Vygotsky, while recognizing that the relationship between teacher and student is important, also considered the significance of peer collaboration in the learning and socialization process (1978, p. 90). Vygotsky proposed the existence of a "zone of proximal development" to explain the roles that teacher-student and student-student interactions play in student learning. The zone of proximal development is defined as the distance between the actual developmental level of a child and the level of potential development. The level of actual development is measured by the child's independent problem solving ability—similar to what is measured by most standardized achievement tests. The level of potential development can be measured by assessing the child's problem solving capabilities when
collaboration with an adult or peer is permitted (Vygotsky, 1978).

In a study with low-ability students, Campione, Brown, Ferrara, and Bryant (1984) used a sequence of tasks that progressively differed from the initial learning situation to measure ability-related differences in the zone of proximal development. The number of researcher-provided hints needed to solve the problem was the dependent measure. For the low-ability students involved in this study, only small differences or changes in the problem solving task led to decreased individual performance and increased the need for hints.

Thus, the zone of proximal development is defined by both the child's actual developmental level and the guidance or structure provided by collaboration with an adult or peer which allows the child to solve more complex problems (Wertsch, 1985). Forman and Cazden (1985) assert that true peer collaboration takes place only when two or more students work together to solve a problem or create a product that could not have been completed independently. Cazden (1988) points out that it is only with their peers, in classroom situations, that children have the opportunity to engage in this kind of collaboration, "giving directions as well as
following them, and asking questions as well as answering them" (p. 134).

**Collaboration as a process.** Damon and Phelps (1989) categorize three major common approaches to peer education: (a) peer tutoring, (b) cooperative learning, and (c) peer collaboration. In a tutoring situation, one child takes the role of "teacher" while the other child is clearly the "student". Approaches that place students in teams where all members have equal status can be characterized as cooperative learning techniques. In peer collaboration, students are actively engaged in the kinds of higher level thinking and problem solving tasks that individual students could not solve on their own.

In a longitudinal study of fourth and fifth graders performing logical reasoning tasks Forman (1981; Forman & Cazden, 1985) found evidence of true collaboration in successful problem solving strategies utilized only when students worked collaboratively. These strategies were rarely seen in individual efforts to solve similar problems. Three processes appeared to be particularly important in the collaborative setting: (a) mutual guidance, (b) a supportive and encouraging atmosphere, and (c) disagreement over conclusions and tactics.

In each of these processes the role of verbalization and articulation of both cognitive strategies and attitudes or opinions is emphasized (Brown, Collins, &
Duguid, 1988; Forman & Cazden, 1985). Related to these processes is the psychological concept of cognitive dissonance, or the reconciliation of ideas and information inconsistent with the student's personal knowledge (Bearison, 1982; Forman & Cazden, 1985; King, in press; Prawat, 1989).

Brown, Collins, and Duguid (1988) stress the value of peer collaboration in the learning process in their theory of cognitive apprenticeship, situated cognition, and social interaction. In their view, learning begins with students in the roles of apprentices, being coached and supported by teachers and peers. After an instructional foundation has been constructed through apprenticeship, students move into a phase of collaborative learning, where skills and tactics are practiced on real-world problems in realistic settings. Collaborative mastery of non-abstract problems in a supportive environment is the necessary first stage before students begin to solve abstract, decontextualized problems. The apprenticeship and collaborative phases of the learning process provide students with a supportive framework that allows them to progress beyond their actual developmental level.

In Vygotsky's (1978) opinion, the most important feature of a learning environment is the creation of a
zone of proximal development—a gap between the actual and the potential. Theoretically the zone of proximal development is always present, however, many learning situations fail to take advantage of its existence. The zone of proximal development is only a factor in learning situations where learning activities are structured to encourage students to move beyond their level of actual development.

Collaboration in Classroom Settings

Overview. John Dewey (1902) and others in the progressive movement stressed the value of developing social skills as part of the educational process. This movement also emphasized the active participation of students in the learning process, which is often achieved through some form of peer collaboration.

Deutsch (1949) provided a convenient framework for systematic research into the relative effects of different social situations by characterizing three different goal structures: cooperative, competitive, and individualistic. The most significant difference between the three conditions is the level of interdependence that is an inherent feature of each goal structure. In the cooperative situation all group members sink or swim together, a situation of high interdependence. In a competitive situation a goal can be achieved only if other participants fail. In the
individualistic situation there is no relationship between the success of one and the success or failure of others.

Kelley and Thibaut (1969) classified these goal structures from the perspective of distribution of rewards. In a cooperative situation, individual rewards are based on the overall quality of the group's work. As might be expected, in the individualistic situation the work of each individual is rewarded independently (that is, it might be possible for all individuals to make an A). Again, the competitive situation is structured such that if one group or individual attains a maximum reward the other groups or individuals will receive the minimum reward.

**Formal programs.** Since the 1970's a number of formal programs have been developed to promote collaborative learning in classrooms. Although these programs differ in many aspects they do have one common element—whole classes are divided into small teams of students whose learning activities are then structured through some combination of formal systems of cooperative tasks and/or cooperative rewards (Bossert, 1988-89; Kagan, 1985). Some of the most popular methods include STAD (Student Teams-Achievement Divisions), TGT (Teams-Games-Tournament), Jigsaw I, Jigsaw II, Group
Investigation, and Co-op Co-Op (more complete descriptions can be found in Sharan, 1980 and Slavin, 1988). All of these methods have been implemented in classrooms across grade levels and content areas.

The differences between these formal programs are extensive and significant. They may differ on task structure, reward structure, or authority structure (Bossert, 1988-89; Slavin, 1980, 1989). Another classification system groups Jigsaw I, TGT, and STAD under the heading of peer tutoring methods, emphasizing their focus on clearly defined tasks and highly structured goals. Other programs are classified as inquiry-oriented, emphasizing data collection and synthesis of information into a group product (Sharan, 1980).

Kagan (1985) identified six major dimensions of cooperative classroom learning programs. First, these programs may differ significantly on the philosophy of education they embody. Some of the most highly structured programs are very similar to traditional classroom organization in their emphasis on teacher defined goals, while other programs allow students to independently investigate topics of their choice. The nature of the learning is another area of potential difference. Some of the programs are much better suited to learning at the knowledge or comprehension level.
Other programs focus on sharing learning-how-to-learn skills. The third dimension that may be varied is the amount of team cooperation or competition built into the program. Different types of task and reward structures fall into this category. The remaining areas of difference are student roles and communication, teacher roles, and evaluation.

Using Kagan's six dimensions, the present study may be characterized as follows:

1. Philosophy of Education—The learning activities in this project are based on teacher and researcher defined objectives and are moderately structured. Thinking skills and strategies are presented as part of the teacher-student instruction and use of these strategies within the collaborative learning tasks is encouraged.

2. Nature of the Learning—The skills and strategies that make up the CATS social studies curriculum focus on critical thinking and problem solving.

3. Cooperation and Competition—No group reward structures have been built into the curriculum. Within-group cooperation is stressed and between-group collaboration is permitted.

4. Student Roles and Communication—In two of the treatment conditions students are provided with explicit
collaboration protocols (utilizing assigned roles) designed to foster elaboration and articulation.

5. Teacher Role--The teacher serves as a consultant and supervisor, ensuring that students stay on task and providing help with hardware or software related problems.

6. Evaluation--Not included as a feature of the collaborative learning activities in this project.

Research in Collaborative Learning

Overview

As might be expected, comparisons between formal programs must be made with caution (Bossert, 1988-89; Newman & Thompson, 1987; Slavin, 1989; Webb, 1982c). Research into the general effectiveness of these formal programs "provides evidence to establish the effectiveness of cooperative learning, [but] it provides no evidence regarding the relative importance of various elements of the cooperative learning methods" (Kagan, 1985, p. 95).

This body of research can be subdivided into three categories (Dansereau, 1988):

1. Field studies in classrooms comparing cooperative learning scenarios with traditional teaching techniques.

2. Investigations of specific parameters of cooperative learning (group size and composition or
verbal interaction patterns, for example) that do not utilize formal methods for processing the material.

3. Finally, a small number of studies have investigated the transfer of skills from cooperative to individual learning. (p. 103-4)

The present study falls into the second and third categories listed above. This project investigates the results of varying the level of structure in a collaborative computer-based learning environment and does not utilize any of the formal programs previously listed. Individually administered standardized tests have been used to assess the effectiveness of the project. As a result of this focus, there is no reason to assume, for example, that research results derived from the comparison of a formal collaborative learning program such as STAD or TGT with traditional classroom instruction will generalize to the present study.

General findings concerning the effectiveness of collaborative learning have been widely published. Slavin (1980) reviewed 28 studies, concluding that "for academic achievement, cooperative learning techniques are no worse than traditional techniques, and in most cases they are significantly better" (p. 337). For learning at the knowledge or comprehension level highly structured
programs with well-defined group reward systems produced the most significant gains in achievement.

Johnson, Maruyama, Johnson, Nelson, and Skon (1981) performed a meta-analysis of 122 studies. They found that cooperation led to improved achievement and productivity when compared to competition or individualistic efforts. No evidence for the effectiveness of between group competition or significant differences between the three types of goal structures could be identified for either outcome measure.

Slavin's most recent work (1989) used best-evidence synthesis techniques to evaluate 60 cooperative learning research studies. He found that 72% of these studies reported positive outcomes for cooperative learning, with only 8% of the studies reporting outcomes favoring control groups. As in his earlier work (1983a), Slavin found the effects of cooperative learning did not differ for high, average, or low achievers.

**Intervening Variables**

**Group size.** Most of the formal collaborative learning programs specify the use of groups with 4-6 members. The Johnson et al. (1981) meta-analysis found that the effectiveness of cooperation (in comparison with competition) increased as group size decreased. Group size is particularly important in computer-based learning environments. It is usually a simple matter to rearrange
desks in a classroom so that students can work together comfortably; in a computer lab the computers are often close together and cumbersome to rearrange. Physical problems such as being able to see the monitor or use the keyboard may also occur with larger groups.

Cox and Berger (1985) conducted a study with seventh and eighth graders to identify optimum group size for computer-based learning activities. Groups with 2-4 members solved more problems than individuals or 5-member groups. Durnin (1985) compared junior high students using the computer to solve science problems individually or in groups of two, three, or four members. In spite of a lack of statistically significant differences between the treatments on achievement posttests, he concluded that groups with four members had more trouble staying on task and coordinating their efforts to complete the task and recommended the use of smaller groups. Trowbridge (1987) found that students working in groups of two or three on computer-based problem solving tasks were more likely to discuss program-related questions. Individuals and quads often misinterpreted the same questions.

Mevarech, Stern, and Levita (1987) studied Israeli junior high students enrolled in a computer-based course in Hebrew. Half of the students were randomly assigned to homogeneous pairs, while the remainder of the students
completed the course individually. Students in the paired condition scored significantly higher on the achievement posttest, as well as on measures of attitude toward their teammates and cooperative learning.

In a study measuring student preferences toward working individually or in pairs at the computer, Lieber and Semmel (1987) found that the majority preferred to work with a partner. As Johnson and Johnson (1986) point out, encouragement and support from peers is a much more "potent reinforcer" than feedback or approval from a computer (p. 13).

**Group composition.** Many of the formal collaborative learning programs specify methods for forming heterogeneous learning groups made up of high-, medium-, and low-ability students (Slavin, 1988). Studies investigating the various combinations of ability levels within collaborative learning groups indicate that a significant relationship may exist between group composition and success (Peterson, Janicki, & Swing, 1981; Webb, 1982c).

One study (Webb, 1982a) in junior high school consumer math classes compared students placed in mixed-ability with students in uniform-ability groups. No significant difference was found between the groups on the outcome measure of achievement. Another study (Webb, 1982b) also compared junior high math students in mixed-
and uniform-ability groups. In this case, the specific instructional content was exponents and scientific notation. A positive relation was found between group composition and achievement in this study. Medium-ability students in uniform-ability groups outperformed medium-ability students in the mixed-ability groups. Further research by Webb and Cullian (1983) found that within uniform-ability groups students were more likely to receive answers to their questions, a factor which proved to be positively related to achievement.

Fourth grade students were placed in uniform-ability groups (high or average) to work on a computer-assisted problem solving tasks in a study conducted by King (in press). Although no significant relationship was found between group ability level and success, significant differences in patterns of verbal interactions were found between successful and unsuccessful groups. Successful groups asked more task-related questions and reached a higher level of strategy elaboration when compared to unsuccessful groups.

Hooper and Hannafin (1988) formed homogeneous or heterogeneous groups of low- and high-ability eighth grade students to complete a computer-assisted mathematics tutorial. Low-ability students in heterogeneous groups consistently outscored low-ability
students in homogeneous groups. Although an interaction between group composition and achievement is frequently hypothesized, the studies reviewed fail to demonstrate a clear pattern of results.

**Cognitive and Affective Outcomes**

**Achievement.** Achievement measures used in most collaborative learning studies are teacher or researcher designed tests that measure mastery of a specific area of content. Task specialization and group rewards have been found to be associated with increased achievement on these tasks (Slavin, 1983, 1987). No pattern of differential achievement outcomes have been identified for low-, medium-, or high-ability students (Slavin, 1983a, 1989).

Webb (1982a, 1982b, 1985, 1989) has focused on specific student behaviors occurring in collaborative settings. Her research indicates a positive relationship between giving explanations and achievement and a negative relationship between not receiving help when it is needed and achievement. Specifics of these studies will be discussed in depth in a later section of this literature review.

**Self-esteem.** Self-esteem has frequently been studied in collaborative learning research, also with generally positive results (Slavin, 1983). These results must be interpreted with great caution, however. Slavin
(1983) points out that these results may be "short-lived and specific to the settings in which they were obtained" (p. 110). Slavin is cautiously optimistic that lasting improvements in self-esteem may result when collaborative learning techniques are implemented on a long term basis, as opposed to brief interventions introduced as part of a research program. A positive relationship between task specialization and increased student self-esteem has also been hypothesized (Bossert, 1988-89).

A generally positive trend toward improved self-esteem as a result of computer-assisted instruction has been found, although very few studies have directly addressed this issue (Roblyer, Castine, & King, 1988).

Attitudes. Slavin (1983) reports on several studies that found a positive relationship between participating in cooperative learning and increased internal locus of control (i.e., the belief that success in school is the result of the student's own efforts and not due to chance or some other factor).

Other studies investigated changes in student attitudes toward their liking of class, school or subject matter. These results have been mixed, possibly due to the presence of a ceiling effect (Slavin, 1983, p. 115). Improved attitudes toward the classroom environment have been found in a study which used structured discussion to
present a series of lessons in map usage to junior high students (Yager, 1985). Johnson, Johnson, and Stanne (1985) compared computer-based problem solving groups using cooperative, competitive, or individualistic goal structures. The cooperative condition proved to be clearly superior for achievement measures but no significant differences were found between the groups on measures of attitude toward computer-assisted instruction or the subject area (geography).

Significant differences have been found between Black, Hispanic, and Anglo students in their perceptions of the social studies learning environment (Knight, 1989). Black students perceived less opportunity for problem solving and interaction with peers than Hispanic or Anglo students within social studies classes. As Knight observes, exact reasons for these differences are not known. Possible explanations include differential treatment by teachers or differences between socio-cultural environments.

Collaborative Learning in Social Studies Classes

Overview

The claim has been made that "when taught correctly, the social studies requires value analysis, critical thinking, group decision making, as well as factual mastery and that all of these goals are aided by the use of CLG's [Cooperative Learning Groups]" (Vermette, 1988,
Cooperative learning has been identified as a particularly promising technique for social studies instruction directed toward low-ability or remedial students (Ross, 1989). Unfortunately, research results from the social studies content area are conflicting, possibly as a result of difficulty matching instructional content with achievement measures (Slavin, 1980).

**Content area differences**

There are two significant differences between the content area taught in social studies classes and other content areas such as mathematics (Brophy, 1989). First, social studies contains an almost overwhelming amount of factual (or propositional) knowledge and a fairly limited amount of procedural knowledge. The second difference is that the procedural knowledge used within the content area is rarely linked to specific facts. As Brophy points out, this means that much of what has been learned from research in areas rich in procedural knowledge closely related to propositional knowledge may not apply to the social studies content area. Issues discussed in social studies classes tend to be ill-structured and controversial (Parker, McDaniel, & Valencia, 1989; Voss, Greene, Post, & Penner, 1983).

**Research results**

Different kinds of verbal interactions have been
found to occur during cooperative learning of lower or higher level social studies instructional material (Peters, 1986) or when learning social studies material through different formal cooperative learning techniques (Nattiv, 1986). Sharan, Hertz-Lazarowitz, and Ackerman (1980) found that elementary social studies students used cooperative learning techniques more successfully when they were engaged in higher-level cognitive tasks.

Two recent studies (Ross, 1988) have been conducted with fourth-grade students solving social-environmental problems via three instructional methods: (a) Student Teams-Achievement Divisions (STAD), a cooperative learning technique; (b) a whole class instructional method which incorporated instruction in problem solving strategies; and (c) traditional instruction. Using pre-, post-, and delayed measures of achievement, no significant differences were found between the whole class method and the cooperative learning groups. Students using either of these techniques did significantly outscore students in the traditional instruction classes. Ross suggests several reasons for these results. First, students in the cooperative groups may not have had enough time to adequately master the problem solving strategies assessed by the achievement test. Second, the possibility exists that the cooperative groups lacked members who could play a
leadership role in modeling the problem solving strategies or directing the learning groups. Finally, this study did not include direct observation of the cooperative learning sessions. The students may not have engaged in the kinds of verbal behaviors that have been found to be positively associated with achievement.

Yager (1985) investigated the effectiveness of structured versus unstructured discussion conditions with junior high students working on a map skills unit. In both cases the teacher presented the day's lesson, which was followed by small-group student discussion sessions. In the structured conditions students were assigned roles (leader or listener) which rotated among group members daily. Students were given specific training and instruction related to their roles. In the unstructured condition, students in each small group were left to develop their own methods for group discussion of the lesson content. Students exposed to the structured collaborative learning condition scored significantly higher on an immediate and a delayed achievement test. On six attitudinal measures students in both groups showed significant gains between pre- and posttesting, but no significant treatment effect (or difference between the groups) was found. Without a third treatment group (which would utilize structure without training) it
is not possible to investigate the contribution that training might have made to the collaborative learning process.

The effect of cooperative team learning in ninth-grade world geography classes composed primarily of low-achievers has also been investigated (Allen & VanSickle, 1984). STAD was the instructional methodology selected for the experimental group while the control classes studied the identical content in the traditional setting of teacher-led discussions and individual work. Pre- and posttests for self-esteem (as measured by the Coopersmith Inventory) and achievement (developed by the researchers to measure lower cognitive knowledge of sub-Saharan Africa) were the dependent measures.

No significant pretest differences existed between the experimental or control groups. Following the six-week treatment, analyses of posttest data found a significant difference in favor of the cooperative learning group on the achievement measure but no significant difference on the self-esteem test (Allen & VanSickle, 1984). Although this study was conducted with a sample very similar to the sample in the present study, the learning tasks and achievement measures are quite different. In the present study, emphasis is placed on critical thinking and problem solving tasks. As a result, achievement measures have been selected to assess
these abilities, not to measure recall of factual knowledge.

**Verbal Interaction and Collaborative Learning**

**General findings.** An investigation of the kinds of verbal interactions that occur when students collaborate in classroom learning may be helpful in explaining some of the contradictory results reported in the preceding sections, particularly for those results related to group composition (Carrier & Sales, 1987; Hertz-Lazarowitz, 1989; Slavin, 1987; Webb, 1985).

Five major types of verbal interactions have been identified by Webb (1982c). Group helping interactions, based on situations involving group reward systems, are generally positively related to achievement. Giving help and receiving help are two types of more specific student–student interactions that occur regularly.

Giving help, especially in the form of elaborated explanations, is almost always associated with increased achievement (Webb, 1982b, 1989). On the other hand, receiving help appears to have a more complex relationship with achievement (Webb, 1982c). When a student asks for help they may receive an explanation, terminal help (i.e. the correct answer with no explanation), or no help at all. Receiving no help or a terminal explanation has been found to be negatively correlated with achievement, while receiving elaborated
explanations is positively related to achievement (Webb, 1985). Low level (or terminal) interactions consist of statements about methods or products while high level elaborations are characterized as discussions about process (Hertz-Lazarowitz, 1989).

The final two types of verbal interactions include off-task and passive behavior. Webb (1982c) found that all studies measuring these interactions found small, negative (but not statistically significant) relationships between these behaviors and achievement.

Microcomputer settings. Several studies have been conducted that investigate the specific kinds of verbal interactions that occur in computer-based learning environments. Eighth grade students using a navigation simulation were assigned to cooperative, competitive or individualistic groups (based on goal structure) in a study by Johnson, Johnson, and Stanne (1985).

Observational data was collected on four categories of verbal interactions: (a) task statements, (b) management statements, (c) social statements, and (d) statements to the teacher. Students in the cooperative condition used task statements more frequently than students in the other conditions and also had the highest level of achievement. Johnson, Johnson, and Stanne conclude that the student-student interaction pattern observed in the
cooperative condition was "almost entirely learning oriented, consisting of statements concerning the completion of the assigned work and the ways in which the group could best work to maximize their success" (p.675).

Two studies have investigated interaction patterns of small groups learning computer programming (Webb, 1984; Webb, Ender, & Lewis, 1986). One study (Webb, 1984) examined junior high school students who were learning the LOGO programming language. Unlike most previous studies, no significant relationship was found between giving explanations and learning computer programming.

A significant, positive relationship was found between giving help and achievement in a second study (Webb, Ender, & Lewis, 1986). In this study junior high school age students learned a different programming language, BASIC, in pairs. In both studies very few instances of students failing to receive answers to questions were noted.

A related study compared the use of various problem solving strategies (means-ends analysis or hillclimbing, for example) and the verbal interaction patterns of collaborative groups solving problems at the computer (King, in press). Successful groups asked more task-related questions, spent more time on problem solving strategy development, and had higher elaboration scores.
These results suggest that an important aspect of collaborative computer-based problem solving is encouraging students to ask task-related questions, which may lead to strategy development and successful problem solving (p. 19).

Trowbridge (1987) studied small groups of middle school students learning science concepts with a computer simulation program. Nineteen different behaviors were observed. These behaviors were classified as keyboard (student interaction with the computer via the keyboard), cognitive (verbal behaviors indicative of thinking activities), and social (verbal and nonverbal behaviors that seemed to facilitate learning). Groups of two or three students displayed more cognitive and social behaviors, indicating a higher level of student-student interactivity. An earlier study by Durnin (1985) which also utilized this classification system concluded that students working in pairs shared more information and engaged in more cognitive interactions.

Structured interactions. Some attempts have been made to develop protocols or scripts to guide student-student verbal interactions in collaborative learning settings. From a series of studies using scripted peer collaboration with college students learning scientific material, Dansereau, O'Donnell, and Lambiotte (1988)
conclude that scripts encourage metacognitive activities, foster more positive attitudes, and result in improved oral and written communication skills. The combination of scripts (which incorporate problem solving strategies) and peer collaboration has also been found to transfer to individual learning situations (Dansereau, 1988).

Swallow, Scardamalia, and Olivier (1988) investigated the effects of using computer software to support collaborative learning of textual information. In this case, the students interacted with a computer program which structured their collaborative learning environment. After selecting a topic to investigate, students were assigned the role of actor or director. It was the director's responsibility to answer the actor's questions and guide the process of investigation. The director received a series of prompts from the computer such as "find out what is known and is not now known", "time for new ideas", "more needs to be said", and "finished thinking". Following the director's prompts, actors entered notes and thoughts into the computer. Fifth and sixth graders were able to use these prompts to engage in extended discussions and clarification of misconceptions.

**Training**

Because of the highly structured nature of many formal collaborative learning methods, training in group
processing skills may be provided for both teachers and students. Slavin (1980) compared programs that included a training element to programs that did not include training. He found no significant differences in cognitive or affective outcomes that could be directly attributed to a training effect, concluding that "it does not appear that group process training is a useful addition to a cooperative learning model, but this needs further study" (p. 336).

One difficulty with much of the research into the possible effect of training on students learning collaboratively is that few research projects have specifically included training as an independent or treatment variable. One study illustrating this problem will be described.

In a study conducted by McDonald, Larson, Dansereau, and Spurlin (1985), college students were given passages of scientific material to learn in pairs or individually. In either case, pairs or individuals were randomly assigned to be trained in the use of a systematic interaction and processing strategy or they were allowed to use their own methods to study the passages. The most effective combination (when measured by a delayed free recall test and a test measuring transfer to a subsequent individual learning task) proved to be the collaborative
dyads who received training in the use of the learning strategy. Again, the effects of structure and training are potentially confounded.

Many other authors contend that providing training in giving help and asking for help (especially elaborated help) could significantly improve the effectiveness of collaborative learning (Bossert, 1988-89; Hertz-Lazarowitz, 1989; Newman & Thompson, 1987; Webb, 1988). Before students can actually request help they must first be aware of the fact that they need help, make a decision to seek help, and identify potential helpers (Nelson-LeGall, 1981). Research (Nelson-LeGall & Glor-Scheib, 1985) has shown that students ask for help from their classmates more frequently than they seek help from their teachers.

Learning strategies. In many of these studies (as well as in the present research) collaborative learning is being used as a kind of learning strategy. Learning strategies are techniques used during learning to "affect the learner's motivational or affective state, or the way in which the learner selects, acquires, organizes, or integrates new knowledge" (Weinstein & Mayer, 1986, p. 315).

One of the results of psychology's increasing focus on cognitive processes is the emphasis being placed on both identifying and teaching cognitive processes and

Direct instruction in cognitive processes and learning strategies takes a "how to do it" approach (Cornbleth, 1985; Jones, 1986). This kind of instruction may be a crucial factor in the success or failure of at-risk students (Jones, 1984). Unfortunately, as Frederiksen (1984) points out, "We find more suggestions as to what processes should be taught than how to teach them" (p. 373). The present research project combines both elements—what skills to be taught and how to teach them. This research has been designed to separate the effects of structure and training in a collaborative learning situation. Special emphasis has been placed on investigating the success of this instructional methodology with a sample of students classified as at-risk of school failure.

**Critical Thinking and Microcomputers**

*A conceptual definition.* Critical thinking skills
and problem solving strategies, while always important, will become essential not only for high school graduation but also for employment in an increasingly technological and information-based economy (Nickerson, 1988, 1988-89; Pauker, 1987). Critical thinking skills require more of the student than recall of knowledge or comprehension (Resnick, 1987). Critical thinking is a process. Commonly identified features of this process include problem identification, information seeking, identification of relevant information, exploring and evaluating alternatives, and reflecting on one's thinking or metacognition (Cornbleth, 1985).

One key to successful critical thinking is the presence of an adequate, subject-specific knowledge base (Alexander & Judy, 1988; Cornbleth, 1985; Bransford, Sherwood, Vye, & Rieser, 1986; Nickerson, 1988-89). For this reason, many educators advocate teaching thinking within the context of specific subject areas (Lengel, 1987; Resnick, 1987). This approach has several advantages: (a) the content area provides a natural knowledge base for practice and development of cognitive skills, (b) criteria to assess the "quality" of thinking and problem solving exist as part of the content area tradition, and (c) even if transfer of skills to other areas is not attained, something of worth will have been learned (Resnick, 1987, p. 36).
Social studies has been identified as one area where this instruction should be included, since one of its most fundamental goals is helping students to learn how to think and make decisions as informed citizens (Brophy, 1989; Fair & Kachaturoff, 1988; Cornbleth, 1985; Lengel, 1987; Ross, 1989; White, 1985). The National Council for the Social Studies Task Force on Scope and Sequence (1984) has issued a statement outlining several skills related to organizing and using information to be included in the middle school social studies curriculum. This list includes the abilities to: (a) classify information, (b) interpret information, (c) analyze information, (d) summarize information, (e) synthesize information, and (f) evaluate information (p. 261).

Tool use of computers. Advocates of using the computer to teach thinking and problem solving share the belief that "information processing technology puts at our fingertips opportunities for better thinking and learning" (Perkins, 1985, p.12). Using the computer as a tool for teaching thinking in the social studies content area allows students to quickly and easily test hypotheses, provides access to additional information, and presents students with motivating and complex situations for problem solving and thinking (Lengel, 1987; Nickerson, 1988). Research has shown that use of a common computer "tool", the database, is associated with
increases in information-processing ability (White, 1985). The CATS social studies curriculum includes five lessons devoted to the creation and use of a database.

Although many educators assume that critical thinking skills inevitably develop as the result of exposure to curricular materials or computer software, research has shown that the most effective way to develop these skills is through direct, systematic instruction by well-trained teachers (Beyer, 1984; Marzano & Arredondo, 1986; Nickerson, 1987). At the University of Arizona, Dr. Stanley Pogrow (1987, 1989) is currently developing a program to increase basic skills performance by Chapter I students in grades 4-6 through instruction in critical thinking skills. These materials are based on the creation of computer involved environments, which utilize a combination of scripted teacher-student interactions and commercially available computer software. Preliminary analysis of data from several test sites has shown significant increases in both reading and math scores on standardized achievement tests for students participating in this program.

Project MiCRO (Edwards, 1989) is another program developed to deliver instruction in computer literacy and critical thinking and problem solving via computers to students at-risk of school failure. This four-year
project was implemented at three sites across the United States, reaching approximately 800 participants each year. About one-third of this total sample took part in the special critical thinking curriculum as part of their content area instruction. Students at the experimental sites made significant pre-post gains in critical thinking (as assessed by a researcher-designed test).

Collaborative learning. Collaborative learning has been shown to be particularly effective for learning tasks which involve critical thinking or problem solving (Damon, 1984; Slavin, 1980). Although much computer-assisted instruction continues to be devoted to drill-and-practice activities, the computer is also a powerful tool for the delivery of critical thinking and problem solving activities within the social studies (Budin, Taylor, & Kendall, 1987; Lengel, 1987). When students engage in critical thinking and problem solving within a computer-based learning environment the typically vertical flow of information and expertise from teacher to student tends to become horizontal, or between students (Weir, 1989), providing a natural foundation for collaborative learning.

Much of the previous research cited in this review has involved students in situations where higher order thinking is necessary for success. For these kinds of tasks, collaborative learning provides students with the
opportunity to be aware of not only their own thinking, but also the thinking processes of their peers (Forman, 1981; Resnick, 1987; VanSickle, 1982).

At-Risk Middle School Students

Middle school students were targeted for this project for a variety of reasons. First, middle school students have been found to be developmentally ready for instruction in problem solving, critical thinking, and metacognition (Haller, Child, & Walberg, 1988; Lowery, 1985). Middle school curriculum, designed to "bridge the gap between the more student-centered elementary school and the more subject-centered high school", offers the flexibility to incorporate a program of instruction in critical thinking (Alexander, 1988, p. 107). Finally, Mann (1986) identifies the middle school grades as a particularly promising level for the introduction of dropout prevention programs. Although it is never too late to implement special programs for at-risk students, the earlier the intervention is made the greater the potential benefits (Slavin & Madden, 1987). By the time high school students are placed in programs for at-risk students they often lag several grade levels behind their peers in both basic skills and credits earned.

Demographic studies of high school dropouts based on the High School and Beyond data show that socioeconomic
status and race are the two background characteristics that correlate the most highly with dropping out (Peng, 1983; Ekstrom, Goertz, Pollack, & Rock, 1986). Membership in a racial/ethnic group or low socioeconomic status does not cause students to drop out of school, but this information can be used to identify at-risk students (Rumberger, 1987).

At-risk students want to learn but they have become "defeated learners [who] see school as a threatening place, are intimidated by and distrustful of adults, and avoid school if at all possible....They have grown hostile, not to learning, but to how learning is organized and delivered" (Conrath, 1986, p.47). In a study that examined at-risk high school students, Damico (1989) found a strong relationship between the social learning environment and staying in school. These "persisters" preferred personalized learning environments utilizing small group work, immediate feedback, and high teacher expectations. Research (Miller, Leinhardt, & Zigmond, 1988; Riehl & Grannis, 1989) indicates that at-risk students who are able to maintain high levels of social and cognitive engagement tend to stay in school.

One study has been identified that specifically addresses issues relating to seventh grade students at-risk of school failure (Stevens & Pihl, 1987). This study found that the stress associated with a history of
school failure contributed to subsequent failures in test situations. Although of normal intelligence, at-risk seventh graders showed significantly lower rates of social problem solving, coping ability, and self-esteem. Stevens and Pihl conclude that effective dropout prevention programs devised for at-risk middle school students must include affective as well as cognitive components (p. 343).

Summary

Several conclusions can be drawn from this review of the literature. Collaborative learning is both a powerful and promising instructional technique, especially for use with tasks involving higher level thinking or problem solving. Specific student-student verbal interactions positively related to achievement have also been identified, but few attempts have been made to include these behaviors in collaborative learning activities. The possibility that certain students might need to be trained to use these behaviors successfully also needs to be investigated.

The combination of positive cognitive and affective outcomes that have frequently been found in collaborative learning research make it an especially appropriate intervention for the special population of at-risk students considered here. Critics of current educational
practice believe that "overcrowded classes and insufficient individualized attention for students, abuses of tracking and ability grouping,... [and] narrow curricula and teaching practices which discourage active participation in learning" are examples of current characteristics of schools that act as "barriers to student development and potential contributors to student dropout" (Glasgow, 1985, p. 122). This examination of the research literature indicates that the combination of structured collaboration, computers, and content area critical thinking may provide at-risk middle school students with a learning environment that will support both cognitive and affective development.
CHAPTER III

Methodology

This research was conducted as part of a larger project (known as the CATS Project) funded by the Louisiana Board of Elementary and Secondary Education Quality Support Fund, School Dropout Identification and Intervention Strategy Program. The CATS Project was developed to provide instruction in critical thinking skills in a computer-based learning environment to at-risk middle school students in three content areas—mathematics, social studies, and science. Additionally, the CATS Project included both teacher training and curriculum development. Computer labs were established at two schools to be used by the participating teachers and students. Each computer station consisted of an IBM PCjr microcomputer with a single disk drive, 256k memory, a color monitor, and an IBM Graphics printer.

This researcher directed the social studies phase of the CATS Project. The implementation phase of the CATS Project took place during a 15-week period from January until May, 1989. The specific research project described here was carried out within the social studies content area for a nine-week period from March 6 until May 13, 1989.

The following sections describe the procedures and methodology used in greater detail.
Research Design

Three treatments, representing varying levels of structured peer collaboration in a computer-based learning environment, were implemented within the nine-week experimental period. Nine intact classes of seventh grade social studies students at two middle schools were randomly assigned to one of the three treatments. Treatment 1, unstructured collaboration, included three classes with a total of 64 students. Thirty-five students in Treatment 1 were identified as at-risk. Three classes, with 63 students (35 identified as at-risk), were selected to receive Treatment 2, structured collaboration. Sixty-three students in three classes were selected to receive Treatment 3, structured collaboration with training. Forty of the students in Treatment 3 were identified as at-risk.

Two independent variables were identified for the purposes of this research. Treatment, with three levels (unstructured collaboration, structured collaboration, and structured collaboration with training), is the first independent variable of interest. The second independent variable used in the data analysis is classification as at-risk of school failure (with two levels).

This research included posttests which measured a range of cognitive and affective outcomes: critical thinking ability, social studies achievement, student
perception of the classroom learning environment, and self-esteem. Data was also collected from observations of randomly selected groups of students in each class to measure the frequency of occurrence of categories of verbal interactions. Inclusion of a wide range of outcome measures has been identified as especially important in the area of computer-assisted instruction (Lockheed & Mandinach, 1986).

This research was structured as a nonequivalent control-group design. This type of research is characterized by nonrandom assignment of subjects to groups and use of posttests with all experimental subjects (Borg & Gall, 1983). The treatments were randomly assigned to the nine intact classes participating in the study. This instructional intervention was designed to allow groups of three students to work and progress independently at their computer stations. Students were posttested individually, with the individual serving as the unit of statistical analysis.

As a result of constraints imposed by data collection necessary for the implementation of the CATS Project only one of the instruments used (the Individualized Classroom Environment Questionnaire) could be administered as a pretest immediately prior to the introduction of the research treatments. All students completed the Cornell
Critical Thinking Test and the Social Studies Subtest of the CTBS during the week of December 10, 1988. The Coopersmith Inventory was administered during the week of January 17, 1989. This data has been analyzed to test for the initial comparability of the groups and scores from these test administrations were used as covariates in subsequent analyses.

**Population and Selection of Sample**

Overview. Two public middle schools in East Baton Rouge Parish were selected to participate in the CATS Project: Prescott Middle School and Broadmoor Middle School. These schools were specifically selected because they were identified by the school system as having large populations of students at-risk of school failure. Interviews were held with the principals at each site to determine willingness to participate and ability to provide the facilities needed (that is, a secure location for a microcomputer lab). After each of the schools agreed to take part in the project, principals discussed the project with the faculty and selected teachers who would participate.

Although the focus of the CATS Project was on at-risk students, intact classes (including regular and at-risk students) took part in the project. A total of 190 students were enrolled in the nine sections of seventh
grade social studies, 143 at Prescott Middle School and 47 at Broadmoor Middle School.

The School Board Office provided student information used by the researcher to classify students as at-risk of school failure. Students who fit any two of the following criteria were classified as at-risk:

1. Repeated any grade
2. >=10% absenteeism for the first 9 week grading period (beginning in August, 1988)
3. IEP (Individualized Education Plan) on file
4. Eligible for free or reduced price student lunch (below Federal Income Poverty Level)
5. <80% mastery criterion on Criterion Referenced Reading Test administered in August, 1988

Of this total sample, 110 students have been classified as at-risk, 82 at Prescott Middle and 28 at Broadmoor Middle.

The target population from which this sample was drawn would be seventh grade social studies students, both regular and at-risk, in East Baton Rouge Parish.

Prescott Middle School. Prescott Middle School, located in the central part of East Baton Rouge Parish, enrolled 950 students in grades 6-8 during the 1988-89 school year. 94% of the student population was black, and 90% received free or reduced price student lunches. Most of the students attending Prescott Middle are drawn
from the surrounding neighborhood. The school was led by a dynamic principal, honored as Louisiana Middle School Principal of the Year in 1988.

At Prescott, teachers are organized into seven instructional teams. Teachers on each team share a common planning period. Team 4, responsible for 143 seventh grade students, was selected to participate in the CATS Project. Team 4 included seven sections of social studies, taught by two teachers. One teacher was responsible for a single section of social studies, with the remaining six sections assigned to the other teacher. Neither teacher had ever used a computer as part of his/her social studies instruction. Prescott Middle offers an 18-week elective course in computer literacy so some of the students did have experience using computers in an educational setting.

A computer lab with eight IBM PCjr microcomputers was placed in a large, vacant classroom located in the wing of the school housing the Industrial Arts and Art classes. The computers were arranged on long tables below a bank of windows at the front of the school. Each teacher was assigned one day of the week to use the computers with his/her social studies classes. On these days the students met in the computer lab for the entire class period.
Broadmoor Middle School. Broadmoor Middle School, located in the suburban, eastern area of East Baton Rouge Parish, had an enrollment of 560 students in grades 6-8 during the 1988-89 school year. The student population was 50% black and 55% of the students received free or reduced price student lunches. The majority of students attending Broadmoor Middle are bussed from other parts of the parish.

The instructional team approach has not been implemented at Broadmoor Middle. One social studies teacher, with two sections of seventh grade social studies, was selected to participate in the project. This teacher had no prior experience with computers and had never used computers as part of her social studies instruction. No course in computer literacy is offered at Broadmoor Middle due to a lack of certified teaching personnel.

A computer lab with eight IBM PCjr microcomputers was placed in the school library. Located on the second floor of the school, the library was spacious enough to allow for a class to use the microcomputer area while another class used the library facilities. Two computers were placed on each of four square tables which were then arranged in a larger square so that the eight computers were placed back-to-back. Again, the participating teacher was assigned one day of the week for computer
usage. At Broadmoor Middle, students assembled in their classroom and then the whole class moved to the computer lab for the remainder of the period.

**Teacher Training**

Computer "literacy". Each of the participating teachers attended two six-hour training sessions held during the school day. One session took place in December, 1988 (prior to the implementation of the CATS Project with the students). The other session was held in January, 1989 to coincide with the beginning of the implementation phase of the project. At these sessions the teachers were introduced to the operation of the IBM PCjr microcomputers and received instruction and hands-on practice with the software to be used during the project. Teachers were also allowed to take the computers home for the Christmas vacation period.

Instruction in the implementation of the CATS curriculum was also a part of the in-service training that all teachers received. Although the focus of this research is on the role of peer collaboration in the learning process, the importance of the teacher's presence in creating an environment where students can engage in critical thinking activities cannot be underestimated (van Deusen & Donham, 1986-7; Moursund, 1988-9).
A stipend was paid to each teacher participating in the CATS Project.

**Curriculum development.** Teachers worked closely with the researcher to identify instructional objectives and appropriate thinking skill(s) which were targeted during the CATS Project as part of the ongoing curriculum development process. Teachers completed weekly lesson plans (sample in Appendix F) that were used by the researcher as the foundation for all of the learning activities. As previously noted, the curriculum was designed to enhance, not supplant, the instructional program already in place.

**Treatment Overview**

**Materials.** Social studies classes at each school used the same social studies text, *The American Nation* (Englewood Cliffs, NJ: Prentice-Hall, 1986), and followed the Curriculum Guides issued by the State of Louisiana as well as East Baton Rouge Parish (a copy of the East Baton Rouge Parish Curriculum Guide is included in Appendix A).

As part of the CATS Project, a 15-week curriculum incorporating instruction in critical thinking skills in a computer-based learning environment was developed to enhance and supplement the existing social studies curriculum. The teachers worked in conjunction with the researcher to identify learning objectives to accompany
the topics covered during the implementation of the project. A copy of the scope and sequence of the CATS social studies curriculum is included in Appendix B.

A variety of instructional software was purchased by the CATS Project to be used over the course of the instruction. Software selection was based on several criteria: appropriateness for CATS curriculum objectives, ease of use, motivational appeal, and hardware compatibility. Software selected included Bank Street Writer (Scholastic), pfs: File, U.S. History Databases (Scholastic), Where in the U.S.A. is Carmen San Diego? (Broderbund), Ten Clues (Sunburst), Crossword Magic (Mindscape), and SuperPrint! (Scholastic).

Learning activities integrating critical thinking, course content, and computer software, were organized in the following format: (a) software used, (b) thinking skill(s) targeted, (c) instructional objectives, (d) framing (or introductory) activities, (e) computer-based learning activities, and (f) bridging (or transfer) activities (Bransford, Stein, Delclos, & Littlefield, 1986). For the majority of the project, students in every class completed identical activities. In some cases teachers were able to adapt the learning activities to their specific content. For example, during the first three weeks of the CATS Project the students used the pfs: File, U. S. History Databases.
Two of the classes explored The Oregon Territory while the other seven classes chose to investigate The California Gold Rush and Transportation Westward.

**Procedures.** All of the students received an introduction to the operation and care of the IBM PCjr microcomputers during the week of January 17, 1989. At the beginning of each subsequent session of computer-based learning the entire class was given introductory information about the software and activities for the day. Students were assigned by the teacher to groups of three for the duration of the 9-week experimental period. Reassignment was made only in the case of extreme incompatibility or absence.

**Treatment 1: Unstructured Collaboration**

**Materials:** Students received the basic instruction and materials described in the Overview. All of the social studies lesson plans are included in Appendix C.

**Procedures.** Students were told to work together to complete the computer-based task but were given no instruction on the collaborative learning process itself. Students were also instructed to take turns keyboarding during their computer session.

**Treatment 2: Structured Collaboration**

**Materials.** Again, students received the same materials and used the same software as students in Treatment 1. They were also provided with a protocol
sheet to guide their collaboration in the computer-based learning activities. The collaboration protocols were designed to promote and direct elaboration and questioning during the computer-based critical thinking activities. They were based on descriptions of successful collaboration found in Webb (1984), Yager (1985), a model developed by Swallow, Scardamalia and Olivier (1988) for use in collaborative learning of textual information, and previous research by MacGregor and Repman (1989) that incorporated structured collaboration with computer programming and problem solving tasks in mathematics classes.

The specific roles were based on a model proposed by Johnson and Johnson (1985, p. 12). This model includes four roles (keyboader, recorder, checker, and encourager) and provides specific responsibilities for each role. For the purpose of this research, the students were assigned to groups of three and given the roles of keyboader, checker, or questioner. While the basic format of these collaboration protocols remained the same over the duration of the experiment, some variations were made to incorporate differences in the learning activities and software being used. The collaboration protocols are included in Appendix D.

**Procedures.** After receiving the introductory information and the learning activity for the day, each
group of students was given a collaboration protocol sheet. Specific roles were not assigned to students, but students were told to change roles each week during the experimental period. Students did stay in the same role through each computer lab session.

Treatment 3: Structured Collaboration with Training Materials. Students were provided with instructional materials identical to the other treatments and with the same collaboration protocols used in Treatment 2.

Procedures. Students in Treatment 3 took part in three 50-minute sessions of training in collaborative learning, at Weeks 1, 4, and 7. The training was conducted by the researcher using tasks similar to those used during the computer-based learning sessions. Each session focused on training students to use elaborated explanations in response to questions from their partners and providing elaborated explanations when errors occur. The transcript that the researcher used during the training session was based on teacher-student interaction transcripts found in Teaching for Thinking (Raths, Wasserman, Jonas, & Rothstein, 1986, pp. 173-179). The transcripts of the three training sessions are outlined in Appendix E.

Each training session took place during a class period prior to the computer-based instructional session.
Students in each class were selected to model the elaboration and questioning techniques to be used in the experimental treatment, with the researcher alternating roles with the students and modeling the desired behaviors. Following this, groups of students practiced the behaviors under the supervision of the researcher and the classroom teacher.

**Instrumentation**

Most of the instruments selected for use in this research are commercially available and all have been widely used in a variety of research settings. A brief description of each instrument follows, including pertinent information on validity and reliability. All posttests were administered following the completion of the CATS Project (May 13, 1989). Posttest scores on each of these measures (including subtest scores, where indicated) serve as the dependent variables in the statistical analysis.

**Critical thinking.** The Cornell Critical Thinking Test, Level X (Pacific Grove, CA: Midwest Publications, 1985), was used to assess critical thinking ability. This test is a 75-item, multiple choice test emphasizing induction, deduction, and assumption identification. Reliability estimates range from .67 to .90, depending on sample and scoring formula used (Ennis, Millman, & Tomko, 1985). The authors acknowledge that establishing
content and construct validity for tests of this type is problematic. No conscious attempt was made to tailor the computer-based learning activities to match the content of this instrument.

**Social studies achievement.** The Comprehensive Test of Basic Skills, Social Studies Subtest, Level H Form U (Monterey, CA: CTB/McGraw-Hill, 1983) was used as a measure of content area achievement. The Social Studies Subtest consists of 40 items. Questions pertaining to geography, economics, history, political science, sociology, and interdisciplinary studies are included (CTBS Examiner's Manual, 1983).

Determining the content validity of a content area achievement test such as the CTBS is generally based on the researcher's interpretation of the match between items on the instrument and the local curriculum (Linn, 1985). In reviewing this edition of the CTBS, Shepard (1985) reported a favorable impression of the content, noting that higher level thinking skills were incorporated in many of the items. Reliability (based on intercorrelations, IRT standard errors, and internal consistency (KR20) = .90) was also judged to be adequate (Shepard, 1985).

**Self-esteem.** The School Form of the Coopersmith Self-Esteem Inventories (Palo Alto, CA: Consulting Psychologists Press, 1981) has been used to measure
student self-esteem. The School Form consists of the fifty-eight short statements that are answered one of two ways: like me or unlike me. Fifty of these items are related to self-esteem while eight of the items make up the Lie Scale. While students in this research responded to all fifty-eight items, the eight item Lie Scale was not used in any subsequent analyses. A total Self Score (the dependent variable of interest in this study) is obtained by summing four subscale scores (general self, social self-peers, home-parents, and school-academic) and multiplying by two. A reliability coefficient of .89 (based on internal consistency) has been calculated for grade 7. Construct validity of the instrument has been established through several extensive research projects (Coopersmith, 1981).

Learning environment. Changes in students' perceptions of the classroom learning environment were measured using the Actual Short Form of the Individualized Classroom Environment Questionnaire (Fraser & Fisher, 1983). The instrument consists of 25 statements describing classroom practices. The student responds to each statement by selecting how often these practices occur (almost never, seldom, sometimes, often, or very often). Five sub-scales are obtained in the scoring process: (a) personalization, (b) participation,
(c) independence, (d) investigation, and (e) 
differentiation.

Personalization and participation can be 
characterized as relationship dimensions (designed to 
assess the extent to which students support and help each 
other within the learning environment). A second 
dimension, personal development, is assessed with the 
independence and investigation sub-scales. Personal 
development is a measure of growth and self-enhancement. 
The final dimension, system maintenance and change, is 
measured by the differentiation sub-scale (Fraser, 1986).

Correlations between the Short and Long Forms of this 
instrument range from .84 to .97. Internal consistency 
falls between .74 and .92. (Fraser & Fisher, 1983). 
Pretesting was conducted immediately prior to the 
beginning of the treatment.

Verbal interactions. Three groups of students from 
each class were selected randomly for observation during 
four of the computer-based learning sessions. Each group 
was observed for a single five-minute interval during the 
computer session. Thus, four observations were made for 
each of 27 selected groups of students, for a total of 
108 observations. As suggested by Webb and Cullian 
(1983), the order in which the groups were observed was 
counterbalanced (that is, student groups were observed at
different times during the class period over the course of the study).

Students were engaged in a different activity during each week of observations, including writing an outline with a word processing program, creating a game with critical and variable attributes of social studies concepts, playing Where in the U.S.A. is Carmen San Diego?, and using a student-created database.

Observational data was recorded by the researcher using the Verbal Interaction Report Form (sample in Appendix G). This form is based on coding forms developed to analyze verbal interactions occurring while students collaboratively learned computer programming (Webb, 1984; Webb, Ender, & Lewis, 1986). For these studies audio recordings were made of students collaboratively learning BASIC or LOGO. The researchers analyzed the verbal interactions using transcripts of the audio tapes. Specific categories of interaction behaviors were identified (including giving explanations and receiving explanations). For the purposes of this research, the coding schemes developed in these studies were combined into a single form that could be used by the researcher to code verbal interactions during five-minute observations of randomly selected groups in each class.
Special attention has been given to the three of the categories listed on the Verbal Interaction Report Form. Giving explanations (the category of verbal behavior most frequently associated with increased achievement), giving input suggestions, and total errors have been summed for each group across the four observation sessions and serve as the dependent variables in data analysis.

Explanations include statements such as "You do this because..." or "I think the reason is...". Although some research (Webb, 1984) separated explanations given in response to questions from explanations given in response to errors, the nature of the learning tasks in this research made such a distinction problematic (Webb, Ender, and Lewis (1986) reported a similar problem and combined all explanations into one category). On the other hand, input suggestions are limited to comments such as "Hit the space bar" or "You forgot to put a period there".

**Experimental Check**

The researcher regularly observed all nine of the social studies classes to ensure that the treatment was carried out as planned. The researcher also met on a weekly basis with each teacher to assess the progress of the intervention and address any problems that arose.
Statistical Analyses

Univariate analyses of variance and covariance and multivariate repeated measures analysis of variance were used in data analysis. When use of a covariate is indicated, the matching test (administered earlier in the academic year) served as the covariate. F ratios have been computed for each analysis followed by planned orthogonal contrasts. The first orthogonal contrast compares the two structured treatments to the unstructured treatment while the second contrast compares the structured treatment to the structured with training treatment.

Limitations

Internal validity. Cook and Campbell (1979) have identified the main threat to the internal validity of a nonequivalent control-group design as the possibility that posttest group differences are actually due to differences that existed between the groups prior to any experimental intervention. For this reason, analysis of covariance has been utilized to accommodate pre-existing group differences. The possibility that the groups differed significantly on some variable that was not measured, and which, therefore, could not be used as a covariate in the analysis, must be considered (p. 684). In light of the range of cognitive and affective measures
utilized in this research, this possibility has been minimized.

External validity. Again, nonrandom assignment of students to classes limits the generalizability of the research results. All of the research has been conducted within a single school system and at only one grade level. For these reasons, it would be unwise to generalize the results of this research to other grade levels or localities. However, by providing a complete description of both the sample and experimental procedures, similarities between this research and other situations can be assessed and possible conclusions about the generalizability of these research results may then be drawn.

Summary

This chapter describes the materials and procedures used to assess the cognitive and affective outcomes resulting from the implementation of three levels of peer collaboration within a computer-based learning environment. Sampling procedures have been described, including specific information on classification of students as at-risk of school failure and detailed descriptions of the research sites. Materials and procedures used with each treatment group have been included. Instruments used, research design, and data
analysis procedures followed in the conduct of this research project have been outlined.
CHAPTER IV

Results

This chapter presents the results from the analysis of data generated by this research project. The purpose of the study was to examine cognitive and affective outcomes of varying levels of structured collaboration in a computer-based learning environment. Three levels of treatment (unstructured collaboration, structured collaboration, and structured collaboration with training) and classification as at-risk of school failure (with two levels) are the independent variables used for statistical analysis. Two cognitive outcomes were investigated: critical thinking and social studies achievement. Self-esteem and students' perceptions of the learning environment were the affective outcomes of interest. Possible differences in rates of verbal interactions across collaborative learning treatment groups were also investigated.

All of the analyses were performed using SAS (Cary, N.C.: SAS Institute, 1986) on an IBM 3033 mainframe computer operating under the VM operating system.

This chapter begins with a statistical description of the sample, provides information relevant to the initial comparability of the treatment groups, and finally
presents the statistical results for each of the five research hypotheses outlined in Chapter I.

The Sample: Descriptive Statistics

Demographic Data.

The sample was composed of nine intact classes of seventh grades social studies students (N = 190) at two middle schools in Baton Rouge, Louisiana. Each class was randomly assigned to one of three treatment groups: unstructured collaboration (n = 64), structured collaboration (n = 63), or structured collaboration with training (n = 64). Table 1 presents demographic information for each treatment group.

Demographic information is presented in Table 2 for students classified as at-risk of school failure (n = 110), not at-risk of school failure (n = 50), and unknown (n = 30). Students were placed in the unknown category only if the information necessary for classification was not available to the researcher. As expected, students in the at-risk classification group were slightly older and predominantly black. At-risk students were fairly evenly divided between males and females as well as between the three treatment groups.
Table 1

Demographic Data by Treatment Group

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Table 2
Demographic Data by At-Risk Classification

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<td>School</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadmoor</td>
<td>28</td>
<td>32</td>
<td>6</td>
</tr>
<tr>
<td>Prescott</td>
<td>82</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstructured</td>
<td>35</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Structured</td>
<td>35</td>
<td>19</td>
<td>9</td>
</tr>
<tr>
<td>Training</td>
<td>40</td>
<td>16</td>
<td>7</td>
</tr>
</tbody>
</table>
Correlations Between Dependent Measures

In order to investigate the strength of the relationship between the major dependent measures (for both pre- and post-assessment) a correlation matrix was calculated. These findings are summarized as follows:

1. Statistically significant, positive correlations exist between pre- and post-assessment measures of critical thinking ($r = .51, p< .0001$), social studies achievement ($r = .65, p< .0001$), and total self-esteem ($r = .61, p< .0001$).

2. Pre-assessment measures of critical thinking and social studies achievement are also positively correlated ($r = .43, p< .0001$). An even stronger positive relationship was found between post-assessment measures of critical thinking and social studies achievement ($r = .56, p< .0001$).

3. No statistically significant correlations were identified between the pre- or post-assessment measures of total self-esteem and the pre- or post-assessment measures of critical thinking or social studies achievement.

Initial comparability

To investigate whether or not significant pre-treatment differences existed between the three treatment groups on critical thinking, social studies achievement, or total self-esteem, univariate analyses of variance were
performed. No significant differences were found between the three groups for critical thinking ability. For social studies achievement an $F(2,150) = 5.15$, $p < .007$, indicated significant pre-treatment differences. The mean for the unstructured group ($M = 21.98$) was higher than the mean for the structured ($M = 17.53$) or the training group ($M = 16.67$). Significant pre-treatment differences also were found on the measure of total self-esteem, $F(2,66) = 3.04$, $p < .05$. For this variable the mean for the training group ($M = 72.07$) was higher than the mean for the structured ($M = 66.15$) or unstructured groups ($M = 61.87$). Table 3 presents the means and standard deviations for these pre-treatment measures by treatment group.

To provide a more complete picture of the sample involved, univariate analyses of variance were also computed to investigate pretest differences between students classified as at-risk and not at-risk. A small number ($< 6$ for each variable) of students who could not be classified on this variable have been excluded from these analyses. No significant differences were found between the groups for critical thinking, or total self-esteem. The groups did differ significantly on the social studies pretest ($F(1,147) = 3.91$, $p < .05$). Students not at-risk of school failure ($M = 20.93$) scored
significantly higher than the at-risk students \( (M = 17.31) \). Table 4 presents the means on each of these variables by at-risk classification.

Table 3

**Mean Pretest Scores for Critical Thinking, Social Studies Achievement, and Total Self-Esteem by Treatment**

<table>
<thead>
<tr>
<th>Dependent measure</th>
<th>Unstructured</th>
<th>Structured</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Critical thinking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>25.07</td>
<td>27.76</td>
<td>26.47</td>
</tr>
<tr>
<td>SD</td>
<td>8.12</td>
<td>10.31</td>
<td>8.32</td>
</tr>
<tr>
<td><strong>Social studies achievement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>21.98</td>
<td>17.53</td>
<td>16.67</td>
</tr>
<tr>
<td>SD</td>
<td>9.82</td>
<td>9.42</td>
<td>7.14</td>
</tr>
<tr>
<td><strong>Self-esteem</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>61.87</td>
<td>66.15</td>
<td>72.07</td>
</tr>
<tr>
<td>SD</td>
<td>16.49</td>
<td>13.02</td>
<td>12.19</td>
</tr>
</tbody>
</table>
Table 4
Mean Pretest Scores for Critical Thinking, Social Studies Achievement, and Total Self-Esteem by At-Risk Classification

<table>
<thead>
<tr>
<th>Dependent measure</th>
<th>At-risk</th>
<th>Not at-risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>26.05</td>
<td>27.47</td>
</tr>
<tr>
<td>SD</td>
<td>9.32</td>
<td>8.61</td>
</tr>
<tr>
<td>Social studies achievement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>17.73</td>
<td>20.93</td>
</tr>
<tr>
<td>SD</td>
<td>9.29</td>
<td>8.55</td>
</tr>
<tr>
<td>Self-esteem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>68.24</td>
<td>67.73</td>
</tr>
<tr>
<td>SD</td>
<td>15.34</td>
<td>11.54</td>
</tr>
</tbody>
</table>
Analysis and Results

Cognitive Outcomes

Analysis. Hypothesis 1 investigated the effects of the treatment (unstructured, structured, or structured collaboration with training) on two cognitive outcomes: critical thinking (measured by the Cornell Test of Critical Thinking) and social studies achievement (measured by the CTBS Social Studies Subtest). Univariate analyses of covariance (one for each dependent variable) were performed using PROC GLM to compensate for unbalanced cell sizes and differences in pre-treatment groups means on the critical thinking and achievement instruments.

Planned orthogonal contrasts were used for post hoc comparisons. Planned orthogonal contrasts are appropriate even if the overall F statistic from the analysis of variance is nonsignificant (Glass & Hopkins, 1984). The first comparison contrasted the structured and training conditions with the unstructured condition. A second contrast was performed to investigate differences between the structured condition and the training condition. Least squares means, which have been adjusted by the use of a covariate, are included in table form for each posttest.

Results: Critical thinking. As summarized in Tables 5 and 6, no significant posttest differences
existed between the three treatment groups. The contrast between the structured and training conditions versus the unstructured condition was nonsignificant ($F(1,126) = 2.87, p< .09$) as was the contrast between the structured and training conditions ($F(1,126) = 2.69, p< .10$).

Table 5

**ANOVA for Cornell Test of Critical Thinking**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Type III SS</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
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<td>262.357</td>
<td>2.75</td>
<td>.07</td>
</tr>
<tr>
<td>Covariate</td>
<td>1</td>
<td>2227.989</td>
<td>46.71</td>
<td>.0001</td>
</tr>
<tr>
<td>Error</td>
<td>123</td>
<td>5867.181</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** $N = 127$.

Table 6

**Least Squares Means for Cornell Test of Critical Thinking**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>LS Mean</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstructured</td>
<td>41</td>
<td>33.92</td>
<td>1.08</td>
</tr>
<tr>
<td>Structured</td>
<td>44</td>
<td>32.92</td>
<td>1.04</td>
</tr>
<tr>
<td>Training</td>
<td>42</td>
<td>30.47</td>
<td>1.07</td>
</tr>
</tbody>
</table>

**Note.** Maximum score = 75. SE = Standard error LS mean.
Results: Social studies achievement. Results from the univariate analysis of covariance for the dependent variable of social studies achievement found no significant difference between the treatment groups (as shown in Table 7). When the planned orthogonal contrasts were performed, a significant difference ($F (1,124) = 5.18, p < .02$) was found in favor of the structured and training conditions when contrasted with the unstructured condition. The second contrast (between the structured and training conditions) was nonsignificant ($F (1,124) = .52, p < .47$). Least squares means for each treatment group are listed in Table 8.

Table 7

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Type III SS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
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<td>181.929</td>
<td>2.90</td>
<td>.06</td>
</tr>
<tr>
<td>Covariate</td>
<td>1</td>
<td>3037.943</td>
<td>96.82</td>
<td>.0001</td>
</tr>
<tr>
<td>Error</td>
<td>124</td>
<td>3890.934</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $N = 128$. 
Table 8

Least Squares Means for CTBS Social Studies Test

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>LS Mean</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstructured</td>
<td>39</td>
<td>19.81</td>
<td>.93</td>
</tr>
<tr>
<td>Structured</td>
<td>45</td>
<td>22.80</td>
<td>.84</td>
</tr>
<tr>
<td>Training</td>
<td>44</td>
<td>21.94</td>
<td>.86</td>
</tr>
</tbody>
</table>

Note. Maximum score = 40. SE = Standard error LS mean.

Affective Outcomes: Self-Esteem

Analysis. The effects of unstructured, structured, and structured collaboration with training on self-esteem (as measured by the Coopersmith Inventory) were investigated in Hypothesis 2. A total self-esteem score on the Coopersmith Inventory was calculated by summing the four sub-scale scores (general self, social self-peers, home-parents, and school-academic) and multiplying by two (Coopersmith, 1981).

A univariate analysis of covariance (using PROC GLM) was calculated using the total self-esteem score as the dependent variable. The ANCOVA was followed by two planned orthogonal contrasts: structured and training conditions versus the unstructured condition, and the structured condition versus the training condition. One cautionary note must be made before discussing the results of this analysis. One teacher at each site
failed to correctly administer the pretest; thus, only sixty-two complete pre-post observations could be used in the following statistical analysis.

**Results: Total self-esteem.** Using the total posttest score for self-esteem as the dependent variable, a univariate analysis of covariance showed that no significant difference existed between the treatment groups ($F(2,58) = 2.71, p< .08$).

Post hoc planned orthogonal contrasts found no significant difference when the structured and training conditions were compared with the unstructured condition ($F(1,58) = 1.23, p< .27$). The contrast between the structured and training conditions was statistically significant ($F(1,58) = 4.09, p< .05$) in favor of the group that received training. Tables 9 and 10 summarize these results.

Table 9

<table>
<thead>
<tr>
<th>ANCOVA for Total Self-Esteem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
</tr>
<tr>
<td>Treatment</td>
</tr>
<tr>
<td>Covariate</td>
</tr>
<tr>
<td>Error</td>
</tr>
</tbody>
</table>

*Note. N = 62.*
Table 10

Least Squares Means for Total Self-Esteem

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>LS Mean</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstructured</td>
<td>14</td>
<td>74.54</td>
<td>3.23</td>
</tr>
<tr>
<td>Structured</td>
<td>23</td>
<td>66.97</td>
<td>2.45</td>
</tr>
<tr>
<td>Training</td>
<td>25</td>
<td>73.93</td>
<td>2.40</td>
</tr>
</tbody>
</table>

Note. Maximum score = 100. SE = Standard error LS mean.

Structured Collaboration and the Learning Environment

Analysis. The third hypothesis formulated as part of this research project addresses changes in students' perceptions of the classroom learning environment resulting from the implementation of varying levels of structured collaboration accompanied by computer-based learning. The Individualized Classroom Environment Questionnaire was administered immediately prior to the implementation of the three treatments and immediately following the completion of the intervention (approximately a nine-week time span). This instrument contains five subscales: personalization, participation, independence, investigation, and differentiation. A multivariate repeated measures analysis of variance was performed using PROC GLM, with the five subscale scores as dependent measures. The two independent variables
used were time (the repeated factor) and treatment.

Three multivariate hypotheses were investigated:
(a) overall treatment effect (significant based on Wilks' Criterion, $F(10,268) = 1.88, p<.05$); (b) overall time effect (nonsignificant based on Wilks' Criterion, $F(5,133) = 1.92, p<.10$); and, (c) overall time by treatment effect (significant based on Wilks' Criterion, $F(10,266) = 2.09, p<.03$). The following sections present the results for the univariate repeated measures analyses of variance for each dependent variable. All of the means for the pre- and post-assessment measures are summarized in Table 16.

Results: Personalization. As illustrated in Table 11, no significant main effects (for time or treatment) or interaction effects could be identified.

Table 11

<table>
<thead>
<tr>
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<th>df</th>
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<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trt</td>
<td>2</td>
<td>21.707</td>
<td>.67</td>
<td>.52</td>
</tr>
<tr>
<td>ID (Trt)</td>
<td>137</td>
<td>2232.504</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>1</td>
<td>6.679</td>
<td>.86</td>
<td>.36</td>
</tr>
<tr>
<td>Time*Trt</td>
<td>2</td>
<td>12.269</td>
<td>.79</td>
<td>.46</td>
</tr>
<tr>
<td>Time*ID(Trt)</td>
<td>137</td>
<td>1066.227</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $N = 140$. 
Results: Participation. A repeated measures ANOVA for the dependent variable participation produced no statistically significant results (Table 12).

Table 12
Repeated Measures ANOVA for Participation

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
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<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trt</td>
<td>2</td>
<td>62.574</td>
<td>2.21</td>
<td>.11</td>
</tr>
<tr>
<td>ID (Trt)</td>
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<td>1940.922</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>1</td>
<td>13.549</td>
<td>1.86</td>
<td>.18</td>
</tr>
<tr>
<td>Time*Trt</td>
<td>2</td>
<td>22.209</td>
<td>1.52</td>
<td>.22</td>
</tr>
<tr>
<td>Time*ID(Trt)</td>
<td>137</td>
<td>999.002</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 140.

Results: Independence. A significant main effect for treatment and a significant time by treatment interaction effect were identified when the independence scale was used as a dependent measure (Table 13). Figure 1 presents these results in graph form. Means for each treatment group are included in Table 16.

Results: Investigation. Table 14 illustrates the results of the repeated measures ANOVA for the dependent variable of investigation. No significant main effects or interaction effects were identified.
### Table 13
Repeated Measures ANOVA for Independence

<table>
<thead>
<tr>
<th>Source</th>
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<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trt</td>
<td>2</td>
<td>135.052</td>
<td>4.78</td>
<td>.01</td>
</tr>
<tr>
<td>ID (Trt)</td>
<td>137</td>
<td>1937.016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>1</td>
<td>21.338</td>
<td>2.75</td>
<td>.10</td>
</tr>
<tr>
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<td>84.432</td>
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</table>

Note. N = 140.

### Table 14
Repeated Measures ANOVA for Investigation

<table>
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<tr>
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<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trt</td>
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<td>41.567</td>
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</tr>
<tr>
<td>ID (Trt)</td>
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<td>2053.704</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>1</td>
<td>5.217</td>
<td>.92</td>
<td>.34</td>
</tr>
<tr>
<td>Time*Trt</td>
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<td>10.625</td>
<td>.93</td>
<td>.40</td>
</tr>
<tr>
<td>Time*ID(Trt)</td>
<td>137</td>
<td>779.218</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 140.
Figure 1. Interaction between time and treatment on the independence scale of the ICEQ.
Results: Differentiation. The final subscale of the ICEQ used in data analysis was differentiation. In this case a significant interaction was found to exist between time and treatment (Table 15). This interaction is presented in graph form in Figure 2. Table 16 includes the means for each treatment group on the differentiation scale.

Table 15
Repeated Measures ANOVA for Differentiation

<table>
<thead>
<tr>
<th>Source</th>
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<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trt</td>
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<td>19.841</td>
<td>.66</td>
<td>.52</td>
</tr>
<tr>
<td>ID (Trt)</td>
<td>137</td>
<td>2060.427</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
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<td>10.120</td>
<td>1.68</td>
<td>.20</td>
</tr>
<tr>
<td>Time*Trt</td>
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<td>57.738</td>
<td>4.79</td>
<td>.01</td>
</tr>
<tr>
<td>Time*ID(Trt)</td>
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<td>779.218</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 140.
Figure 2. Interaction between time and treatment for the differentiation scale of the ICEQ.
### Table 16

**Means on ICEQ Subscales by Time and Treatment**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>PERS</th>
<th>PART</th>
<th>INDEP</th>
<th>INVES</th>
<th>DIFF</th>
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<tr>
<td><strong>Unstructured</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>49</td>
<td>18.67</td>
<td>20.04</td>
<td>12.45</td>
<td>15.16</td>
<td>10.35</td>
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<tr>
<td></td>
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<td>(3.6)</td>
<td>(3.6)</td>
<td>(3.5)</td>
<td>(3.2)</td>
<td>(3.7)</td>
</tr>
<tr>
<td>Time 2</td>
<td>49</td>
<td>18.94</td>
<td>20.18</td>
<td>12.02</td>
<td>15.71</td>
<td>9.69</td>
</tr>
<tr>
<td></td>
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<td>(3.4)</td>
<td>(3.3)</td>
<td>(3.6)</td>
<td>(3.8)</td>
<td>(2.9)</td>
</tr>
<tr>
<td><strong>Structured</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>47</td>
<td>18.53</td>
<td>19.56</td>
<td>9.79</td>
<td>14.70</td>
<td>9.00</td>
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<td>(2.7)</td>
<td>(2.8)</td>
<td>(2.9)</td>
<td>(3.1)</td>
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<td>Time 2</td>
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<td>11.85</td>
<td>14.43</td>
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<td>(3.0)</td>
<td>(3.4)</td>
<td>(2.7)</td>
<td>(3.2)</td>
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<tr>
<td><strong>Training</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>44</td>
<td>18.52</td>
<td>19.11</td>
<td>10.73</td>
<td>14.45</td>
<td>10.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.6)</td>
<td>(3.7)</td>
<td>(3.3)</td>
<td>(3.6)</td>
<td>(3.6)</td>
</tr>
<tr>
<td>Time 2</td>
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<td>17.82</td>
<td>18.84</td>
<td>10.75</td>
<td>15.00</td>
<td>8.84</td>
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<td></td>
<td></td>
<td>(3.1)</td>
<td>(3.4)</td>
<td>(3.2)</td>
<td>(2.9)</td>
<td>(3.0)</td>
</tr>
</tbody>
</table>

**Note.** Maximum score for each subscale = 25. Standard deviations are in parentheses under each mean.

**Changes in At-Risk Students' Perceptions of the Learning Environment**

**Analysis.** The possibility that the introduction of collaborative learning within a computer-based learning environment might have a differential effect on
perceptions of the learning environment of at-risk students (when compared to students not at-risk of school failure) was considered in Hypothesis 4. Analyses similar to those conducted to test Hypothesis 3 were used; the chief difference was the use of at-risk classification as an independent variable. A small number (22) of students who could not be classified on the at-risk variable were omitted from these analyses.

Three repeated measures MANOVA hypotheses were tested. First, the possibility of an overall at-risk effect was supported (based on Wilks' Criterion, $F(5,112) = 2.49$, $p < .04$). The second overall effect investigated was time, which was also upheld (Wilks' Criterion, $F(5,112) = 2.30$, $p < .05$). An overall at-risk by time interaction was the final multivariate hypothesis of interest. An $F(5,112) = .66$, $p < .66$, showed no statistically significant interaction between these two variables.

Results. Table 17 gives the means for at-risk and non-at-risk students for each of the ICEQ subscales. The following statements summarize the findings of the univariate repeated measures ANOVAs that were performed.

1. Personality: For this dependent measure, no significant differences were found for any of the effects investigated (at-risk, time, or at-risk by time).
2. Participation: No significant differences were identified for the main effects (at-risk and time) or the interaction effect (at-risk by time).

3. Independence: No significant differences were found for any of the effects investigated (at-risk, time, or at-risk by time).

4. Investigation: A significant difference \((F(1,235) = 6.56, p < .01)\) was found to exist for the main effect of at-risk classification. An examination of the means (Table 17) shows that students at-risk of school failure scored higher on this subscale on both the pre- and post-assessment. Other effects (time and at-risk by time) were nonsignificant.

5. Differentiation: No significant differences were found for the main effect of at-risk classification or the interaction effect of at-risk by time. One significant difference was found for this subscale, for the main effect of time \((F(1,235) = 3.82, p < .05)\). Both groups' perceptions of the learning environment decreased on this variable between the pre- and post-assessments.
Table 17
Means on ICEQ Subscales by Time and At-Risk Classification

<table>
<thead>
<tr>
<th>ICEQ Subscale</th>
<th>Group</th>
<th>n</th>
<th>PERS</th>
<th>PART</th>
<th>INDEP</th>
<th>INVES</th>
<th>DIFF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At-risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 1</td>
<td>78</td>
<td>18.96</td>
<td>19.94</td>
<td>10.49</td>
<td>15.32</td>
<td>10.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.5)</td>
<td>(3.2)</td>
<td>(3.4)</td>
<td>(2.8)</td>
<td>(3.6)</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>78</td>
<td>18.40</td>
<td>18.99</td>
<td>11.50</td>
<td>15.40</td>
<td>9.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.3)</td>
<td>(3.3)</td>
<td>(3.6)</td>
<td>(2.8)</td>
<td>(3.3)</td>
</tr>
<tr>
<td></td>
<td>Not at-risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 1</td>
<td>40</td>
<td>18.25</td>
<td>19.53</td>
<td>11.78</td>
<td>13.90</td>
<td>9.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.5)</td>
<td>(3.4)</td>
<td>(3.1)</td>
<td>(3.5)</td>
<td>(3.4)</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>40</td>
<td>18.45</td>
<td>19.63</td>
<td>11.78</td>
<td>14.28</td>
<td>8.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.4)</td>
<td>(2.8)</td>
<td>(2.9)</td>
<td>(3.5)</td>
<td>(2.2)</td>
</tr>
</tbody>
</table>

Note. Maximum score for each subscale = 25. Standard deviations are in parentheses under each mean.

Verbal Interactions

Analysis. Hypothesis 5 perhaps most directly examines the effect of introducing structure and training into the collaborative learning process. This hypothesis suggests that students who are exposed to structured collaboration (both with and without training) will have significantly higher rates of giving explanations within their collaborative learning groups. A further
difference between the structured and training groups in the rate of giving explanations was also hypothesized.

Data was collected from observation of three randomly selected groups from each class (that is, a total of 27 groups were observed, nine in each treatment condition). The researcher coded verbal interactions of each group for a single five-minute interval using the Verbal Interaction Report Form. Four observations were made of each group during the project. Three of the scores obtained from this instrument were used in these analyses: (a) explanations given, (b) input suggestions made, and (c) total errors. The scores for each group on each variable were summed across the four observations to provide the three dependent measures used in data analysis. A complete set of four observations was available for 22 of the 27 groups observed. The group was the unit of analysis used to test this hypothesis.

The data was analyzed using PROC GLM and univariate analysis of variance. Three separate ANOVAs were performed (one each for explanations, input suggestions, and errors). Planned orthogonal contrasts were used for post hoc comparisons.

Results: Explanations. Table 18 illustrates the ANOVA source table for this dependent variable. A post hoc comparison contrasting the structured and training conditions with the unstructured condition was
statistically significant ($F(1,19) = 4.46, p < .05$) as was the contrast between the structured and training condition ($F(1,19) = 5.10, p < .04$). A comparison of the means (Table 19) shows that students in both of the structured treatment conditions offered more explanations during collaborative learning than students in the unstructured condition. A most encouraging finding is that the addition of training to structured collaboration led to an even greater rate of explanations given.

Table 18

ANOVA for Explanations

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trt</td>
<td>2</td>
<td>34.519</td>
<td>4.96</td>
<td>.02</td>
</tr>
<tr>
<td>Error</td>
<td>19</td>
<td>66.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $N = 22$.

Results: Input suggestions. An ANOVA was performed to investigate whether there were any significant differences between treatment groups on their rates of making input suggestions. No significant differences were found for the overall ANOVA ($F(2,19) = .11, p < .90$) or for either orthogonal contrast. Means for each treatment group are presented in Table 19.
Results: Errors. One consideration to be made in interpreting the significant effect found for explanations is the possibility that increased rates of giving explanations were the result of groups having higher rates of making errors. No significant differences were found between the treatment groups for the overall ANOVA ($F(2, 19) = .06, p < .95$), or for either of the post hoc orthogonal contrasts.

Table 19

Means for Verbal Interactions and Errors by Treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>Explanations</th>
<th>Input Suggestions</th>
<th>Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstructured</td>
<td>7</td>
<td>2.86</td>
<td>14.29</td>
<td>2.86</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>1.95</td>
<td>3.25</td>
<td>2.43</td>
</tr>
<tr>
<td>Structured</td>
<td>7</td>
<td>3.57</td>
<td>13.57</td>
<td>2.86</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>1.99</td>
<td>4.61</td>
<td>1.60</td>
</tr>
<tr>
<td>Training</td>
<td>8</td>
<td>5.75</td>
<td>13.50</td>
<td>2.00</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>1.67</td>
<td>2.67</td>
<td>1.70</td>
</tr>
</tbody>
</table>
Summary

This chapter outlines the data analysis procedures used and the results obtained from an investigation of the five research hypotheses of interest. A summary of results for each hypothesis investigated follows.

Hypothesis 1: No statistically significant differences were found to exist between the treatment groups for the posttest of critical thinking. A planned orthogonal contrast between the structured and training conditions versus the unstructured condition found a significant difference for the posttest of social studies achievement. The means for the structured ($M = 22.80$) and the training ($M = 21.94$) groups were higher than the mean for the unstructured group ($M = 19.81$), after adjusting for pretest differences.

Hypothesis 2: Analysis of covariance was used to investigate differences on a measure of total self-esteem. A significant contrast was found in favor of the training condition versus the structured condition on total self-esteem.

Hypothesis 3: A repeated measures MANOVA, followed by repeated measures ANOVAs, was utilized to compare changes in students' perceptions of the learning environment following a nine-week treatment. Using the five subscales of the ICEQ (personalization, participation, independence, investigation, and
differentiation) for dependent measures, significant time by treatment interactions were found for independence and differentiation.

**Hypothesis 4:** Repeated measures MANOVA, followed by repeated measures ANOVAs, for the five subscales of the ICEQ, were performed to investigate differences between at-risk and non-at-risk students' perceptions of the learning environment. At-risk classification was found to have a main effect on the dependent variable of investigation, while a main effect for time was found on the differentiation scale.

**Hypothesis 5:** A significant effect was found when the treatment groups were compared on explanations given during the collaborative learning sessions. A planned orthogonal contrast between the structured and training conditions versus the unstructured condition was significant. The contrast between the structured and training conditions was also significant in favor of the groups receiving training.
CHAPTER V

Discussion, Limitations, and Implications

The purpose of this study was to investigate cognitive and affective outcomes resulting from the use of varying levels of structured peer collaboration (unstructured, structured, and structured with training) in a computer-based learning environment. The study was designed to apply research findings showing a positive relationship between giving explanations in collaborative learning groups and achievement into classroom practice, focusing on a sample of seventh grade students that included a large percentage of students identified as at-risk of school failure.

Specifically, the study investigated the effects of training students to give explanations to their peers while engaged in computer-based, critical thinking activities in their social studies classes. The training was reinforced through the use of collaboration protocols. The effectiveness of the use of collaboration protocols alone (without training) was also investigated. In this chapter significant findings will be discussed, limitations of the study will be presented, and implications for further research and classroom practice will be suggested.
Discussion

Training, Explanations, and Achievement

A clear pattern of research results associating giving explanations with increased achievement in collaborative learning settings (usually mathematics or computer science classes) has been identified (Webb, 1989). These studies, frequently conducted with average or above-average students, have also found that high-ability students tend to give the most explanations (Webb, 1989). The need to investigate the relationship between giving explanations and achievement with low-ability students has been recognized (Webb, 1989). In particular, several researchers have hypothesized that training in the use of specific verbal behaviors could significantly improve the effectiveness of collaborative learning for low-ability students (Bossert, 1988-89; Hertz-Lazarowitz, 1989; Newman & Thompson, 1987; Webb, 1989).

This study demonstrates that providing training in giving explanations as part of the collaborative learning process is an effective method of increasing the number of explanations given in relatively homogeneous low-ability learning groups. It is noteworthy that there were no significant differences between the three treatment groups for the other verbal interactions of
interest in this study (making input suggestions— a low-level verbal interaction) or in the number of errors that occurred. Thus, it can be concluded that the number of explanations given differed as a result of the training that the students received. In the following sections, analyses investigating the effect of this difference in observable behavior on achievement will be discussed.

Unfortunately, no differences between the groups could be detected for the measure of critical thinking. It was recognized from the outset of the study that use of a standardized instrument for the assessment of critical thinking is problematic. It has also been noted that transfer of cognitive skills from a specific content area to a more general area is very difficult to achieve (Bransford, Sherwood, Vye, & Rieser, 1986; Resnick, 1987) and that students working in collaborative learning settings may need more time to learn thinking and problem solving skills (Ross, 1988). Specific difficulties that may inhibit or limit transfer include: (a) the student may lack an appropriate knowledge base, (b) thinking skills are "shaped" by the content area in which they are used, and (c) students frequently do not learn the cues necessary to apply a thinking skill in a different context (Beyer, 1987, p. 164).

Upon reflection, it is apparent that the CATS social studies curriculum focused almost exclusively on
critical thinking skills within a single content area. The transfer activities provided with each lesson (which were identical for the three treatments) also encouraged transfer within the content area. To more accurately assess a possible group effect from the addition of structure and training to collaborative learning, different learning activities should be provided for each group. Components that could be included in the revised curriculum would be an emphasis on how to apply thinking skills in other content areas and contexts, explanations of why the skills should be used in different contexts, and presentation of the cues that indicate that use of a particular thinking skill is required (Beyer, 1987; Resnick, 1987).

Significant differences did appear for the content area achievement measure, the CTBS Social Studies Subtest. Students who received structured collaboration (with or without training) scored significantly higher on the posttest than did students in the unstructured collaboration classes. Although no conclusions can be drawn that directly associate training or giving explanations with increased content area achievement, this does support research showing that structure is an effective component of collaborative learning environments (Dansereau, O'Donnell, & Lambiotte, 1988;
Swallow, Scardamalia, & Olivier, 1988; Yager, 1985). As demonstrated in previous research (Dansereau, 1988; Yager, 1985), the effects of structured collaboration transferred from small-group learning to individual performance on an achievement test.

It should be noted, however, that even though students in the training classes gave more explanations the rate was still fairly low (an average of slightly more than one explanation during each observed session). Further, several of the groups receiving training gave no explanations during one or more of the sessions that were observed. One possible explanation for the lack of a direct effect for training on social studies achievement is that despite an increased rate of giving explanations, students who received training still did not engage in this behavior frequently enough to produce measurable results. Shorter training sessions, given more regularly (weekly or even more often), might have resulted in more consistent and frequent use of explanations within the learning groups. At the same time, this study clearly demonstrates that low-ability students who receive no training in providing higher level elaborations almost never engage in this behavior.

Both the researcher and the classroom teachers noticed that students in both of the structured conditions exhibited more direct involvement with the
learning activities and less off-task behavior, which may account for the increased achievement scores of these groups. The students in the structured groups asked more task-related questions and fewer questions on the "mechanics" of operation of the computer hardware and software. In the majority of the structured collaborative learning groups, roles and responsibilities were readily accepted by the students and they were able to follow the collaboration protocols provided each week with no obvious difficulty.

Structured Collaboration and Self-Esteem

Self-esteem has been studied as an affective outcome in collaborative learning settings (Slavin, 1983a; Johnson & Johnson, 1983) and in computer-based learning environments (Roblyer, Castine, & King, 1988). Although results that associate changes in self-concept with relatively short-term instructional interventions must be interpreted with caution (Slavin, 1983a), the need to identify learning environments that might result in lasting changes in students' attitudes toward themselves and toward learning remains.

The relationship between self-esteem, collaborative learning and achievement is complex. One model (Slavin, 1983a) proposes that cooperative learning will lead to increased self-esteem only when accompanied by increased
achievement and improved peer relationships. In the present study, results from the analysis of covariance revealed a statistically significant contrast between the training group ($M = 73.93$) and structured group ($M = 66.97$) for total self-esteem. The finding of a positive effect for task specialization (a component of both the structured and training conditions) on content area achievement did not transfer to an improvement in self-concept. The significant difference between the two structured groups was the addition of training in the specific roles and responsibilities to be used within the collaborative learning groups. Applying these findings to Slavin’s model, it may be hypothesized that training led to an improvement in student-student social relationships, which in turn resulted in improvement in the self-concept of students in the training group.

At the same time, it should be noted that students in the unstructured groups had the highest mean self-esteem scores ($M = 74.54$). This finding, along with the lack of any significant, positive correlations between the pre- and post-assessment measures of critical thinking and social studies achievement and the pre- and post-assessment measures of self-esteem, seems to indicate that for the students involved in this study, increased achievement alone does not necessarily result in a more positive self-concept.
Changes in Perception of the Learning Environment

Treatment effects. Collaborative, computer-based learning environments are very different from traditionally organized classrooms (Goodlad, 1984; Johnson & Johnson, 1983). The intervention utilized in this study was devised to allow students to work as true collaborators (Cazden, 1988; Forman, 1981; Forman & Cazden, 1985) on social studies tasks that allowed students to engage in critical thinking and problem solving. In true peer collaboration, the goal is to create a learning environment where students solve problems together that they would be unable to solve individually (in other words, creating a zone of proximal development). This differs from peer tutoring situations where one student plays the role of "teacher" and cooperative learning settings where lower level cognitive outcomes are emphasized (Damon & Phelps, 1989).

Using the five scales of the Individualized Classroom Environment Questionnaire as dependent measures two significant time by treatment interaction effects were identified. Results from data analysis indicate that students in the unstructured and training conditions declined on the differentiation scale, while students in the structured condition showed an increase. The only other statistically significant finding was an
increase for students in the structured condition on the independence scale and little change for the other groups. Although findings from this study contradict an earlier study (Yager, 1985) which found significant improvement in students' attitudes toward the classroom learning environment following the introduction of cooperative learning, they may be explained in terms of the constructs underlying the dimensions measured by the ICEQ.

Independence has been characterized as a measure of students' perceptions of their control over their work habits and general behavior while differentiation is a measure of the amount of freedom students have to work at their own pace and in their own style (Hattie, Byrne, & Fraser, 1987, p. 81). Possibly students in the structured classes felt that they were more in control of the processes within their collaborative learning groups and had greater freedom to set their own pace when collaboration protocols (without training) were made available to them. Similarly, it is not surprising that students who received training in the roles and responsibilities to be used within the collaborative learning groups declined in their perception of the amount of freedom they had to control the pace and style of their learning groups.
At-risk students. At-risk students frequently report feeling uncomfortable with the way instruction is traditionally organized and delivered (Conrath, 1986; Miller, Leinhardt, & Zigmond, 1988; Riehl & Grannis, 1989). When at-risk and non-at-risk students were compared on the same five classroom environment measures one statistically significant finding was identified. At-risk students consistently felt they had more opportunities to engage in their own research or independent investigations (as measured by the investigation subscale). The possibility of including more activities that allow discovery-type learning and individual projects within the curriculum needs to be considered, although research has shown that direct instruction, not student discovery, is the most effective means of delivering instruction in thinking skills to at-risk students (Jones, 1986).

One significant main effect for time was also identified. Scores on the differentiation scale for both at-risk and non-at-risk students decreased from pre- to posttest period. As mentioned earlier, when treatment was investigated scores on the differentiation scale also declined for students in two of the three treatment groups. One common aspect of the instructional organization at the research sites that may have
contributed to this finding is the fact that many groups had to work quickly to complete the computer activities within a single class session. The classroom teachers frequently urged the students to "hurry up and finish before the bell". Rigid scheduling constraints and these teacher attitudes are incompatible with classroom environments that allow students to pace themselves.

This study seems to conflict with earlier research (Damico, 1989; Miller, Leinhardt, & Zigmond, 1988; Riehl & Grannis, 1989) showing that at-risk students who stay in school prefer learning environments that include group work and immediate feedback. Several possible explanations for the lack of positive effects for training as part of this intervention on students' perceptions of the learning environment have been identified. First, studies of persisters (that is, at-risk students who stay in school) are most frequently done with older students whose attitudes may differ significantly from the younger adolescents involved in this study. A ceiling effect may also be present in this study. Means on the personalization and participation scales were relatively high before and after the intervention. Finally, the effects of the collaborative learning intervention were limited because the treatment was relatively brief (only one day per week over a nine-week time span).
Anecdotal observations

Despite the fact that much has been written about the need to integrate collaborative learning (Vermette, 1988), computer-based instruction (Budin, Taylor, & Kendall, 1987), and critical thinking (Massialas & Papagiannis, 1987) into social studies classes the combination of all three of these elements has not been evaluated in an experimental setting until the current study. Although this study produced an abundant amount of data for statistical analysis, the researcher also spent many hours at each school discussing the program with teachers, students, and administrators. The following sections will focus on issues and impressions discussed and formulated in these informal settings.

The teachers and school administrators remained enthusiastic about this program throughout the entire 15-week implementation period. Student enthusiasm also remained high. Teachers reported that every Monday students usually asked what computer activities were planned for the week and often asked if they could use the computer lab more often.

Prior to the implementation of this program some concerns were expressed that the computer activities developed for this program would be too difficult for the student population involved. Explicit instructions for hardware and software use were provided to both students
and teachers in the form of lesson plans and "help" sheets placed at each computer terminal. Teachers were surprised to see how quickly the students learned how to use database searching techniques, word processing, and graphics programs.

At the same time, the teachers involved in this project required extensive support from the researcher in the implementation of the computer-based learning activities with their students. In particular, two of the teachers remained very unsure of their abilities to operate the hardware and software even after the in-service training sessions. This observation is similar to findings from Project MiCRO, a project which also used computers to deliver instruction in critical thinking to at-risk students. Recommendations from Project MiCRO apply to the present study: (a) extensive (more than 10 hours) training is needed before teachers will be able to use computers as effective teaching tools, (b) apprentice-style training (incorporating immediate feedback and suggestions for alternative strategies) is particularly effective, and (c) teachers must already possess strong teaching skills and have high expectations for student achievement (Edwards, 1989, p. 16).
Perhaps the most encouraging observation made by the teachers throughout this project had to do with students who rarely participated in regular classroom activities. Many of these students seemed to "come alive" in the computer lab, asking content-related questions, and remaining on-task for extended periods of time. This observation alone seems to provide a rationale for further research into creating motivating and challenging social studies learning environments through the use of collaborative learning, computers, and critical thinking.

Limitations

The following limitations apply in generalizing the results obtained from this study:

1. In the present study the collaborative learning activities were used only one day each week, in a setting different from the regular classroom instruction. It is possible that if the collaborative learning conditions had been utilized as part of the daily classroom instruction an entirely different pattern of research results would have been obtained.

2. Students' perceptions of the learning environment were assessed in the classroom, not the computer lab, which may limit the validity of the results obtained. The researcher has also become aware of a revised form of the ICEQ (described in Knight, 1989) that
might have been more appropriate for use with this project.

3. The sample selected for this project was relatively homogeneous and drawn from two schools within the same school district. Some data analysis problems resulted from students being promoted, transferred between classes, and added to the experimental classes at approximately the time the study was being implemented. A high rate of absenteeism (including suspensions and assignment to the "time out" room) added to the problem of incomplete data. When analysis of covariance or repeated measures analysis is utilized, only data from students with complete sets of pre- and posttest scores can be used.

4. While the pretest period was distributed over several weeks, all of the posttesting had to be completed within six school days. The posttesting for this project followed administration of two sets of standardized tests given throughout the school system. Many of the students appeared to be "tired" of taking standardized tests and several voiced complaints about the tests during the posttesting. The exact effect, if any, of these attitudes on students' scores is not known.

5. Selection of appropriate instruments to measure constructs such as critical thinking and self-esteem is problematic. Use of the standardized CTBS Social
Studies Subtest is both a strength and a weakness of the present study. When achievement is measured by a specific researcher-designed test the generalizability of results is automatically limited. On the other hand, transfer of learning from specific classroom tasks to standardized tests is difficult to measure. By relying solely on the CTBS for content area achievement the effects of this intervention may be underestimated.

6. Significant differences were noted between instructional styles of the three teachers participating in this study. As can be seen from the lesson plans, teachers were frequently asked to cover certain information and procedures in class before the weekly computer-based learning session. Based on informal observations in the computer lab, it was apparent to the researcher that these instructions were not always followed. The amount of follow-up done by each teacher is also an unknown element.

7. As previously mentioned, there is also a need for caution when interpreting changes in students' attitudes and self-concept as a result of short-term instructional interventions. While changes in attitudes and self-concepts may be detected, it is not known how long these changes may persist after the intervention has been concluded (Slavin, 1983a).
Implications for Future Research

This research illustrates that a combination of training and structured collaborative, computer-based learning activities can have a positive effect on content area achievement and self-esteem. There is a need for additional research on several interesting questions.

First, it had been expected that students receiving training would exhibit an upward trend in the number of explanations given during collaborative learning. Examination of the data collected during observations of the groups shows that this was not the case, implying that the additional training sessions might have served a maintenance function alone. More research is needed to determine how much training is required and if training would be more effective if it was delivered in more frequent, shorter sessions.

Second, there is a need for additional research into the effects of training on achievement with students of different ability levels and students in heterogeneous learning groups. This research should include specific methods to assess the correlation between the number of explanations an individual student gives and cognitive and affective outcomes.

Third, for the purposes of comparing at-risk with non-at-risk students' perceptions of the learning environment, this study would have been enhanced if
the ICEQ had been administered at three points in time: prior to the introduction of the CATS program, immediately before the three treatments were implemented, and as a posttest following the completion of the program. Analysis of this data could be used to investigate the "global" effects of using computer-based learning environments with at-risk students.

Fourth, further investigation into the relationship between self-concept and collaborative learning needs to be done, especially with students of different ages and ability levels. A more precise examination of the relationship between cognitive and affective outcomes from collaborative learning is a promising area to begin this line of inquiry.

Finally, considerable research into the effects of computer-based critical thinking and problem solving with low-ability students is indicated. Although students in this project were exposed to a wide variety of computer software and learning activities, research shows that long-term exposure may be needed before the use of computer "tools" transfers to individual cognitive abilities (Salomon, 1988).

Implications for Classroom Practice

On the whole, the CATS Project was well-received by teachers, students, and administrators at the
experimental sites. This was the first opportunity most of the participants had to utilize the computer as a tool for improving critical thinking and problem solving within the social studies and by the end of the project the majority of the teachers and students had become even more enthusiastic about the potential benefits of using computers as personal and educational tools.

One significant implication for classroom practice that can be drawn from this study concerns teacher training. Teachers need extensive support to develop computer-based learning activities that enhance and supplement existing curriculum objectives as well as to take advantage of new objectives that can be supported through the classroom use of computers. Considerable support is also needed to help teachers become effective managers of computer hardware and software.

Careful selection of instructional methodologies is vital for teachers who work with students who are at-risk of school failure. Keeping students in school is only part of the solution to the dropout problem. Learning environments that lessen the achievement gap between at-risk and regular students must also be developed.

Results from the statistical analyses indicate that collaborative, computer-based learning within social studies classes appears to be a promising combination of instructional methodologies for at-risk
and regular middle school students. Enhancing the collaborative learning process through the use of structure and training does result in increased use of elaborated explanations and promotes student engagement in critical thinking and problem solving activities within the social studies content area. Collaborative learning techniques are not expensive to implement, and it is the belief of this researcher that they can be used to enhance traditional classroom instruction as well as in newer instructional settings such as computer labs.
REFERENCES


Fraser, B.J. (1986). Two decades of research on perceptions of classroom environment. In B.J. Fraser (Ed.), The study of learning environments (pp. 1-33). Salem, OR: Assessment Research.


APPENDICES
APPENDIX A

East Baton Rouge Parish
Social Studies Curriculum Guide--7th Grade
### I. Unit 1 (3 Weeks)

**A. Exploration and Colonization**

<table>
<thead>
<tr>
<th>TOPIC/STRAND</th>
<th>STATE CURRICULUM GUIDE</th>
<th>DATE ASSIGNED</th>
</tr>
</thead>
<tbody>
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<td>1. Identify factors that combined to make possible the age of exploration</td>
<td>P I A 4</td>
<td></td>
</tr>
<tr>
<td>2. Utilize a timeline to demonstrate chronological perspective in regard to exploration</td>
<td>P IV B 6,7 4</td>
<td></td>
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<tr>
<td>3. Describe conditions under which early explorations to America were accomplished</td>
<td>P I A 4</td>
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<td>4. Match major explorers of North America with the countries sponsoring and financing the travels of each</td>
<td>I II A-F 5</td>
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<tr>
<td>5. Use a map to show the location and extent of European exploration in North America</td>
<td>P III B 14 D 6</td>
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<tr>
<td>6. Describe Spanish, French, and English colonization in North America</td>
<td>I II A-F 6</td>
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<tr>
<td>7. Identify on a map these European claims in North America: English, French and Spanish territory in 1750</td>
<td>P III D 2</td>
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<tr>
<td>8. Locate and identify the thirteen original English colonies on a map</td>
<td>P III B 12 D 6</td>
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<tr>
<td>9. Utilize a timeline to develop chronological perspective as regards English colonization in North America</td>
<td>P IV A 5 B 7</td>
<td></td>
</tr>
<tr>
<td>10. Describe differing lifestyles (religion, education, amusements, etc.) among English colonies located in the northern middle, and southern areas of North America</td>
<td>P I A 7</td>
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<td>11. Identify three different cultural factions that settled in the thirteen original colonies and the foods characteristic of those cultures</td>
<td>P I A II A-F 7</td>
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<td></td>
<td>12. Identify the Magna Carta and describe the heritage of &quot;rights&quot; Englishmen brought with them to the New World</td>
<td>P I A II A-F 8</td>
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<td>13. Identify the freedoms of religion and press in the English colonies</td>
<td>P I A II A-F 8</td>
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<td></td>
<td>14. Identify and explain two reasons for friction that led to war between English and French colonies in North America</td>
<td>P I A II A-F 8</td>
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<td></td>
<td>15. Cite the reasons for and the results of the French and Indian War</td>
<td>P I A II A-F 9</td>
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<td></td>
<td>16. Explain the relationship between the French and Indian War and England's renewed interest in governing and taxing colonies</td>
<td>P I A II A-F 9</td>
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<td>II. Unit 2 (3 Weeks)</td>
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<tr>
<td>B. Revolution in America</td>
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<td>17. Identify major areas of disagreement existing between England and the colonies in the Pre-Revolutionary War Era</td>
<td>P I A II A-F 11</td>
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<td></td>
<td>18. Analyze factors responsible for the break between the colonies and England as expressed in the Declaration of Independence</td>
<td>P I A II A-F 12</td>
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<td>19.</td>
<td>Compare the strategic advantages enjoyed by England and by the colonies at the outbreak of the Revolutionary War</td>
<td>P I A II A-F</td>
</tr>
<tr>
<td>20.</td>
<td>Identify colonial patriots and associate with each the contribution(s) made to the colonial cause</td>
<td>P I A II A-F</td>
</tr>
<tr>
<td>21.</td>
<td>Locate and relate specific information about the major battles of the Revolutionary War</td>
<td>I III B 17</td>
</tr>
<tr>
<td>22.</td>
<td>Utilize a timeline to sequentially indicate events pertaining to conflict between England and the American colonies from 1750-1785</td>
<td>P IV B 7</td>
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</table>

III. Unit 3 (3 Weeks)

C. Experiments in Government

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<tr>
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<th>DATE ASSessed</th>
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<tr>
<td>23.</td>
<td>Identify the Articles of Confederation as the first constitution of the U.S.</td>
<td>P I A II A-F</td>
<td>16</td>
</tr>
<tr>
<td>24.</td>
<td>Identify two of the weaknesses of government under the Articles of Confederation</td>
<td>P I A II A-F</td>
<td>16</td>
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<tr>
<td>25.</td>
<td>Utilize in context, the following words with specific meanings pertaining to government</td>
<td>P I A II A-F</td>
<td>17</td>
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<tr>
<td>26.</td>
<td>Describe the functions of the 3 branches of the Federal government which check and balance each other</td>
<td>P I A II A-F</td>
<td>17</td>
</tr>
<tr>
<td>27.</td>
<td>List the four procedures which may be used to amend the constitution of the United States</td>
<td>P I A II A-F</td>
<td>18</td>
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<tr>
<td>DATE TAUGHT</td>
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<td>STANDARD</td>
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<td>28.</td>
<td>Correlate the rights enumerated in the Bill of Rights with specific real life situations</td>
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<td>I A</td>
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<td></td>
<td>II A-F</td>
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<td>29.</td>
<td>Express arguments for and against the new national government assuming a strong role in determining and carrying out financial policies</td>
<td>I</td>
<td>V N</td>
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<td></td>
<td>V C</td>
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<td>30.</td>
<td>Summarize the differences that led to creation of the first political parties in the United States</td>
<td>I</td>
<td>V C</td>
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<td></td>
<td></td>
<td>V N</td>
</tr>
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<td>31.</td>
<td>Identify the Northwest Ordinance in which Congress made provisions for governing the Northwest Territory</td>
<td>P</td>
<td>I A</td>
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<td>32.</td>
<td>Compare different life styles and economics in the Northeast Middle and Southern states</td>
<td>I</td>
<td>V C</td>
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<td></td>
<td></td>
<td>V N</td>
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<td>33.</td>
<td>Record the main issues and events in the conflict between the U.S. and the Barbary Pirates</td>
<td>I</td>
<td>V C</td>
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<td></td>
<td></td>
<td></td>
<td>V N</td>
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<td>34.</td>
<td>Identify and outline the major events of the Louisiana Purchase</td>
<td>P</td>
<td>VIII H</td>
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<td>VIII I</td>
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IV. Unit 4 (3 Weeks)

D. Jeffersonian Democracy

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<td>1 or P</td>
<td>STANDARD</td>
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<td>35.</td>
<td>Identify and outline the major events of the Louisiana Purchase</td>
<td>P</td>
<td>VIII A</td>
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<td>VIII I</td>
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<tr>
<td>36.</td>
<td>Cite the reasons for and the results of the War of 1812 using the following pattern: Problem-Resolution-Result</td>
<td>P</td>
<td>II A-F</td>
</tr>
<tr>
<td>DATE TAUGHT</td>
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<td></td>
<td>36. Locate the site of the Battle of New Orleans on a map and explain why</td>
<td>I III B 17</td>
<td>23</td>
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<td></td>
<td>it was fought after the War of 1812 was over</td>
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<td>37. Identify leaders in connection with the War of 1812</td>
<td>P II A</td>
<td>24</td>
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<td></td>
<td>38. Utilize a cartoon to explain the meaning and the significance of the</td>
<td>I VI B 1,2</td>
<td>24</td>
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<td></td>
<td>Monroe Doctrine</td>
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<td>V. Unit 5</td>
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<td></td>
<td>E. Economic, Cultural, and Territorial Developments</td>
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<td>39. Explain what is meant by the term Jacksonian Democracy</td>
<td>I I A</td>
<td>29</td>
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<td>40. Identify Tariff Compromise</td>
<td>I I A</td>
<td>29</td>
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<td>41. Identify the &quot;monster&quot; bank</td>
<td>I I A</td>
<td>30</td>
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<td></td>
<td>42. Identify the Whig Party as one of the 2 major political parties in the</td>
<td>I I A</td>
<td>30</td>
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<td></td>
<td>early 1800's</td>
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<td></td>
<td>43. Identify the Republican and Democratic political parties from the late</td>
<td>I I A</td>
<td>30</td>
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<td></td>
<td>1800's to the present</td>
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<td>44. Name one reformer in each of the following reform movements of the 1800's</td>
<td>I V H</td>
<td>31</td>
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<td></td>
<td>: temperance, movement, women's rights, educational reform, prison reform</td>
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<td>45.</td>
<td>Name several literacy writers during this period</td>
<td>I V H 31</td>
<td></td>
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<td>46.</td>
<td>State how several inventions during this period improved the system of communication</td>
<td>I V H 31</td>
<td></td>
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<tr>
<td>47.</td>
<td>Locate on an outline map and identify the method of acquisition of each of the following: Oregon, Texas, the Mexican Session (California, New Mexico Territory, Utah Territory) and the Gordon Purchase</td>
<td>I III B 17 32</td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td>Cite the reasons for and the results of the Mexican-American War using the following pattern: Problem-Solution-Result</td>
<td>P II A-F 32</td>
<td></td>
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<tr>
<td>49.</td>
<td>Utilize a timeline to explain the chronological sequence of the expansion movement</td>
<td>P IV B 6,7 32</td>
<td></td>
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<tr>
<td>50.</td>
<td>Locate on a map the following events pertaining to the expansion of the United States between 1819 and 1853</td>
<td>I III E 5 33</td>
<td></td>
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VI. Unit 6 (3 Weeks)

<table>
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<tr>
<th>DATE TAUGHT</th>
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<tbody>
<tr>
<td>51.</td>
<td>Explain the relationship between the manufacturing center of the Northeast and the conflicting agricultural interests of the Northwest and Southern states</td>
<td>I V H 36</td>
</tr>
<tr>
<td>52.</td>
<td>Differentiate between the 3 types of Southern planters</td>
<td>I V H 36</td>
</tr>
<tr>
<td>53.</td>
<td>Identify on a map the major geographic areas of the United States in 1860</td>
<td>I III E 5 36</td>
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<td>DATE TAUGHT</td>
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<td>54.</td>
<td>List and explain the underlying causes of the Civil War</td>
<td>I</td>
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<td>55.</td>
<td>Cite two reasons why Southerners thought slavery was necessary and two reasons why Northerners felt that it was morally wrong</td>
<td>I</td>
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<tr>
<td>56.</td>
<td>Describe the manner in which slaves were treated prior to the Civil War</td>
<td>I</td>
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<tr>
<td>57.</td>
<td>Identify significant individuals in the anti-slavery movement</td>
<td>P</td>
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<tr>
<td>58.</td>
<td>Use a table to identify the major points of the Missouri Compromise, Compromise of 1850 and the Kansas-Nebraska Act using the following patterns: Problem-Solution-Results</td>
<td>I</td>
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<tr>
<td>59.</td>
<td>Locate on a map those regions affected by the Missouri Compromise of 1850 and the Kansas-Nebraska Bill</td>
<td>I</td>
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<td>60.</td>
<td>Identify some basic conclusions that may be drawn from a list of the acts about the election of 1860</td>
<td>I</td>
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<td>61.</td>
<td>List reasons why the Southern states seceded from the USA</td>
<td>I</td>
</tr>
<tr>
<td>62.</td>
<td>Locate on a map the Confederate States of America and their capitals: Richmond, Virginia, and Washington D.C.</td>
<td>I</td>
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<tr>
<td>63.</td>
<td>Compare the advantages and disadvantages of the North and the South in the Civil War</td>
<td>I</td>
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<td>64. Describe the North and the South's plan for military victory with the aid of a map</td>
<td>I III E 5</td>
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<td>VII. Unit 7 (3 Weeks)</td>
<td>65. Identify Lincoln's plan for reconstruction, Johnson's plan and the Radical Republicans plan</td>
<td>I V H</td>
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<td></td>
<td>66. Describe how we have been able to maintain stable executive leadership through constitutional guidelines</td>
<td>I V 1</td>
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<td>67. Compare and identify the major changes in the South following the Civil War with respect to the following: Plantation system, Agriculture, Industry, Political and Social aspects</td>
<td>I V H</td>
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<td>68. Explain why it was easy for graft and corruption to spread during Grant's administration</td>
<td>I V H, I</td>
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<td>69. Identify the spoils system and the merit system which replaced it</td>
<td>P I A</td>
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<td>70. Identify the Compromise of 1877</td>
<td>P I A</td>
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<td>VIII. Unit 8 (3 Weeks)</td>
<td>F. Changes in American Life</td>
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<td>71. List and describe inventions that affected the settlement of the frontier</td>
<td>I V H, I</td>
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<td>72. Describe the effect the railroads had on the development of the West</td>
<td>I V H, I</td>
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<td>73. Cite the major reasons for conflicts between the Indians and the other</td>
<td>I V H, I 52</td>
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<td>settlers during the period of United States history</td>
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<td>74. Describe the development of the &quot;Cattle Kingdom&quot;</td>
<td>I V H, I 52</td>
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<td>75. Cite reasons for the use of big business</td>
<td>I V H, I 53</td>
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<td>76. Cite ways in which the improvements in transportation changed the</td>
<td>I V H, I 53</td>
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<td>availability of foods throughout the United States during the period</td>
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<td>77. List two major inventions that contributed to or were the result of the</td>
<td>I V H, I 53</td>
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<td>rise in industry</td>
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<td>78. List the major developments in the growth of the labor movement in the</td>
<td>I V H, I 53</td>
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<td>United States</td>
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<td>79. List several problems which faced the American farmer in this period</td>
<td>I V H, I 54</td>
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<td>80. Summarize the role government involvement plays in the food industry</td>
<td>P VIII J 55</td>
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<td></td>
<td>and its effect on what people eat</td>
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<td>81. Describe the rise of the middle class in American society</td>
<td>I V H, I 55</td>
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<td>82. List several advancements made in the area of humanitarian reform</td>
<td>P VIII B 55</td>
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<td>83. Describe the changes in American education during the latter half of</td>
<td>I V H 55</td>
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<td>the nineteenth century</td>
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<td></td>
<td><strong>I. INTRODUCTION</strong></td>
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<td>P. PROFICIENCY</td>
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<td><strong>I</strong></td>
<td><strong>V</strong></td>
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<td><strong>84.</strong></td>
<td>Describe contributions in journalism, literature, architecture, painting and sculpture, music and science that evolved from the late nineteenth century</td>
<td>I</td>
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<td><strong>9. Unit 9 (3 Weeks)</strong></td>
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<td><strong>85.</strong></td>
<td>Determine which two lines of latitude and which two lines of longitude these places are located between: Alaska, Hawaii, the Continental U.S.</td>
<td>P</td>
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<tr>
<td><strong>86.</strong></td>
<td>Identify and utilize the time zones of the U.S. and relate them to longitude</td>
<td>P</td>
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<tr>
<td><strong>87.</strong></td>
<td>Describe the acquisition of Alaska and Hawaii by the U.S.</td>
<td>I</td>
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<tr>
<td><strong>88.</strong></td>
<td>Recognize propaganda and its purpose in the context of &quot;yellow&quot; journalism in the U.S. preceding the Spanish-American War</td>
<td>P</td>
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<tr>
<td><strong>89.</strong></td>
<td>List the reasons for the results of the Spanish-American War using the following pattern: Problem-Solution-Result</td>
<td>P</td>
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<tr>
<td><strong>90.</strong></td>
<td>Utilize a cartoon to explain the meaning of one of the following: Open Door Policy in China, Roosevelt Corollary, Good Neighbor Policy in Latin America</td>
<td>I</td>
</tr>
<tr>
<td><strong>91.</strong></td>
<td>Use an atlas to locate the territories in the Caribbean acquired by the U.S.</td>
<td>P</td>
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<tr>
<td><strong>92.</strong></td>
<td>Summarize the problems encountered in building the Panama Canal and the measures taken to overcome those problems</td>
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<td><strong>93.</strong></td>
<td>Identify the cause and results of World War I</td>
<td>I</td>
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<tr>
<td>94.</td>
<td>Identify the Allied and Central powers in World War I</td>
<td>I II E 6</td>
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<tr>
<td>95.</td>
<td>Identify reasons why the U.S. entered World War I</td>
<td>I V H,I</td>
</tr>
<tr>
<td>96.</td>
<td>Select and describe one major battle or campaign fought during World War I</td>
<td>I III E 5</td>
</tr>
<tr>
<td>97.</td>
<td>Identify the Treaty of Versailles and Wilson's Fourteen Points</td>
<td>P IIA</td>
</tr>
<tr>
<td>98.</td>
<td>Identify the League of Nations</td>
<td>P II E</td>
</tr>
<tr>
<td>X. Unit 10</td>
<td>(3 Weeks)</td>
<td></td>
</tr>
<tr>
<td>99.</td>
<td>List 3 technological inventions developed early in the twentieth century that</td>
<td>I IX A</td>
</tr>
<tr>
<td></td>
<td>changed the way Americans lived</td>
<td></td>
</tr>
<tr>
<td>100.</td>
<td>List two major changes in American society during the 1920's</td>
<td>I IX B</td>
</tr>
<tr>
<td>101.</td>
<td>Characterise the reform movements</td>
<td>I V H</td>
</tr>
<tr>
<td></td>
<td>of prohibition and woman suffrage</td>
<td></td>
</tr>
<tr>
<td>102.</td>
<td>Cite 3 measures taken by the government to abate the effects of the Great</td>
<td>P II B,C,D</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td></td>
</tr>
<tr>
<td>103.</td>
<td>Identify the circumstances that altered American beliefs, values, and lifestyles in the 1930's</td>
<td>I V H</td>
</tr>
<tr>
<td>XI. Unit 11</td>
<td>(3 Weeks)</td>
<td></td>
</tr>
<tr>
<td>104.</td>
<td>List the basic causes of World War II</td>
<td>P II F</td>
</tr>
<tr>
<td>DATE TAUGHT</td>
<td>TOPIC/STRAND</td>
<td>STATE CURRICULUM GUIDE</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>------------------------</td>
</tr>
<tr>
<td></td>
<td>I 105. Identify major World War II leaders and the countries they were from</td>
<td>P II C 75</td>
</tr>
<tr>
<td></td>
<td>I 106. List a few major battles of and their outcomes from World War II</td>
<td>P IV 8 6 76</td>
</tr>
<tr>
<td></td>
<td>I 107. Identify several major problems Americans faced on the home front during World War II</td>
<td>P II C 76</td>
</tr>
<tr>
<td></td>
<td>I 108. Compare the United Nations to the League of Nations</td>
<td>I V C 76</td>
</tr>
</tbody>
</table>

III. Unit 12 (3 Weeks)

J. Recent Trends

<table>
<thead>
<tr>
<th>DATE TAUGHT</th>
<th>TOPIC/STRAND</th>
<th>STATE CURRICULUM GUIDE</th>
<th>DATE ASSESSED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I 109. Cite three major differences between communism and democracy</td>
<td>I V C 78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 110. Identify the term &quot;cold war&quot;</td>
<td>P I A 79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 111. Locate the following on an outline map: USSR, People's Republic of China, Korea, Vietnam, Cuba, Iran and Taiwan</td>
<td>P III B 15 79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 112. Identify these major United States policies: Monroe Doctrine, Truman Doctrine, Eisenhower Doctrine</td>
<td>P I A 80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 113. Investigate and identify the presidential programs of Truman, Eisenhower, Kennedy, Johnson, Nixon and Carter</td>
<td>P I A 81</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 114. Identify these leaders: Martin Luther King, Jr. and Joseph McCarthy</td>
<td>P II E 81</td>
<td></td>
</tr>
<tr>
<td>DATE TAUGHT</td>
<td>TOPIC/STRAND</td>
<td>STATE CURRICULUM GUIDE</td>
<td>DATE ASSESSED</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>I 115</td>
<td>Explain who becomes president when a president resigns, is impeached,</td>
<td>I VI C 1,2</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>becomes disabled or dies in office</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I 116</td>
<td>Identify three of the following:</td>
<td>P I A</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Brown vs. Board of Education, Civil Rights Act, War on Poverty, 26th Amendment, McCarthyism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I 117</td>
<td>List two domestic problems facing the United States today</td>
<td>P II B</td>
<td>83</td>
</tr>
</tbody>
</table>

APPENDIX B

CATS Social Studies Curriculum--Scope and Sequence
# SCOPE AND SEQUENCE

## THE CATS SOCIAL STUDIES CURRICULUM

<table>
<thead>
<tr>
<th>Week</th>
<th>Thinking Skills</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identifying relevant information</td>
<td>pfs: File, U.S. History databases</td>
</tr>
<tr>
<td></td>
<td>Interpreting data</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Problem analysis</td>
<td>pfs: File, U.S. History databases</td>
</tr>
<tr>
<td></td>
<td>Breaking a problem into components</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Identifying relevant information</td>
<td>pfs: File, U.S. History databases</td>
</tr>
<tr>
<td></td>
<td>Problem analysis</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Identifying relevant information</td>
<td>SuperPrint!</td>
</tr>
<tr>
<td></td>
<td>Problem analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternate representation of information</td>
<td></td>
</tr>
<tr>
<td>5-6</td>
<td>Problem analysis</td>
<td>Crossword Magic</td>
</tr>
<tr>
<td></td>
<td>Identifying relevant information</td>
<td></td>
</tr>
<tr>
<td>7 *</td>
<td>Interpreting visual information</td>
<td>Bank Street Writer</td>
</tr>
<tr>
<td>7 **</td>
<td>Problem analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifying relevant information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifying relevant information and supporting details</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sequencing information</td>
<td>Bank Street Writer</td>
</tr>
<tr>
<td></td>
<td>Identifying supporting details</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Decision making</td>
<td>Where in the U.S.A. is Carmen SanDiego?</td>
</tr>
<tr>
<td></td>
<td>Drawing inferences</td>
<td></td>
</tr>
<tr>
<td>10 **</td>
<td>Recognizing critical and variable attributes</td>
<td>Ten Clues</td>
</tr>
<tr>
<td>11</td>
<td>Decision making</td>
<td>Where in the U.S.A. is Carmen SanDiego? and Ten Clues</td>
</tr>
<tr>
<td>----</td>
<td>-----------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Drawing inferences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem analysis</td>
<td></td>
</tr>
<tr>
<td>12-13 **</td>
<td>Decision making</td>
<td>Where in the U.S.A. is Carmen SanDiego?</td>
</tr>
<tr>
<td></td>
<td>Drawing inferences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem analysis</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Classification</td>
<td>pfs: File</td>
</tr>
<tr>
<td></td>
<td>Information gathering</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Problem analysis</td>
<td>pfs: File</td>
</tr>
<tr>
<td></td>
<td>Generating hypotheses</td>
<td></td>
</tr>
</tbody>
</table>

Note. * Experimental period begins.
** Training session (Session 1, Week 7; Session 2, Week 10; Session 3, Week 12).
APPENDIX C

Social Studies Lesson Plans
SOCIAL STUDIES

Week 1
Learning to use PFS File: Frontier

Computer Program: pfs: File and Frontier file

Thinking Skills:
- Identifying relevant information
- Interpreting data

Objectives:

The learner will be able to:

- Discover the main topics, key events, important people, and trends in the Expanding American Frontier file.
- Use a database program to enter and retrieve information.

Framing:

Introduce the concept of a database. Use examples such as the telephone directory or TV Guide for comparison purposes. Introduce the concept of a computerized database. Finally, you will need to cover methods of searching (see the Quick Guide in your blue notebook). You should have a copy of p. 5 of the Quick Guide at each computer station.

Learning Activities:

1. Boot up pfs: File. Remove the program disk.
2. Insert the Frontier disk.
3. Select Search/ Update and hit Tab.
4. Type frontier.
5. Press PF10 for a blank retrieve spec.
6. Complete the activities in Activity 1, substituting a topic of your choice. Have the students work in pairs. Let one person type while the other person
proofreads. Be sure and have them change roles after 2-3 questions. They need to practice making exact matches and matches in the form of ..word.. in several of the fields.

7. Students not at the computer can complete a textbook assignment of your choice.
SOCIAL STUDIES

Week 2
Classifying Topics in the Frontier Era

Computer Program: pfs: File and the Frontier File

Thinking Skills:
Problem analysis.
Breaking a problem into components.

Learning Objectives:
The learner will be able to:
Classify events according to type.
Identify key persons in the area of interest.

Framing:
Using the material in Class and Members—Select introduce the concepts of verbal classifications. There are 7 types of events in the Frontier file: Economic, Political, Military, Religious, Settlement, Exploration, Transportation. List these on the board and discuss possible specific events that could fall into these topics. Review search techniques.

Learning Activities:
1. Boot up pfs: File, remove and replace with the Frontier file.

2. Assign each pair of students one of the 7 types of events listed above. Have them browse through the file using PF10 and list some of the events that fit their assigned type of event. Also have them make a list of the different topics that they come across. From their list of topics have each pair then find all of the events that are listed for that topic. Again, make sure that the students take turns typing and proofreading.

3. Students not at the computer can prepare a scavenger hunt to challenge each other next week. Have the students identify questions they think can be answered from the file. Put each question on a card
or separate sheet of paper and save them.

Bridging:

Review the questions on Page 16 of the handout.
SOCIAL STUDIES

Week 3
Advanced Database Searching--Printing Database Information

Computer Program: pfs: File and Inventions or Frontier file

Thinking Skills:

Identifying relevant information

Problem analysis

Objectives:

The learner will be able to:

Identify the appropriate field to use when searching for a specific topic.

Search in the database specifying more than one field.

Use the FN PrtSc function to print out information

Framing:

Reinforce the field concept--point out to the students that if they are searching for an inventor by name they will never retrieve the relevant information if they enter a name in the invention field. Also discuss the fact that it is possible to make a search more specific by specifying more than one field in a search. For example, to locate what Otis invented in 1856 you could enter ..Otis.. in the Inventor field and 1856 in the Year field.

Tell the students that they will be using the information they retrieve this week to create a timeline next week. You may want to have them look at examples of timelines in their text.

Learning Activities:

1. Boot up pfs: File. Remove the program disk and insert the file disk of your choice.

2. Distribute a Database Challenge Question to each pair of students.
3. Search the database for the answer to each question.

4. Turn on the printer.

5. Using the FN PrtSc (the P key) print out Page 1 of the form. Next use FN PgDn to get to Page 2 of the form and print it using FN PrtSc. Turn the printer offline and use the form feed button to advance the paper.

Bridging:

Using the sample page of the timeline that I created, have the students look at their printouts and select the information that they want to include on their page of the timeline. Working with the whole class, combine all of the printouts into a master timeline. Be sure to collect all of the printouts so that they will be available next week.
1804

Lewis and Clark Expedition

Key Person:
Meriwether Lewis
SOCIAL STUDIES

Week 4
Creating a Timeline with SuperPrint!

Computer Program: SuperPrint!

Thinking Skills:

Identifying relevant information

Problem analysis

Alternate representation of information

Objectives:

The learner will be able to:

Identify information needed to create a timeline using historical events.

Use verbal information to create a pictorial sign for an historical event using SuperPrint!

Put historical events in sequence.

Framing:

Point out examples of timelines in the social studies textbook. Discuss the kinds of information given for each event in a timeline. Have the students decide on the information they want to include on their timeline and have them locate this information on their database printouts from last week.

Demonstrate SuperPrint! by creating a banner you will use as the heading for your timeline. To create the sample banner I gave you I chose banner, typed in my text, added the Indian graphic, saved my design and then printed it.

Learning Activities:

1. Give each pair of students a copy of the SuperPrint! Quick Guide, a xeroxed copy of the graphics library, a SuperPrint! Disk 2 and a SuperPrint! Data Disk.

2. Have each pair of students follow the instructions on the Quick Guide to start up the program (we will have to share the
SuperPrint! Program disks).

3. Have each pair of students create their sign, save their design, and print it out. Before printing check each sign for accuracy!!

Bridging:

Organize the signs into the correct sequence and display your timeline!
SOCIAL STUDIES

Weeks 5-6
The Vocabulary of Social Studies

Computer Program: Crossword Magic

Thinking Skills:

Problem Analysis
Identifying Relevant Information

Objectives:

The learner will be able to:

Select words that are important to the understanding of teacher-selected topics.

Write definitions or provide identifying information for words selected.

Use Crossword Magic to create a crossword puzzle.

Framing:

The vocabulary of social studies includes words used to define concepts and identify events and key people. Discuss the importance of vocabulary knowledge to the understanding of the various topics in the social studies curriculum. Organize students into groups of 3 and assign a topic to each group. You may want to have one group do only people, one do only events, and one do only concepts, or they could be combined into the various topics. Multiple groups can be assigned the same topic, if desired. Students should then use the textbook or supplementary materials to select approximately 15 concepts, events or key people and identify or define each. The words and definitions will be used to create a crossword puzzle on the computer.

Learning Activities:

Week 5:

1. Prior to your computer day have the groups of students identify and define the vocabulary words.
2. Enter the words and definitions on the computer using Crossword Magic.

3. Save the puzzle on disks.

Week 6:

1. Edit the puzzles created during Week 5. Have the students in each group carefully check their puzzles for spelling and clarity.

2. Print the puzzles.

Bridging:

Exchange the puzzles between groups or classes and complete the puzzles.
SOCIAL STUDIES

Week 7
The Story Behind a Picture

Computer Program: Bank Street Writer

Thinking Skills:

Interpreting visual information

Problem analysis

Identifying relevant information and supporting details

Objectives:

The learner will be able to:

Identify an historical event from a picture.

Use the textbook and supplementary sources to provide the following information for the event: who, what, when, where, and why.

Create an outline of this information using Bank Street Writer and print out the outline.

Framing:

Discuss the importance of visual information to our understanding of historical events. Using an example from the textbook, point out the important information often contained in pictures and their captions. Tell the students that they will be using a picture or illustration from their textbook as a basis for writing a newspaper article about an historical event. This week we will outline the key information and enter it on the computer using Bank Street Writer. Next week we will use these outlines to write up a newspaper-style account of an historical event.

Learning Activities:

1. Assign each group of students a picture from their history textbook.
2. Give each group a Who--What--When--Where--Why worksheet.
3. Tell the students to take turns keyboarding.
5. Save and print each outline.
6. After each outline is completed each group of students should check their outline for accuracy.

Bridging:

Have the students use supplementary materials and sources to add supporting details to their outlines.
WORKSHEET
THE STORY BEHIND A PICTURE

Using the picture that you have been assigned, complete the following information. You may use your textbook and other supplementary sources that are available. Next week we will use this information to write a newspaper story about this event so include as much information as possible.

PAGE OUR PICTURE IS ON:

EVENT:

WHO are the key people in this event?

WHAT occurred during this event?

WHEN did this event take place?

WHERE did this event occur?

WHY is this event significant?
SOCIAL STUDIES
Week 8
The Story Behind a Picture

Computer Program: Bank Street Writer

Thinking Skills:

Identifying relevant information and supporting details

Synthesis

Objectives:

The learner will be able to:

Use information about an historical event (outlined last week) to write a newspaper article.

Framing:

Discuss how a newspaper-style account of an event differs from a textbook-style account. You may want to read several examples of short newspaper articles, emphasizing these stylistic differences. In particular, stress the use of active, you-are-there language.

Learning Activities:

1. Using the outline created last week, have each group of students write a newspaper-article style account of their historical event. They should follow the format on the attached worksheet.
2. Make sure each group has included a headline, byline, and dateline for their article.
3. Have the students take turns keyboarding.
4. Save and print each article.

Bridging:

Have the students read their articles aloud. You may also want to collect all of the articles and put them in a folder for use in the classroom.
This week we will use the outline we created last week to write a newspaper article about an historical event. Each article needs a HEADLINE, BYLINE, and a DATELINE.

The HEADLINE should be at the top of the page. You can center your headline by pressing ALT-C before you type your headline in.

The BYLINE includes the names of your group members. These names should be listed under the headline.

The DATELINE should be at the beginning of your first paragraph. First you put the place where your event takes place, then a comma, then the date of your event. Here's an example:


REMEMBER:

1. Use complete sentences.

2. Use language that will make the reader think that the event has just taken place.

3. Use correct punctuation.

4. Use your picture in your textbook to add any interesting details that make your event more exciting to read about.

5. Save and print your article.
SOCIAL STUDIES

Week 9
Where in the U.S.A. is Carmen SanDiego?

Computer Program: Where in the U.S.A. is Carmen SanDiego?

Thinking Skills:

Drawing inferences and conclusions
Analyze and evaluate information
Use information to make decisions and solve problems

Objective:

The learner will be able to:

Use geographical information and clues to solve cases in the computer game Where in the U.S.A. is Carmen SanDiego?

Framing:

Play a sample game of Carmen SanDiego with the whole class. Put one copy of the scrapbook summary at each computer station and show the students what information it contains.

Learning Activities:

1. Boot up DOS, hit enter twice. At the A> remove DOS.

2. Put the Carmen SanDiego program disk in and type Carmen.

3. Give each group of students one copy of the clue checklist. They can play 3 games on this one sheet. Tell them to record the information on the checklist as they discover it.

4. Tell the students to take turns at the keyboard.
Bridging:

Ask the students about strategies they found successful. Discuss the need to work efficiently and carefully to be able to solve the crime in the time allotted.
SOCIAL STUDIES

Week 10
Ten Clues

Computer Program: Ten Clues

Thinking Skills:

   Identifying attributes of a concept

   Discrimination between critical and variable attributes

Objectives:

   The learner will be able to:

   Identify critical and variable attributes of a concept.

   Create a list of 10 attributes (with at least one critical attribute) for an assigned social studies concept.

Framing:

   You need to practice this activity with a familiar object before the students attempt to create a game this week in the computer lab. I have attached a sample activity for a table—PLEASE practice at least one of these activities BEFORE we go to the lab. The students have to understand the concept of an attribute (both critical and variable) to be able to successfully complete their games.

Learning Activities:

1. Assign one social studies concept (person, place or idea) to each group.

2. Each group should write down their clues before entering them—stress the importance of the order that the clues will appear when the game is played.

3. Have each group enter the clues.

4. When they save their games they must enter a title and a password. For the title have them use the period and teacher’s name (First
Hour--Brown, is an example). Have all groups use the word CLUE for their password.

Bridging:

Next week we will swap the disks and play games created by students in other classes.
SOCIAL STUDIES

Week 11
Fun and Games

Computer Programs: Ten Clues and Where in the U.S.A. is Carmen San Diego?

Thinking Skills:

Problem analysis

Identifying relevant information

Identifying attributes of a concept

Objectives:

The learner will be able to:

Identify a key person, event or concept from the social studies curriculum using critical and variable attributes.

Use geographic information and clues to solve a case presented in Where in the U.S.A. is Carmen San Diego?

Framing:

Discuss the importance of strategies in solving problems. You may want to point out examples of successful strategies used frequently in games the students are already familiar with.

Learning Activities:

1. Each group of students should have the opportunity to play both Ten Clues and Carmen San Diego? during the computer session today.

2. Make sure students playing Ten Clues are getting a chance to play games created by students in the other classes.

Bridging:

Have students discuss strategies they found successful.
SOCIAL STUDIES

Weeks 12-13
Where in the U.S.A. is Carmen SanDiego?

Computer Program: Where in the U.S.A. is Carmen SanDiego?

Thinking Skills:

Drawing inferences and conclusions
Analyze and evaluate information
Use information to make decisions and solve problems

Objective:

The learner will be able to:

Use geographical information and clues to solve cases in the computer game Where in the U.S.A. is Carmen SanDiego?

Framing:

Play a sample game of Carmen SanDiego with the whole class. Put one copy of the scrapbook summary at each computer station and show the students what information it contains.

Learning Activities:

1. Boot up DOS, hit enter twice. At the A> remove DOS.

2. Put the Carmen SanDiego program disk in and type Carmen.

3. Give each group of students one copy of the clue checklist. They can play 3 games on this one sheet. Tell them to record the information on the checklist as they discover it.

4. Tell the students to take turns at the keyboard.
Bridging:

Ask the students about strategies they found successful. Discuss the need to work efficiently and carefully to be able to solve the crime in the time allotted.
SOCIAL STUDIES

Week 14
Creating a Database--The Fifty States

Computer Program: pfs: File

Thinking Skill:

Identifying relevant information

Objectives:

The learner will be able to:

Locate specific information (data) about each state and enter this information in the correct field on a database template.

Framing:

This week we will be creating a database of information about each of the 50 states. I will provide each group with a brief summary of each state's characteristics and they will enter the information into a database template that I have created. Each group should enter information on two different states during this week's lab session. You will need to go over any unfamiliar terms (see the copy of the template that is on the student worksheet). You may also need to discuss the concept of a database as a collection of information and stress the importance of accuracy in entering data.

Learning Activities:


2. Choose 2--Add forms.

3. Give each group of students information on one state. After they have entered this information they need to press F10. If time permits, they can then enter the information for another state.
Bridging:

I will combine entries from all of the classes to create one database which includes all 50 states. Next week we will search the database to answer questions and test hypotheses.
WORKSHEET

CREATING A STATES DATABASE

This week each group will be entering information on different states to create a database. Follow these steps:

1. Put your STATES data file disk in the computer.

2. Choose 2—Add forms then TAB down to the name of the file and type STATES. Hit enter.

3. Using the page of information about your state, enter information in each field. A blank form that shows all of the information you will be entering is at the bottom of this page.

4. WORK CAREFULLY!!! Make sure you are entering the CORRECT information and that you are putting it in the correct field of the record for your state.

5. When you have entered all of the information hit F10. If you have enough time you may enter information about another state.

<table>
<thead>
<tr>
<th>STATE:</th>
<th>ENTERED UNION (YEAR):</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPITAL:</td>
<td>RANK:</td>
</tr>
<tr>
<td>POPULATION:</td>
<td></td>
</tr>
<tr>
<td>% URBAN:</td>
<td></td>
</tr>
<tr>
<td>PRINCIPAL INDUSTRIES (3):</td>
<td></td>
</tr>
<tr>
<td>CHIEF CROPS (3):</td>
<td></td>
</tr>
<tr>
<td>% UNEMPLOYMENT:</td>
<td></td>
</tr>
<tr>
<td>PER CAPITA INCOME:</td>
<td></td>
</tr>
</tbody>
</table>

 STATES
 F1-Help
SOCIAL STUDIES

Week 15
Working with the States Data File

Computer Program: pfs: File

Thinking Skills:

Problem analysis

Identifying relevant information

Objectives:

The learner will be able to:

Search the States data file using retrieve specs (1 and 2 fields) to locate specific information.

Select the correct field to search the data file to test hypotheses.

Write an hypothesis about the relationship between two of the fields included in the States data file.

Framing:

Discuss the term hypothesis (an educated guess). Use the relationship between height and weight to generate hypotheses with the entire class (that is, as height increases weight tends to increase). Discuss the kinds of data you would need to be able to test this hypothesis. Ask the students if you can ever prove an hypothesis. Point out that you use data to support or not support hypotheses. Point out that all that a database can do is provide information. We must do the analysis that gives meaning to the information.

Learning Activities:

1. I will provide each group with a States Worksheet. This week I would like the students to work as independently as possible—encourage them to call on you for help as a last resort.

3. Select 4 (Search/Update) and type in STATES for the file name.

Bridging:

Reinforce the concept of using information to support or not support hypotheses by discussing some of the work done this week in the computer lab. Also discuss other interesting hypotheses about the states and the information needed to test them.
GROUP:

STATES WORKSHEET

This week we are going to use a data file with information on all 50 states to answer some questions and test some hypotheses. As you use the database to answer these questions write down your SEARCH STRATEGY. Record what field you searched in and EXACTLY what you typed in to accomplish your search.

1. What is the most populous state? ________________

SEARCH STRATEGY:

2. How many states entered the union before 1820? ________

List these states:

SEARCH STRATEGY:

3. In which states is rice one of the chief crops? ______________

SEARCH STRATEGY:

4. Test this hypothesis:

States with high unemployment have low per capita incomes.

List the data your search produces:
Does this data support or not support the hypothesis?

SEARCH STRATEGY:

5. Which states have government as a principal industry?

SEARCH STRATEGY:

6. Here is an hypothesis starter. You need to write an hypothesis that will test the relationship between population and % urban. Fill in the blanks and then use the data file to test your hypothesis.

States that have (high, medium, low) __________________ have (high, medium, low) ________________.

List the data that you found to test this hypothesis:

Does this data support or not support your hypothesis?

SEARCH STRATEGY:
APPENDIX D

Collaboration Protocols
Experimental Week 1
Curriculum Lesson 7

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Keyboarder

1. Type the name of the event in on the computer.

2. Enter information to complete the Who-What-When-Where-Why Activity Sheet. Remember, you can use your textbook to find additional information.

3. Read the information OUT LOUD as you type the answer to each question into the computer.

4. Save and print your group's outline at the end of today's computer session.

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Questioner

1. Help your group decide what information to use to complete the worksheet. Use your textbook to find additional information.

2. The keyboarder is going to read OUT LOUD as the information is entered. LISTEN to what the keyboarder is typing.

3. Do you think some of your information doesn't make sense? Ask your group to explain it to you.

4. Do you think you are putting your information into the wrong category? Give your group your opinion and explain what you are thinking to your group.
THINK--LISTEN--DISCUSS

WORKING TOGETHER

The Checker

1. Make sure everyone in your group is working on the assignment.

2. The keyboarder is going to read OUT LOUD as the information is entered. LISTEN to what the keyboarder is typing.

3. WATCH what the keyboarder is entering. Do you think you see a mistake? Point it out to your group and EXPLAIN what you think the problem is.

4. Make sure your group has entered information to answer ALL of the questions on the worksheet before your group saves their outline.
Experimental Week 2
Curriculum Lesson 8

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Keyboarder

1. Type in the HEADLINE, BYLINE, and DATELINE for your article.
2. Working with your group, type in your article.
3. Read each sentence OUT LOUD as you type it in.

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Questioner

1. Using the worksheet, help your group write up the information you gathered last week into a newspaper article about your historical event.
2. LISTEN to each sentence that the keyboarder reads. If it doesn't sound like a newspaper article should sound, explain what changes your group needs to make.
3. ASK each member of your group for their opinion about the information your group should include in their article.
THINK--LISTEN--DISCUSS

WORKING TOGETHER

The Checker

1. Check every sentence in your article to make sure that it is a complete sentence. If you find a mistake, explain the correction that needs to be made to your group.

2. Check the punctuation in your article.

3. Make sure that the other members of your group are working on the assignment.
Experimental Week 3
Curriculum Lesson 9

THINK--LISTEN--DISCUSS

WORKING TOGETHER

The Keyboarder

1. Follow your group's suggestions about the best course of action to follow to solve the crime.

2. If you do not understand what your group wants you to enter ask them to explain it to you.

THINK--LISTEN--DISCUSS

WORKING TOGETHER

The Questioner

1. ASK your group for their opinions about the next move you should make.

2. If your group does not agree you need to try to find a solution that everyone agrees with.

THINK--LISTEN--DISCUSS

WORKING TOGETHER

The Checker

1. Use the Scrapbook Summary to try to find the information your group needs to solve the crime.

2. As your group discovers information to solve the crime check off the appropriate categories on the clue checklist.
Experimental Week 4
Curriculum Lesson 10

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Keyboarder
1. Type in the clues that your group has selected.
2. Make sure you enter the clues in the order you want them to be shown when you play the game.
3. READ OUT LOUD as you are typing.

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Questioner
1. THINK OUT LOUD as you help your group plan your strategy.
2. Make sure your group agrees on which clues to use and what order to enter them in.
3. If ANYONE in your group does not understand one of the clues or the strategy you are using, EXPLAIN it to them.

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Checker
1. Check all your spelling CAREFULLY.
2. Listen as the keyboarder reads what is being typed. If something does not make sense, ask someone in your group to explain it to you.
3. Make sure the other members of your group are doing their jobs.
Experimental Week 5
Curriculum Lesson 11

THINK--LISTEN--DISCUSS

WORKING TOGETHER

The Keyboarder

1. Follow your group's suggestions about the best strategy to win the game you are playing.

2. If you do not understand what your group wants you to enter, ask them to EXPLAIN it to you.

THINK--LISTEN--DISCUSS

WORKING TOGETHER

The Questioner

1. Ask your group for their opinions about the next move you should make.

2. If your group does not agree, you need to try to find a solution that everyone agrees with.

THINK--LISTEN--DISCUSS

WORKING TOGETHER

The Checker

1. Ten Clues: Check your spelling CAREFULLY.

2. Carmen San Diego: Fill in the Scrapbook Summary to try to find the information your group needs to solve the crime.
Experimental Weeks 6-7  
Curriculum Lessons 12-13

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Keyboarder

1. Follow your group's suggestions about the best course of action to follow to solve the crime.
2. If you do not understand what your group wants you to enter ask them to explain it to you.

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Questioner

1. ASK your group for their opinions about the next move you should make.
2. If your group does not agree you need to try to find a solution that everyone agrees with.

THINK--LISTEN--DISCUSS
WORKING TOGETHER

The Checker

1. Use the Scrapbook Summary to try to find the information your group needs to solve the crime.
2. As your group discovers information to solve the crime check off the appropriate categories on the clue checklist.
Experimental Week 8
Curriculum Lesson 14

THINK—LISTEN—DISCUSS

WORKING TOGETHER

The Keyboarder

1. Enter the information needed to complete each field of the record for your group's state. Read the information OUT LOUD as you enter it.

2. Make sure you are putting the CORRECT information in the CORRECT field. If you do not understand something ASK your group to EXPLAIN it to you.

THINK—LISTEN—DISCUSS

WORKING TOGETHER

The Questioner

1. Find the information you need to complete your record on the state data sheet given to your group.

2. Make sure that you EXPLAIN to the rest of your group WHAT information you need to complete your record and WHY that information goes in a certain field.

THINK—LISTEN—DISCUSS

WORKING TOGETHER

The Checker

1. Make sure that your group is working CAREFULLY.

2. Is the information you are entering CORRECT? Is the keyboarder putting the information into the CORRECT field? If you disagree with your group's decisions, EXPLAIN your reasoning to the rest of your group.
Experimental Week 9
Curriculum Lesson 15

THINK—LISTEN—DISCUSS

WORKING TOGETHER

The Keyboarder

1. Type in the search strategy that your group decides on.

2. EXPLAIN what you think this search will accomplish to your group.

THINK—LISTEN—DISCUSS

WORKING TOGETHER

The Questioner

1. READ the question that you are answering OUT LOUD to the rest of your group.

2. ASK your group for their ideas as you plan your search strategy.

THINK—LISTEN—DISCUSS

WORKING TOGETHER

The Checker

1. CHECK what the keyboarder is entering—
   Is everything spelled correctly?
   Are you entering your search in the correct field?

2. WRITE DOWN the answer to each question and your group's search strategy.
APPENDIX E

Training Sessions
Researcher: One of the things that we would like to teach you is how to work together more efficiently and effectively. This week we are going to use pictures in your history text to write newspaper stories. I'd like to work with you to show you some ways that you and your group can work together while we're in the computer lab. I'm going to practice these ideas with one or two of you then everyone will get a chance to practice with their group.

Write Who-What-When-Where-Why questions on board

R: As we answer these questions my group and I are going to do three things. First, we are going to LISTEN to each other. We are also going to THINK about what we are doing and saying. We are also going to DISCUSS our ideas with each other.

Select two students to practice with.

Assign roles of keyboarder and checker to students.

Have everyone turn to p. 265 in their textbooks

R: What is happening in this picture?

What is the event that is shown in this picture?

Add information to the outline on the board as it is given

R: What else can you tell me about this event from looking just at this picture and its caption? (details and supporting evidence)

R: Where could we look to find additional information on this event?

Use text to find key person, approximate time frame and location

R: One thing that is really important is answering the question that has been asked. For example, just what kind of information do we need for this question: Where did this event occur? Right, we need a place, a location. If you don't understand why your group is using certain information to answer one of these
questions, ask them to explain it to you. When you want your group to change something you need to explain just what you are thinking to your group.

R: Now we're left with a hard question--Why is this event significant? Tell me your ideas. (Accept each idea and ask for additional ideas)

R: That was great! We really worked together to get this work done. Let's try it again with the picture on p. 260.

Repeat the process with other students

Have all students turn to p. 341. A copy of the roles and the worksheet will be distributed to each group and students will select roles. Each group of students will go through the same process. The researcher and classroom teacher will move around the classroom and offer encouragement and suggestions.

R: Everyone really did a good job! Working together is a lot of fun. Remember, when we work together we all need to think, listen, and discuss. Don't forget to use these ideas when we go to the computer lab this week.
TRAINING SESSION 2

Researcher: This week we are going to use a new program in the computer lab. This program is called Ten Clues. It is like the game you may have played called 20 Questions. This week each group is going to work together to create a game. Next week we'll exchange disks and play the games your classmates and students in other classes might have created. Today I'm going to practice with a couple of groups.

R: The key thing that you need to understand about this game is the concept of attributes (write on board). Discuss this concept, differentiating between critical and variable attributes. Read list of attributes. Tell students to raise their hand if they think they know what is being described.

R: This is one activity where working effectively with your group is important, both in planning and playing your game.

R: Who knows the three roles that we use in the computer lab? Accept and list on the board. Follow up by asking students to describe the responsibilities that accompany each role. List roles and responsibilities on board.

R: Now I need 2 volunteers. I'm going to be the keyboarder so I need a Questioner and a Checker. (Select 2 volunteers) Show these volunteers a card with the concept to be described on it.

R: As the students list the critical and variable attributes of the concept I will write them on the board.

As each attribute is stated have the students EXPLAIN why the attribute is critical or variable. After listing 8-10 attributes, number them in the order that they would appear in a Ten Clues game. Have the students verbalize the strategy they are incorporating.

Practice with 2 other volunteers and then allow the small groups to practice with social studies concepts selected by the classroom teacher. The teacher and researcher will observe the groups during this practice.

R: Terrific!! Remember, as you work in your groups in the lab LISTEN to your group, THINK about what they are saying, and EXPLAIN your ideas to your group. See you in the lab!
TRAINING SESSION 3

Researcher: For the next couple of weeks in the computer lab we will be working with the same database program that we used at the beginning of this project. This time you will get to create a database on the fifty states and then you will use this database to test some hypotheses and answer some questions.

Discuss the concept of an hypothesis. Use examples from other content areas (the relationship between height and weight, for example). Ask students if we prove an hypothesis or just support it with evidence from the data.

R: Ask students to list roles and describe the usual responsibilities. List on board.

R: There are some important things we need to keep in mind when we work on this activity.

R: First, we need to determine if we can answer the question with the information in our file. Whose responsibility would this be? (Discuss answers, add responsibility to roles on board)

Use overhead to display sample data file.

R: To work on the hypothesis part of the assignment we need to look for connections between the categories. This is something the whole group will do together. Next each group will need to write the hypothesis using the connections that we want to investigate. Finally we will have to decide how we can search our database to find data that supports or fails to support our hypothesis. Discuss how these activities will fit in with the roles the students have been using. List changes on board.

Select 2 volunteers. Ask them to examine the data on the overhead and look for two categories that might be connected in some way. Ask them to EXPLAIN OUT LOUD exactly what they are thinking as they formulate an hypothesis that relates the two categories. Ask the class to elaborate on their explanation. Ask the rest of the class if the data to investigate the hypothesis is in the data file. If so, have the volunteers EXPLAIN a possible search strategy and the kind of data needed to test the hypothesis. If not, have the volunteers formulate another hypothesis.
Repeat this process with several sets of volunteers. No small group practice will be included this week--this is the most difficult concept encountered and it seems particularly important for the researcher to directly mediate the groups as they practice, providing extensive modeling of the interaction that should take place in each group.

R: We will really have alot of fun in the computer lab this week if everyone works this well together!! Don't forget to THINK, LISTEN, AND EXPLAIN as you work with the states database!
APPENDIX F

Sample Lesson Plan Form
C.A.T.S. Project
Curriculum Information

Week of: ____________

Topic:

Pages in text (T) or Curriculum Guide (G):

Learning Objectives:

Thinking Skills:
APPENDIX G

Verbal Interaction Report Form
### VERBAL INTERACTION REPORT FORM

<table>
<thead>
<tr>
<th>Interaction Variable</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student-Student Interactions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Giving Help</strong></td>
<td></td>
</tr>
<tr>
<td>Gives explanation</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td>Gives input suggestion</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td><strong>Receiving Help</strong></td>
<td></td>
</tr>
<tr>
<td>Makes error, receives explanation</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td>Asks for explanation, receives one</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td>Receives input suggestion</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td>Asks question, receives response</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td>No help given when needed</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td><strong>Teacher-Student Interactions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Receiving Help</strong></td>
<td></td>
</tr>
<tr>
<td>Makes error, receives explanation or suggestion</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td>Asks question, receives response</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
<tr>
<td>Total Errors</td>
<td>8.7.6.5.4.3.2.1.0</td>
</tr>
</tbody>
</table>
VITA

Judith LaVine Repman was born May 16, 1954 in Martinez, California. She was raised in California, Michigan, and Canada before moving to Baton Rouge, Louisiana in 1967. A graduate of Broadmoor High School, she entered Louisiana State University in 1972. She received a B.A. in History in 1974 and a Master's degree in Library Science in 1976.

Judith was employed as the library/media specialist for Cornerstone Academy, Baton Rouge from 1983 to 1986. During this time she enrolled as a part-time student in the doctoral program in educational media at Louisiana State University. She became a full-time graduate student and was employed as a graduate research assistant in August, 1986. She was awarded the Ph.D. in August, 1989.

Judith's primary research interests include critical thinking, integration of computer-based learning into the content areas, the role of school library/media specialists in instructional development and enhancement, and at-risk students. She is married to Duane A. Repman and is the mother of a son, James.
DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Judith LaVine Repman

Major Field: Education (Media)

Title of Dissertation: Cognitive and Affective Outcomes of Varying Levels of Structured Collaboration in a Computer-Based Learning Environment

Approved:

S. Kain MacGregor
Major Professor and Chairman

[Signature]

Dean of the Graduate School

[Signature]

EXAMINING COMMITTEE:

[Signatures]

Date of Examination:

July 24, 1989