

COMPUTER-ASSISTED INSTRUCTION AND THE
CREATIVE THINKING AND WRITING
ABILITIES OF FOURTH GRADE
STUDENTS

By

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PREFACE

I designed this study to determine if using a dialogue form of computer-assisted instruction (CAI) in generating wordbanks for creative writing improves the creative thinking and writing abilities of fourth grade students more than the abilities of fourth grade students who do not use CAI for that purpose.

Projects such as this are not possible without the assistance and encouragement of many people. I am grateful to Dr. David Yellin, who served as my dissertation director, for his assistance and advice. I especially appreciate Dr. Vernon Troxel for serving as chairman of my committee, for offering advice on the statistical analysis, and for giving me wise counsel throughout my program at Oklahoma State University. I thank Dr. Joyce Friske for serving on my committee, for giving me encouragement, and for providing advice and assistance with my computer program. In addition, I extend my appreciation to Dr. Bernard Belden and Dr. Thomas Warren for serving on my committee and for their assistance with the final manuscript.

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CHAPTER I

THE RESEARCH PROBLEM

Introduction

Specifying goals of education is confusing because educators use the term "goals" interchangeably with "ends," "purposes," "aims," and "objectives" (Zais, 1976). Regardless of which term educators use, many priorities in education do exist. Educators agree that education should teach a child to communicate (Haley-James, 1982; Wall & Taylor, 1982), expand the cognitive abilities (Nickerson, 1984; Brandt, 1983; Hansen, 1982), and expand creative abilities (Marksberry, 1963). Furthermore, education should equip the child to participate in the current age of technology (Robinson, 1982; Eisele, 1979).

Lesgold (1986) points out, however, that the school day is already filled with the existing curriculum. Classroom teachers cannot give up time in reading or writing to teach students isolated topics like thinking skills, creativity, or the use of computers.

The situation supports Whitehead's (1957) point that there is a tendency in education to provide specific areas of study without emphasizing the interrelation of those areas. Modern curriculum includes the basic components of

instruction, reading, writing, and math, as well as an array of disciplines that educators believe to be either necessary or valuable for maturing citizens. Seemingly, these basic components and the complex component of modern technology are at the far ends of the educational continuum. In reality, they can overlap, intertwine, and generate each other.

The task for teachers is, therefore, to discover effective methods of bringing together the various priorities of education for individual students and to show how those priorities relate to one another. Educators need to make efforts that will generate a fusion of the disciplines, stimulate cognitive growth, and result in creative, productive citizens in a modern technological society.

Educators believe such an outcome is possible. Seymour Papert (1981), a leader of technology in education, believes that society is "at a point in the history of education when radical change is possible . . . and the possibility of that change is directly tied to the impact of the computer (p. 19)." Valdez (1986) also suggests that a broad-based use of computers in many subject areas will enhance thinking and learning. This study addresses the task of bringing together an effective method of instruction with the creative growth of students in thinking and writing.

Purpose of the Study

This study sought to determine if using a dialogue form

of computer-assisted instruction (CAI) in generating a wordbank for creative writing improved the creative thinking and writing abilities of fourth grade students more than the abilities of fourth grade students who did not use CAI for that purpose. The study addressed the following questions:

1. Did the students' creative thinking ability improve during the duration of the study? If so, could the improvement be attributed to the use of a dialogue form of CAI?
2. Did the students' creative writing ability improve during the duration of the study? If so, could the improvement be attributed to the use of a dialogue form of CAI?

Hypotheses

The research design for the study was Campbell and Stanley's (1963) Pretest/Posttest Control Group represented as follows:

$$\begin{array}{rcc}
 R & \begin{array}{ccc} O_{1e} & X & O_{2e} \end{array} \\
 & \hline
 & \begin{array}{ccc} O_{1c} & & O_{2c} \end{array}
 \end{array}$$

where

- R = Random Sample
- O_{1e} = Pretest/Experimental Group
- O_{2e} = Posttest/Experimental Group
- O_{1c} = Pretest/Control Group
- O_{2c} = Posttest/Control Group
- X = Experimental Treatment

This study tested the following null hypotheses:

H_{0 1a}: There is no significant difference between means of the experimental and control groups on the measure of creative thinking.

A_{1a}: There is significant difference between means of the experimental and control groups on the measure of creative thinking.

H_{0 1b}: There is no significant difference between means of the experimental and control groups on the measure of creative writing.

A_{1b}: There is significant difference between means of the experimental and control groups on the measure of creative writing.

H_{0 2a}: There is no significant difference between the pretest and posttest means of creative thinking.

A_{2a}: There is significant difference between the pretest and posttest means of creative thinking.

H_{0 2b}: There is no significant difference between the pretest and posttest means of creative writing.

A_{2b}: There is significant difference between the pretest and posttest means of creative writing.

H_{0 3a}: There is no significant interaction between the experimental and control groups and the pretests and posttest means of creative thinking.

A_{3a}: There is significant interaction between the experimental and control groups and the pretest and posttest means of creative thinking.

H_{0 3b}: There is no significant interaction between the experimental and control groups and the pretest and posttest means of creative writing.

A_{3b}: There is significant interaction between the experimental and control groups and the pretest and posttest means of creative writing.

Definitions

The writer used the following definitions in testing the hypotheses of this study:

Computer-Assisted Instruction (CAI). CAI is a form of instruction prepared for students that is delivered by the microcomputer.

Creative Thinking. Creative thinking is thought represented by fluency, flexibility, and originality (Torrance, 1974a, 1974b, 1974c).

Creative Thinking Ability. Creative thinking ability is the term used to describe the process of creative thinking in an individual as indicated by the individual's achievement score in creative thinking.

Creative Writing. Creative writing is the original writing produced by an individual that reflects picturesqueness, vividness, flavor, personal element, original solution or ending, original setting or plot,

humor, invented words or names, and other unusual twist in style or content (Yamamoto, 1964).

Creative Writing Ability. Creative writing ability is the term used to describe the ability of an individual in creative writing as indicated by the individual's achievement score in creative writing.

Dialogue. Dialogue is one type of CAI. It is the back and forth interaction between a microcomputer software program and the user.

Disk. A disk or diskette is used to store the program's information that is accessed by an individual user with a microcomputer.

Feedback. Feedback is any message from the computer program to the user. Feedback provides information, explanation, and encouragement to the user.

Flexibility. Flexibility is variations in kinds of ideas or strategies. It includes shifting from one approach to another.

Fluency. Fluency is the number of ideas produced in words by an individual.

Hardware. Hardware refers to the equipment of a micro computer system and peripherals including the keyboard, monitor, printer, and disk drive.

Learning Style. Learning style is the way individuals respond to their environmental, emotional, sociological, and physical surroundings (Dunn, 1981).

Microcomputer. Microcomputers are a type of computer

designed for individual use. For purposes of this study, microcomputer refers to personal computers commonly used by educators in the schools.

Originality. Originality is ideas that are unusual or not obvious or commonplace.

Software. Software is the term for educational programs that are stored on diskettes and delivered to students by means of the microcomputer.

TALK. TALK is the name used to identify the creative writing software program, Let's Go For a TALK! TALK is an original program written for this study by the writer. The program contains eight topics of interest to children. Within each topic, the program poses randomly-selected questions from each of the six levels of Bloom's taxonomy (Bloom, 1956).

Assumptions

This study assumes the following:

1. Expanding the creative thinking ability of students is a priority of education.
2. Expanding the creative writing ability of students is a priority of education.
3. Measuring a product of creative expression is an indication of the creative process.
4. The Torrance Tests of Creative Thinking (Verbal Test, Forms A and B) are accurate measures of creative thinking.

5. Torrance's Evaluation of Originality and Interest is an accurate measure of creative writing.
6. Randomly selecting subjects for the experimental groups yielded comparable groups for study.

Limitations

Limitations of the study are as follows:

1. The participating school district is located in a suburb of Tulsa, Oklahoma, consisting primarily of Caucasian students. The results, therefore, are only representative of suburban school districts consisting primarily of Caucasian students.
2. All fourth grade classes in all schools of the school district did not participate. The participating schools are located near the center of the socioeconomic range of a suburban school district (Appendix A). The results, therefore, are only representative of students randomly selected from schools located near the center of the socioeconomic range of a suburban school district.
3. The writer approached only one school district for participation in the study.
4. The time needed for testing required the writer to administer the creative thinking pretests and post-tests to large groups of 64 subjects instead of smaller groups of 15 as recommended by the test manual.

5. Inter-scorer reliability was not addressed as a factor in this study.
6. This study is limited only to students who completed the entire program.
7. Another possible limitation was the classroom teachers' influence on the subjects by word or attitude.
8. Time constraints required that the writer conduct the study during the last four weeks of the school year.

Summary

This chapter provided introductory information for the study with respect to purpose, hypotheses, definitions, assumptions, and limitations. Chapter II provides a review of the literature pertaining to motivation and learning, creativity in thinking and writing, and computer-assisted instruction as a tool to expand the creative talents of students. Chapter II also presents the pilot study, results, and revisions.

CHAPTER II

THE BACKGROUND INFORMATION

Introduction

Osborn (1963) points out that individuals in previous generations were, out of necessity, more creative than are individuals in modern, technological times. Osborn explains:

The disciplines of education and the pressures of living tend to enhance our critical faculties at the expense of our imaginative ability. This is another reason why we are almost certain to become less and less creative unless we deliberately do something to conserve and develop the imaginative talent with which we were born (p. 60).

Apparently, the trend will continue until educators make a concerted effort to expand the creative potential of students. How educators accomplish the task will depend on the motivational aspects of the teaching process, the extent to which students engage in creative activities, and the degree of cognitive potential of the teaching tools.

The first part of this chapter presents a review of the literature pertaining to motivation and learning, creativity in thinking and writing, and computer-assisted instruction as a tool to expand the creative talents of students. The

second part of the chapter describes the pilot study, results, and revisions.

Review of the Literature

Motivation and Learning

The close relationship of motivation and learning makes it difficult to distinguish between the two. In 1964, Sears and Hilgard claimed that the distinction is important to educators because what keeps the student motivated to perform may also keep the student learning. More than twenty years later, however, Wlodkowski (1977) pointed out that "There is no conclusive evidence to support the intuitive notion that motivation enhances learning (p. 6)."

Motivation exists in extrinsic forms (external satisfaction in the form of rewards or prizes) and intrinsic forms (internal satisfaction related to task itself). Teachers should use intrinsic forms of motivation because extrinsic forms fail to sustain motivation (Perkins, 1984; Wlodkowski, 1974; Torrance & Myers, 1970). When teachers use forms of extrinsic motivation, the reward becomes the reason for student performance. When the reward is no longer present, the reason for the performance is gone and students lose interest in the activity. In contrast, when the reward is within the task itself, the motivation is built into the task and the student continues to maintain interest.

Malone (1981) insists that external motivation

"destroys the intrinsic motivation a person has to engage in an activity (p. 69)." He suggests that when "students are motivated to learn something, they may spend more time and effort learning, feel better about what they learn, and use it more in the future (p. 69)." Malone explains that intrinsically motivating activities include aspects of challenge, fantasy, and curiosity.

Lockhart and Schmeck (1983) point out an underlying assumption in research studies that suggests teachers should concern themselves with how students learn as well as what they learn. Research indicates that student learning styles affect learning (Copeland, 1984; Dunn, 1984; Nickerson, 1984; Gregorc, 1979; Dunn & Dunn, 1979; Torrance & Myers, 1970). Specifically, student academic achievement increases, student attitudes toward school improve, and discipline problems decrease when teachers teach students according to the students' preferred learning style (Dunn, 1984).

Unfortunately, more than two-thirds of our students function poorly in the traditional school "because they do not have traditional learning styles (Reckinger, 1979, p. 255)." According to Dunn and Dunn (1979), only 20-30 percent of school age children learn best by their auditory sense, while 40 percent learn best by their visual sense, and the remaining 30-40 percent learn best by tactual/kines-
thetic, visual/tactual or some combination of the senses. Teachers, therefore, should use teaching techniques and tools that support student learning styles.

Preferred learning styles also affect motivation. Dunn and Dunn (1979) found that "when taught through methods that complemented their learning characteristics, students at all levels became increasingly motivated and achieved better academically (p. 239)."

Combs (1982) emphasizes that learning is a personal experience motivated by personal need and that "personal discovery of meaning cannot occur without the active participation of the learner (p. 78)." According to Combs, conditions that foster learning include:

- (1) making student involvement and participation possible
- (2) satisfying student needs
- (3) promoting positive self-concepts
- (4) providing challenge without being threatening
- (5) providing students with feelings of belonging and identification

In addition, Crandall, Katkovsky, and Crandall (1965), found that students are also motivated when they believe they have self-responsibility for a performance.

Tyler (1949) and Marksberry (1963) point out that it is possible for schools to provide a variety of educational experiences that aim for the same objective while using the different interests of students and teachers. James (1983) indicates that "any object not interesting in itself may become interesting through becoming associated with an object in which an interest already exists (p. 62)."

Furthermore, James suggests that students show more interest in concrete, novel things that they see or hear than in abstract statements spoken by the teacher.

White (1959) argues that motivation is more effective when difference-in-sameness is present. He explains that interest wanes and "motivation subsides when a situation has been explored to the point that it no longer presents new possibilities (p. 322)." According to White, behavior should focus on characteristics of exploration and experimentation providing for "a kind of variation within the focus (p. 323)."

Creativity

Thirty years ago a frustrated educator pointed out that everyone wants creativity but no one knows how to get it (Taylor, 1956). In reality, creativity is innate in every individual to some degree, and one task of education is to bring out and develop that creativity (Perkins, 1984; Eby, 1983; Iakovlev, 1976; Osborn, 1963; Rogers, 1954; Weisskopf, 1951).

According to Adams (1979), cultural, environmental, and emotional blocks exist that stifle the creative process. For example, the belief that fantasy and reflection are a waste of time is an example of cultural blocks and it is common for educators to discourage activity perceived as daydreaming. Adams (1979) points out that teachers valuing their own ideas and not accepting the ideas of students are

examples of environmental blocks in the creative process. Fear of making a mistake or taking a risk, preference for judging ideas as opposed to generating ideas, and a lack of challenge and imagination are examples of emotional blocks.

According to Hunt (1982), unconscious thoughts control the individual's habits and creativity. Adams (1979) agrees, but points out that the individual's conscious mind is the "control valve" for creativity (p. 42). Educators, therefore, need to find ways to bring subconscious thoughts to the conscious mind.

Bull (1979) contends that students are not creative because teachers fail to support creative activities. For example, Friedman and Rowls (1980) found that teachers tend to ask questions that focus on acquiring or remembering facts. Bull (1979) and Torrance (1971) suggest that provocative, open-ended questions stimulate creativity by freeing the student to think about things in new ways. The task of the classroom teacher, therefore, is to generate classroom activities that free the learner from cultural, environmental, and emotional blocks and give the student an "opportunity to respond in terms of his or her [own] experience and abilities (Torrance, 1971, p. 36)."

Thinking. Educators believe a central purpose of education is to teach students to think (Nickerson, 1984; Brandt, 1983; Hansen, 1982; Friedman & Rowls, 1980; Taba, 1965). As societal and individual needs change, the ability to think creatively becomes increasingly important. The

ability to produce creative ideas and to solve problems is an asset in career success and in forming useful, lifetime habits. Hansen (1982) emphasizes that "Only when one masters not only the subject but the rational and thinking processes associated with it, can he or she claim to be educated (p. 63)."

According to James (1983), a teacher's prime concern should be to ingrain good habits into students by presenting automatic and habitual as many useful actions as possible. Whether they be habits of deed or habits of thought, good habits are a result of time spent in good practice. Nickerson (1984) reveals that experts spend more time than novices in problem-solving.

Teaching thinking skills need not be a separate subject or a burden to the classroom teacher. As a matter of fact, Beyer (1983) insists that teaching thinking skills in isolation becomes a waste of time and resources when teachers teach thinking skills only to have teachers in other areas reteach the skills. Bereiter (1984) insists that thinking skills should be made an integral part of every instructional objective. He suggests that the instructional program should be so permeated with thinking skill activities, "that they cannot be isolated and reduced to verbalized subject matter (p. 75)."

According to Beyer (1983), evidence suggests that teaching thinking skills through subject-matter courses improves the learning of the subject matter as well as the

thinking skills. Worsham and Austin (1983) conducted research with high school students in a structured cognitive skills program in a language arts curriculum and found that the participating students had an improvement on their SAT scores. Worsham and Austin attribute the increase in achievement to a shift in classroom instruction from acquiring facts to increasing thinking skills.

According to Taba (1965), questions play a crucial role in increasing thinking skills. Hunkins (1972) agrees with Taba, but explains that research indicates teachers do not ask "powerful" questions (p. 9). Hoskisson (1973) refers to the types of questions teachers ask as "false" questions and "true" questions (p. 159). False questions are those questions that have single, correct answers, while true questions allow for alternatives and a variety in the types of responses they prompt.

A variety in types of questions asked allows for a variety in responses. Benjamin Bloom (1965) devised a hierarchical order of types of questions. He defined a number of categories of thinking that include all intellectual objectives. The categories evolved from a search for a method of classifying behavior relating to mental acts or thinking. Bloom organized the taxonomy in a hierarchical order of six major levels as shown in Figure 1.

- 6) Evaluation
- 5) Synthesis
- 4) Analysis
- 3) Application
- 2) Comprehension
- 1) Knowledge

Figure 1. Bloom's Taxonomy

Bloom built the hierarchy on the premise that simple behaviors coupled with other simple behaviors form more complex behaviors. Each behavior or level subsumes the previous levels. Hunkins (1972) explains that, according to Bloom's taxonomy, if a student is to function and expand at a particular level, the student should be able to already function at the lower levels. If that is not the case, however, the student would need cognitive experiences at the those lower levels. The scheme, therefore, is for teachers to develop questions that expand the student at all levels. In order to do that, teachers must understand the levels of knowledge, comprehension, application, analysis, synthesis, and evaluation.

Knowledge is the recall of specific bits of information. This basic level is the foundation for the other levels. Sanders (1966) suggests that a student's chances for success in the higher levels of thought rest with the importance and usefulness of the knowledge he possesses. An

example of a knowledge questions is "Where do you and your friends play?"

Comprehension is the lowest level of understanding on Bloom's taxonomy. It is understanding a communication and making use of the material without necessarily relating it to other material or seeing its fullest implications. The comprehension level is important to students because thinking at this level requires students to begin to put knowledge to work. Students need to be able to find the main idea of the material read or the main idea of the situation encountered. Students also need to learn to formulate inferences (Hunkins, 1976). An example of a comprehension question is "What do you do to make new friends?"

Application is the use of abstractions in specific and concrete situations. Sanders (1966) extends the definition by explaining that application questions pose problems that are similar to the form and context in which they would be encountered in life. Hunkins (1972) identifies the central thrust of application questions as dealing with data or solving some kind of problem. Situations in everyday life call for us to apply the knowledge and understanding we acquire. Students who learn to think at this level should be able to apply knowledge and understanding as well as demonstrate them. An example of an application question is "What could you do to help others make new friends?"

Analysis is the breakdown of a communication into elements or parts so that the hierarchy within or the relations between the ideas expressed are clear. Analysis includes focusing on the relationships of the parts to each other as well as to the total communication. Analysis is basic to identifying and solving problems. Students need to become actively familiar and skilled with the process of relating ideas to each other and distinguishing between elements or situations (Hunkins, 1972). An example of an analysis question is "How are friends and family alike?"

Synthesis is the putting together of parts of elements so that they make a whole. It includes a creative flair, arranging and combining the parts in a new manner or pattern. Sanders (1966) suggests that synthesis thinking is not tied as closely to the form of questions as are the other levels, but suggests, instead, that it thrives in a classroom atmosphere that seeks and rewards originality. An example of a synthesis question is "How would you make new friends if everyone lived in trees?"

Evaluation is making judgments about the value of ideas, works, solutions, methods, and materials. Evaluations may be made in terms of either external or internal criteria. Bloom (1965) explains that evaluation is the last category in that it requires some of the other levels of behavior, but is not necessarily the last step in thinking. He suggests that it is possible for the evaluative process to precede the "acquisition of new knowledge, a new attempt

at comprehension or application, or a new analysis and synthesis (p. 185)." An example of an evaluation question is asking, "How well do you make new friends?"

Teachers use questions with students to focus attention, motivate, teach, and evaluate. Research indicates, however, that questions typically focus on a low level involving remembering or acquiring facts (Friedman & Rowls, 1980; Gillin, Kysilka, Rogers, and Smith, 1972). Acquiring facts is necessary to form basic foundations. Teachers, however, should draw from a broad range of levels for their questions rather than from any single level. Hunkins (1968) suggests that a rise in student achievement occurs when teachers change the emphasis of questions to higher levels.

Torrance (1961) found that when researchers used questions to prompt the thoughts of students trying to find ways to improve a toy elephant, the group trained to answer questions with clever, unusual responses provided a significantly higher amount of responses than the untrained group. According to Torrance, the trained students provided more ideas and showed more creativity in their thinking than the untrained group. Torrance concluded that teachers should teach using principles of questioning techniques that will yield more and better ideas. Brainstorming, the free-flowing of ideas and holding evaluation of the ideas until later, is one technique that will yield more and better ideas.

Parnes and Meadow (1959) found that subjects who used a brainstorming technique in creative thinking improved in productivity and in performance more than subjects who did not brainstorm. Parnes and Meadow also conducted research to determine if instruction in brainstorming would be effective with subjects who had no previous training in the technique. Results indicate that subjects trained in brainstorming produce more good quality ideas than untrained subjects. Results also indicate a positive correlation between the quantity and the quality of ideas produced. Parnes and Meadow suggest that the brainstorming technique overcomes the tendency in subjects toward inhibition and, therefore, encourages a larger quantity of ideas which results in an increase in the quality of the ideas.

According to Osborn (1963), principles of brainstorming that lead to producing quality ideas include withholding criticism until the end of the session and encouraging a quantity of ideas. Osborn found that by deferring criticism of ideas during brainstorming, individuals can produce better ideas than if criticism accompanies the ideas. Furthermore, Osborn found that quantity increases quality. He states, "In case after case, the last 50 ideas produced at a brainstorm session have averaged higher in quality than the first 50 (p. 167)."

Individuals can use the brainstorming technique in activities that emphasize thinking and writing. Elbow, (1984) describes two orders of thinking. The first order is

creative and does not require conscious direction or control. The second order is conscious and directed. Elbow also describes two orders of writing. The first is free-writing without "planning, control, organizing, and censoring (p. 38)" while the second is thoughtful, critical rewriting. Figure 2 demonstrates how Elbow links the first order of thinking with the first order of writing and the second order of thinking with the second order of writing. Elbow explains that "The two writing processes enhance the two thinking processes (p. 38)."

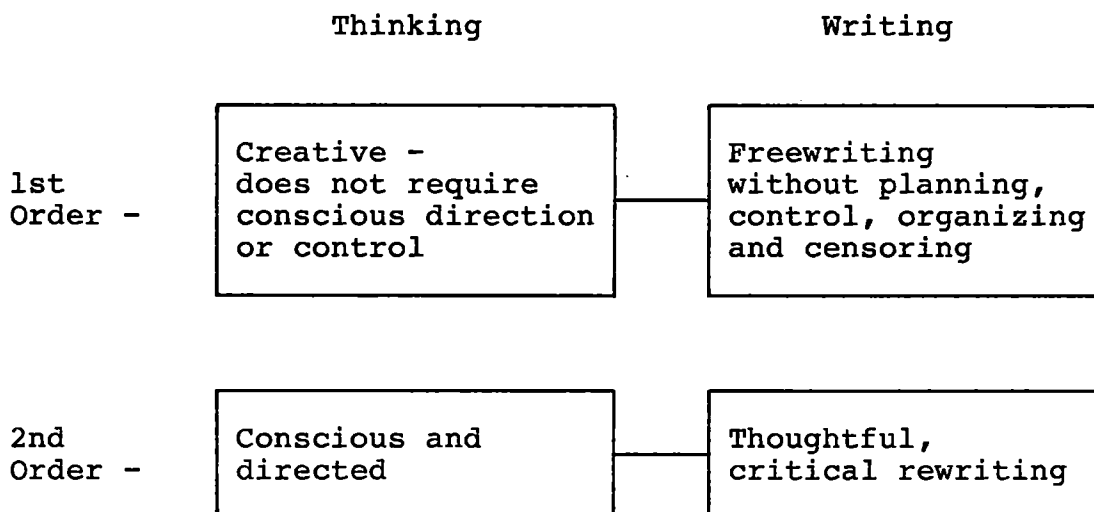


Figure 2. Elbow's Orders of Thinking and Writing

According to Nickerson (1984), research shows there is a corresponding ability between thinking and writing. Nickerson explains that "writing is viewed not only as a medium of thought but also as a vehicle for developing it (p. 33)."

Writing allows for the organizing and expressing of one's thoughts. Conversely, Nickerson points out that "one cannot learn to write effectively without learning how to organize one's thoughts and to express them clearly (p. 28)." The result is a cycle that suggests that if there is improvement in thinking, then there will be an improvement in writing, and, therefore, an improvement in thinking.

Writing. According to Haley-James (1982), writing encourages learning by focusing thought, making thought available for inspection, allowing more complex thought, translating mental images, making use of multisensory perceptions, and motivating communication. Writing, however, is a difficult task. DeHaven (1979) describes writing as

. . . both complex and abstract. Children who are eager to get their ideas down in print, soon find that words do not consciously tumble out onto the page in response to thought or momentary impulse. Instead, one must hold a thought in focus while carefully translating each word into its visual symbols. Writing is a demanding task, and skill in writing does not develop as easily as skill in speaking (p. 215).

Purposes for writing vary, but they typically include the following: writing for intrinsic pleasure, to recollect what is known, to preserve or express ideas or experiences, to stimulate imagination, to foster artistic expression, to clarify thinking, to inform, to persuade, to transact business, and to entertain (Haley-James, 1982; Tompkins, 1982; Petty, Petty & Becking, 1976; Moffett & Wagner, 1976).

Witty (1957) contends that providing students the opportunity to write allows teachers a better opportunity to

understand the students and their needs. Furthermore, writing provides students a form of escape and help with problems.

Educators believe certain qualities distinguish creative writing from ordinary composition. Qualities of artistic expression include the unusual, emotion, flexibility, picturesqueness, vividness, flavor, personal element, original solution or ending, original setting or plot, humor, invented words or names, and other unusual twist in style or content (Petty, Petty & Becking, 1976; Yamamoto, 1964; Carlson, 1961).

According to Emig (1982), however, research in writing is in early stages "conceptually as well as historically (p. 2)." Furthermore, she questions research designs such as pre- and posttest constructs that assume researchers can identify significant writing variables and then weight and rate them.

Writing researchers vary in their opinions on the specific stages or phases that constitute the creative writing process (Glatthorn, 1982; Marashio, 1981; Applebee, 1981; DeHaven, 1979). However, a synthesis of phases includes 1) exploring, 2) drafting, 3) writing, and 4) revising.

It is during the first stage, exploring, that brainstorming, the free-flowing of ideas, impressions, and associations, occurs in the mind of the writer. Interests and experiences in the subconscious mind surface at the

conscious level. Moffett and Wagner (1976) explain that sharing experiences, ideas, and feelings is an important aspect of writing. Brainstorming allows the writer to explore and develop a line of thinking before actually writing. Teachers should encourage students to build a base for writing; however, that frequently does not occur. For example, Wilhide (1985) conducted research with eighth grade students and found that students did not understand the exploring phase and they gave no evidence of practice in prewriting or brainstorming activities. Applebee (1981) questions whether "we short-circuit the brainstorming and reflection needed in prewriting, insisting that students 'get to work' (p. 460)." It is possible that the desire for a tangible product may obscure the importance of the exploring phase.

During the drafting phase, the writer notes the ideas, impressions, and associations brought to mind during the previous phase. The writer examines, evaluates, and expands interests, experiences, and beliefs or feelings. The writer begins an out-pouring of reactions to the chosen topic.

During the writing phase, the writer attempts to compose or arrange the draft into an organized form by reforming, perfecting, and refocusing without regard to the skills of writing, spelling, and so forth.

During the revising phase, the writer perfects the composition and polishes it with regard to form and style.

The writer edits the composition using the skills of writing, spelling, punctuation, and so forth.

Oliver (1982) points out that teachers traditionally teach writing as a linear process emphasizing a step-by-step procedure. Oliver explains, however, and Moffett (1983) and Glatthorn (1982) agree, that writing is not a linear process but actually is recursive and interactive. The phases of creative writing form a cycle of loops encompassing the whole process and relating back to each other. Figure 3 shows how the recursive and interactive process works.

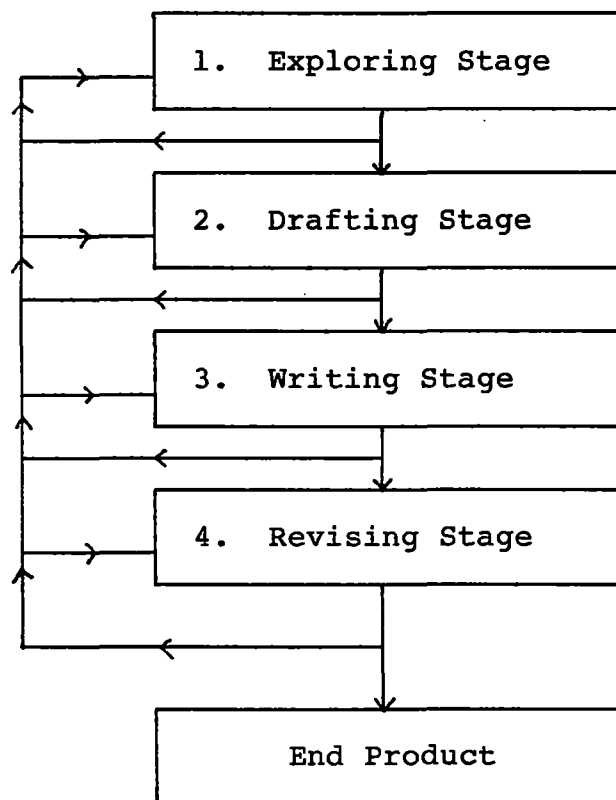


Figure 3. A Recursive and Interactive Writing Process

Oliver (1982) points out that children "receive little or no advice on how to generate ideas or explore their thoughts (p. 163)." According to Boesch and Cox-Chapman (1983), writers write about what they know best. Children are experts about themselves and, therefore, tend to build their interests around themselves and their families. Glatthorn (1982) suggests that teachers should give students a choice of topics and "help them discover what they know, what they believe, and what they feel (p. 723)."

Children up to age nine tend to select topics based on fantasy rather than real experiences and they tend to write compositions of higher quality when they write about fantasy (Wyatt, 1962; Dehouske, 1982). Topics of interest to children include leisure activities, places in the community, modes of transportation, sports, games, family, early memories, personal treasures, dreams, and animals (Boesch & Cox-Chapman, 1983; Wyatt, 1962; Applegate, 1960; Witty, 1957; Clark, 1954).

DeHaven (1979) points out that children may be reluctant to write because of a lack of stimulation, a belief that their ideas are not significant, or because of a previous negative experience leading them to believe writing is an insurmountable task. DeHaven suggests teachers help reluctant writers by spending more time in prewriting discussions to develop ideas for writing and by providing adequate structure to give children a feeling of security.

According to Anderson (1964), teachers need to guide

children to write creatively as they learn to express their interests, experiences, or impressions. DeHaven (1979) and Oliver (1982) suggest posing provocative questions that have no single right or wrong answer as one way to stimulate ideas. Oliver explains that the approach allows the teacher to ask

a series of questions designed to induce the student to generate facts, concrete details, examples and illustrations, causes, comparisons, and so forth, that are germane to the topic under consideration (p. 166).

Stimulating individual students with questions relating to individual topics is a problem for the classroom teacher because of time constraints and the enormity of the task. Using computer-assisted instruction to generate questions is one way to alleviate the time required for personal attention by the classroom teacher and to deal with the many topics that children enjoy.

Computer-Assisted Instruction

According to Zaharias (1983), instructional uses of microcomputers fall into three categories: (1) Computer-Assisted Instruction where students use the microcomputer as an instructional tool, (2) Computer-Management Instruction where teachers use the microcomputer in management activities such as generating tests, scores, and individual student prescriptions, and (3) Information Processing where any user retrieves information stored in the microcomputer's memory.

Computer-Assisted Instruction (CAI) is a form of instruction prepared for students that is delivered by the microcomputer. Kuchinskas (1983), Hill (1983), Watts (1981), Dence (1980) and Eisele (1979) describe specific types of CAI:

1. problem solving--the learner is in control and interacts with the computer while the computer simulates reality
2. gaming--encourages development of strategy
3. simulation--models features of an experiment or problem
4. drill and practice--reinforces or maintains facts previously learned
5. tutorial--computer instructs learner
6. demonstration--illustrates concepts by use of graphics and simulation
7. word processing--allows learner to write, edit, and organize
8. dialogue--provides interactive conversation between the learner and the computer

Most of the early software for education tended to be drill and practice and tutorial because of the ease in programming the single, correct-answer type of software. More recently, however, software reflects more complex programs made possible through problem-solving, simulation, and dialogue.

Although computers in the classroom are appearing with

increasing frequency, some educators are not convinced that the impact will be far-reaching. Suhor (1983), for example, believes that the presence of a social influence need not result in educational and curricular changes. He points out, for example, that telephones and televisions did not replace school buildings. Suhor admits that some inventions like the printing press and data base systems do affect education, but he insists that schools should proceed slowly and carefully if incorporating CAI into the curriculum.

Furthermore, Suhor calls into question the notion that computers are advanced educational technology, suggesting, instead, that students may be held back in their learning process:

The bias towards a linear model of thinking discourages development of more complex and challenging materials that deal with higher cognitive abilities.

This technical quirk hides a deeper question about human values and professional priorities: should the development of higher thinking skills be sought primarily through computers? In recent years we have learned much about cognitive processes embedded in and developed through oral and written language . . . with such exciting resources for direct, eye-to-eye development of human potential, we should wonder mightily about a medium that is fundamentally asocial, tending to isolate learners from peers and teachers (p. 31).

Dede (1983), on the other hand, sees education gradually shifting "from a teaching/learning model based almost exclusively on human instruction to a new approach that combines teachers and machines (p. 22)." His vision gives computers a major role in instruction:

Desktop computers will create new types of instruction. Graphics, music, voice output, touch-screen, and voice input will enable the computer to use games, simulations, and 'microworlds' to teach sophisticated skills. Such devices can motivate extended student concentration and learning without teacher supervision. The computer will even be able to diagnose the learning style and needs of the individual student and gear instruction to match these characteristics as well as collect data on student learning to aid evaluation and research (p. 22).

Dede emphasizes that a preferred situation calls for a trained, professional human working individually with each student, but he points out that financial considerations and class sizes prevent that from happening. Dede suggests that combining teachers and machines offers a promising alternative. He envisions students trained by computers in areas with limited ranges of right answers such as basic math and language decoding, and educated by teachers in areas with ranges of multiple answers such as creative writing and critical interpretation.

No doubt the controversy will continue as long as educators are free to voice their opinions or until research provides definitive conclusions. In the meantime, educators will search and research the problem. Newman (1984) probably isolates the major issue concerning computers in the classroom when she questions if "the technology [is] to be used for doing what we have been doing, only more efficiently: substituting electronic workbooks" for paper workbooks or if students can "control computers as creative tools (p. 494)." She suggests that computers can enhance

learning by providing students a tool that will allow self-direction, reflective thinking, and control of that tool.

Convinced that computers will have effects on students, teachers, and education in general, Gleason (1981) points out that research efforts to compare CAI to traditional methods of instruction are inconclusive. For example, in a study cited by Seidel (1980), researchers compared CAI and non-CAI student achievement of disadvantaged students to national norms at a given grade level. The results were inconclusive. Seidel found, however, that student attitudes were positive towards CAI. Similarly, Senter (1981) found that students who have their first name mentioned in feedback have better attitudes toward CAI than students who do not receive personal feedback.

Early CAI focused on areas such as math and science. During the past several years, however, the selection of software began to include other areas such as the language arts. Programs are now available in specific areas like reading, spelling, grammar, punctuation, and writing. For example, English/Language Arts content represented twelve percent of all software produced from 1984 to 1985 and that amount represented a 45 percent increase over the previous year ("MICROgram," 1985).

Another recent change in software concerns the type of CAI available. Although most software continues to be drill and practice ("MICROgram," 1985), some CAI is markedly different from the drill and practice exercises typical of

early educational programs. Burns (1980) indicates that drill and practice routines typically focus on Bloom's first level of knowledge or facts, seldom reaching the higher levels of analysis, synthesis, or evaluation.

According to Burns and Culp (1980), the process of discovering what one wants to say is a result of planning and inquiry. With that in mind, they devised an interactive computer program for college students who needed to focus on background knowledge of a topic for a writing assignment. Burns and Culp programmed the computer to ask questions based on key words in the student's answers to previous questions. The result was an interactive conversation, or dialogue, between the computer and the student that provided the student with thought-provoking questions aimed at bringing subconscious knowledge to the conscious mind.

Other types of interactive CAI programs are available. Programs include questioning learners about animals in order to guess what specific animal the user has in mind (Mason, 1983), a conversational program where the computer offers phrases and sentences in reply to learners' input (Mason & Blanchard, 1982), and interactive activities to expand reading and writing (Rotenberg, 1984; Zacchei, 1982).

Wall and Taylor (1982) describe a type of interactive program whereby the student expresses ideas and writes a story that the computer stores. At a later time, the teacher reads the creative component and provides feedback via the computer. Still later, the student considers the

suggestions, rewrites, and edits the story. In this instance, the interaction is between the student and teacher using the computer as a tool rather than the interaction being between the computer and the student.

Kuchinskas (1982) suggests that four basic principles accompany interactive language:

1. Language is productive rather than receptive
2. Children learn by modeling
3. The computer is a motivational factor
4. Students should not be passive receivers

Kuchinskas adds that a language product should be reproduced in some permanent form.

According to Mehan, Miller-Souviney, and Riel (1984), teachers can achieve educational goals by using the interactive capabilities of computers. Computers are most effective when integrated into the curriculum and viewed as a tool rather than a dispenser of knowledge in isolated activities. In fact, according to Mehan and his colleagues, the most important ingredient in the success of computers is the coordination of instruction on and off the computers. For example, the teacher can brainstorm at the chalkboard with the whole class to build a wordbank for a story topic and then extend the same type of activity to the computer. Bradley (1982) indicates, however, that words listed on the chalkboard tend to acquire a permanence for students and, therefore, students are reluctant to offer additional ideas.

If students already know what they want to say, they

can easily use paper and pencil to record ideas (Lesgold, 1986). Students hesitate, however, when they have to know what to say about their topic, and as Shostak (1981) points out, there is much evidence to support the notion that "students would produce better writing if teachers spent more time on prewriting activities (p. 49)." Unfortunately, the time required for a teacher to brainstorm with each individual student about that student's personal topic is enormous and unrealistic in most classrooms.

Wall and Taylor (1982) suggest that an advantage of the computer is that the computer plays a role of receiver of written messages and the role of responsive listener through feedback. Although there is no single educational approach that is best for all students (Dence, 1980), interactive computer programs can be useful to all students (Bork, 1986). Because of their programming capabilities, teachers can use computers as a vehicle for inspiring fantasy (Rhodes, 1986), problem-solving (Valdez, 1986), and stimulating and expanding ideas for creative writing (Shostak, 1981; Burns, 1980).

Summary

A review of current literature indicates that teaching techniques should be motivating to students and tap the innate creative within each individual. Creativity in thinking and writing should become a matter of habit and teachers can use activities such as thought-provoking questions to stimulate thoughts, feelings, and ideas.

Asking questions from a hierarchical order provides a basis for thoughts beyond a factual level and expands student thought processes at all levels. Furthermore, research indicates that student achievement increases by changing the emphasis of questions from lower factual levels to higher cognitive levels. Using questioning in brainstorming activities is one way to stimulate thoughts and ideas in creative writing.

Children write about what they know best and they tend to be experts on themselves and their families, early memories, etc. Teachers, therefore, should help children discover what they know, believe, and feel. Children may be reluctant to write and teachers should, therefore, spend more time in prewriting discussions to develop ideas for writing. Using provocative questions that have no single right or wrong answer is one way to stimulate ideas. However, the overwhelming task of individually stimulating the thought process of each student is impossible within the time constraints of classrooms. Computer-assisted instruction is one tool that may provide an answer to the problem.

Computer-assisted instruction is most effective when it is integrated into the curriculum and the computer is viewed as a tool rather than a dispenser of knowledge. In creative writing, for example, the computer can pose questions to individual students about their individual topics. Computer-assisted instruction can be used to stimulate and

expand ideas in the exploring stage of the creative writing process.

The Pilot Study

According to Isaac and Michael (1981), a pilot study allows the researcher to gain ideas, approaches, and clues not foreseen. Ideas and clues gained in the pilot study "greatly increase the chances of obtaining clear-cut findings in the main study (p. 34)." The writer used the pilot study as a tool for identifying and correcting problem areas within the study, and as a general practice for the main study.

The subjects in the pilot study were 32 fourth grade students randomly selected from the four fourth grade classes in one school determined to be near the center of the socioeconomic range of Union School District, Tulsa, Oklahoma (Appendix A). The writer randomly assigned the students in School C to two groups of 16 each. One group acted as the experimental group. The other group acted as the control group.

The room provided by the participating school for testing subjects was a classroom converted to a reading lab. Furniture consisted of three tables and approximately twenty chairs. Some subjects seated themselves around the tables and others lay in the floor.

The writer gave the two groups the Torrance Tests of Creative Thinking (Verbal Test, Forms A and B) (Torrance,

1974a, 1974b) as pretests and posttests for a measure in creative thinking. The two groups also received Torrance's Evaluation of Originality and Interest (Yamamoto, 1964) as pretests and posttests for a measure in creative writing.

The writer directed the subjects in the experimental group to receive a dialogue form of CAI (TALK) and then write a creative story using some of the words from the wordbank created by TALK. Directions to the subjects included using TALK three times during the one-week pilot study. Each session required approximately 20 minutes. The experimental group did not receive classroom instruction in creative writing for the duration of the pilot study.

In order to counteract a halo effect possibly experienced by the experimental group, the writer instructed subjects in the control group to use the microcomputer and software programs normally available in their classrooms. The writer also instructed subjects in the control group to record time on task and topic of software selected (Appendix B). The control group did not receive classroom instruction in creative writing for the duration of the pilot study.

Hardware used in the pilot study consisted of two Apple IIe microcomputers with single disk drives and color monitors, and two Epson printers. All hardware belonged to the participating school district.

Results

In order to evaluate the process that the pilot study

followed and the product yielded through the pilot study, the writer requested participating teachers and subjects in the experimental group to complete an evaluation questionnaire (See Appendix C). The writer encouraged the teachers to respond freely and did not require teachers or students to identify themselves on the evaluations.

Process. According to the teachers, the major problem encountered during the pilot study concerned the equipment. The District's computer coordinator identified and resolved the problem; however, the experimental group lost the services of the computer station for approximately two days during the process.

Another problem concerned proper use of the keyboard during operation. Teachers indicated that piece of information would have been helpful to them.

Teachers also indicated that subjects encountered difficulty knowing how much writing was appropriate when using the computer program. Teachers indicated that spelling was a concern to some subjects in that subjects felt the need to spell all words correctly.

Some subjects did not understand what they were supposed to write in their creative writing stories. Teachers reported some subjects wrote their stories at home instead of in the classroom.

Subjects indicated on the evaluations that they began and ended the computer program without assistance from teachers. Subjects also indicated they liked using the

computer. Teachers indicated that students in were generally excited about using the computers and excited about being chosen to participate in the activity, but one student was not excited when his teacher insisted he give up his recess time to complete the program.

Teachers indicated strengths of the computer program for the subjects include working independently with computers, experience with printers, and helping students to organize their thoughts. The only weakness mentioned by any teacher was the long length of the program and the uncertainty of subjects regarding how much to write.

Teachers indicated a favorable overall impression of the computer program. They suggested, however, that the writer should visit the site during sessions, be present during the first day, or even be present during the entire experimental study.

Fourteen of the 16 subjects in the experimental group responded to the student evaluation questionnaire; however, not all subjects responded to all questions. Thirteen subjects indicated they found the directions easy to understand. Five subjects indicated the program was too long, four subjects believed the program was too short, and five subjects indicated the length of the program was just right.

Eleven students indicated they had no problems using the computer program. Problems mentioned by other subjects included not understanding the questions or knowing how to

respond to some questions, and difficulty in finding keys on the keyboard.

Subjects indicated a variety of responses when asked what items they liked best about the program. Three subjects indicated they liked being able to use the computer while one subject pointed out it allowed a different use of the computer. Two subjects liked writing the stories best while three favored specific topics within the programs such as school, family, and animals. One student liked the questions best, and one student indicated "It gave me a chance to talk."

When asked to indicate what they did not like about the computer program, four subjects mentioned mechanics such as turning the program on and equipment failures. Three subjects indicated the questions were "dumb" or "silly." One subject did not like writing the creative story while one subject did not like completing the test booklets.

Product.

A multivariate analysis of variance (MANOVA) could not allow for pair-wise deletion of variables. Results, therefore, reflect only the analysis of subjects' scores for whom all scores were available.

Data loss resulted from parents' refusal of permission for their children to participate in the study and subjects moving or being absent on testing dates. In addition, the

writer inadvertently misplaced 13 creative writing post-tests.

The check for results indicated no significant differences on the remaining nine cases. The number of cases; however, was too small to make an accurate check.

Revisions

Conducting the pilot study provided the writer an opportunity to identify and rectify weaknesses in several areas. Areas of major revision include testing conditions, amount of hardware available, directions to experimental subjects, and technical assistance during the study.

The writer determined that subjects in the experimental study should each be able to sit in a chair at a table or desk during testing times. Minor wording in the directions of the test manuals needed to be changed to make the directions more clear to the subjects.

The writer determined that more computer stations needed to be available to the experimental group to allow more opportunity for CAI. The participating district agreed to provide a total of eight computers, color monitors, and printers to the writer for the study. It became obvious to the writer that three sessions per week per subject was an unrealistic number because of time constraints. The writer, therefore, directed the subjects to use the CAI and write a creative story twice each week, but encouraged more sessions if time permitted.

Directions to the experimental group needed to be simple, but thorough. The writer determined the subjects needed to see a complete demonstration of the CAI. Subjects also needed to have available a self-explanatory description of how to begin and end the computer program with a reminder to keep the CAPS LOCK key locked down.

Being constantly available for assistance in two schools during the four-week experimental study was an impossible task for the writer. However, the computer coordinator in each building of the participating school district agreed to act as a troubleshooter should technical problems arise. The District's computer coordinator also agreed to be available to the schools should problems arise. The writer decided to visit each school on Friday of each week of the experimental study in order to gather information and confer informally with participating teachers about any problems or needs and the general progress of the study.

The writer prepared a list of randomly selected alternate subjects for each school. The alternates provided a means of fulfilling the need for a minimum of 64 subjects in each cell.

Summary

This chapter presented a review of the literature pertaining to motivation and learning, creativity in thinking and writing, and computer-assisted instruction as a tool to

expand the creative talents of students. The chapter also described the pilot study, results, and revisions.

Chapter III presents an overview of the experimental design with respect to the subjects involved in the experiment, the format of the treatment, the instruments used for data gathering, and a description of the analysis of the data.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

This study sought to determine the differences in the creative thinking and creative writing abilities of fourth grade students after using CAI. This chapter presents an overview of the experimental design with respect to the subjects involved in the experiment, the format of the treatment, and the instruments used for data gathering. Following the overview of the experimental design is the description of the analysis of the data.

Subjects

The subjects in this study were 128 fourth grade students randomly selected from two schools determined to be near the center of the socioeconomic range of Union School District, Tulsa, Oklahoma (Appendix A). The study, conducted for four weeks during the spring of the 1984-1985 school year, involved subjects randomly assigned to four groups of 32 each. The experimental group consisted of two subgroups, one in each school. The control group consisted of two subgroups, one in each school.

Research Design

The study tested the null hypotheses that a dialogue form of computer-assisted instruction would not improve the creative thinking and creative writing abilities of fourth grade students. The null hypotheses for the study are as follows:

H₀ 1a: There is no significant difference between means of the experimental and control groups on the measure of creative thinking.

H₀ 1b: There is no significant difference between means of the experimental and control groups on the measure of creative writing.

H₀ 2a: There is no significant difference between the pretest and posttest means of creative thinking.

H₀ 2b: There is no significant difference between the pretest and posttest means of creative writing.

H₀ 3a: There is no significant interaction between the experimental and control groups and the pretest and posttest means of creative thinking.

H₀ 3b: There is no significant interaction between the experimental and control groups and the pretest and posttest means of creative writing.

The research design for the study was Campbell and Stanley's (1963) Pretest-Posttest Control Group Design (Figure 4). The writer selected this design because of the need to randomly select subjects and the need to obtain a

pre-treatment measure of the subjects' creative thinking and writing abilities. The writer needed to establish creative thinking and creative writing ability at the beginning of the study in order to reliably evaluate the effects of the treatment. Designed to detect moderate differences with power set at 80 percent, each cell ideally should have 52 subjects (Cohen, 1969). This study had 64 subjects in each cell.

$$\begin{array}{ccccc}
 & O_{1e} & X & O_{2e} & \\
 R & \hline & & & & \\
 & O_{1c} & & O_{2c} &
 \end{array}$$

where

- R = Random Sample
- O_{1e} = Pretest/Experimental Group
- O_{2e} = Posttest/Experimental Group
- O_{1c} = Pretest/Control Group
- O_{2c} = Posttest/Control Group
- X = Experimental Treatment

Figure 4. Research Design

Internal Validity

According to Campbell and Stanley (1963), controls for internal validity include history, maturation, testing, instrumentation, regression, selection, mortality, and

interaction of selection and maturation. Furthermore, Campbell and Stanley indicate that the Pretest-Posttest Control Group Design controls for all the sources of internal validity.

History. The study controlled for history because the experimental and control groups ran simultaneously. Historical events that produced differences in one group would also produce differences in the other group. The study controlled for intrasession history because the writer randomly selected subjects in both groups from the population. The writer pretested and posttested the experimental and control groups together; therefore, both groups received the same instructions. Subjects in the experimental group received identical directions throughout the study from the computer.

Maturation and Testing. Maturation and testing occurred equally in the experimental and control groups and were, therefore, not factors. Furthermore, pretests and posttests consisted of alternate forms.

Instrumentation. Instrumentation was not a factor because the writer pretested and posttested the experimental and control groups together, which provided for control for within-session instrument differences. In addition, the writer assigned each test a number code for scoring purposes, which provided the judges no information about which test was a pretest or posttest or which test represented the

experimental or control group. Assigning the tests with number codes eliminated any subtle biases of the judges that could influence the results.

Regression and Selection. Regression was not a factor because the writer randomly selected subjects for both the experimental and control groups from the same population. Selection was also not a factor because of random selection.

Mortality. Mortality was not a factor because all subjects selected for the experimental and control groups were randomly selected from the same population. All subjects who completed both pretests and posttests remained in the analysis.

External Validity

According to Campbell and Stanley (1963), controls for external validity include interaction of testing and treatment, interaction of selection and treatment, reactive arrangements, and multiple-treatment inferences. Campbell and Stanley indicate, however, that even though the sources are threats to external validity, "experiments can be made more valid externally . . . without losing internal validity (p.17)." In this study, however, the interaction of testing and treatment, the interaction of selection and treatment, and reactive arrangements did cause external validity to become a factor.

Interaction of Testing and Treatment. According to Campbell and Stanley (1963), no undesirable interaction of testing and treatment exists if the tests are similar to those usually used in classrooms. The pretests and posttests in creative writing, stories freely written by the subjects, were familiar and usual activities for the subjects. Pretests and posttests in creative thinking, however, were standardized, open-ended tests that were unusual and unfamiliar activities to the subjects. Therefore, generalizing to the larger population is not possible because, although this study did control for the interaction of testing and treatment in creative writing, the study did not control for the interaction of testing and treatment in creative thinking.

Interaction of Selection and Treatment. According to Campbell and Stanley (1963), the Pretest-Posttest Control Group Design controls for differences between experimental and control groups. The possibility exists, however, that the results hold only for the larger population from which the experimental and control groups were selected. Campbell and Stanley explain:

This possibility becomes more likely as we have more difficulty in getting subjects for our experiment. Consider the implications of an experiment on teaching in which the researcher has been turned down by nine school systems and is finally accepted by a tenth. This tenth almost certainly differs from the other nine, and from the universe of schools to which we would like to generalize, in many specific ways. It is, thus, nonrepresentative. Almost certainly its staff has higher morale, less fear of being inspected, more

zeal for improvement than does that of the average school (p. 19).

The participating school system was the first and only system approached by the writer to participate in the study. The district administrator gave the writer permission to approach the building principals. The building principals gave the writer permission to approach the fourth grade teachers. When the teachers all agreed to participate, no other school system needed to be approached. Because the school system agreed to participate, and based on Campbell and Stanley's comments, the participating system is representative of other school systems. Sampling bias probably occurred, however, since the writer did not allow a more representative selection of school systems the opportunity to refuse to participate (Campbell & Stanley, 1963). For that reason, results represent the fourth grade population of the target school system only.

Reactive Arrangement. The writer obtained parental permission for subjects in the experimental and control groups (Appendix D). Random selection and assignment to the experimental and control groups minimized reactive arrangement, or a guinea-pig effect.

The writer, who was a stranger to the subjects, administered the creative thinking pretest and posttest to the subjects and told them that they were helping with a project from the writer's school. The regular classroom teachers administered the pretest and posttest in creative

writing using uniform directions (Appendix E). Teachers referred to the pretests and posttests as "activities." Because students in elementary school frequently have similar tasks, the activities were not out of the ordinary.

In order to counteract a halo or novelty effect that might be experienced by the experimental group, the writer directed subjects in the control group to use the microcomputers and software in their classrooms as usual. The writer also directed subjects in the control group to record times and topics that they used in their sessions at the microcomputer (Appendix B).

In spite of the efforts to avoid reactive arrangements, and because of the number of classroom teachers involved and the nature of the treatment, the writer cannot determine the degree of effect of reactive arrangement present by word or action in the study. The result, therefore, is that reactive arrangement became a factor in this study.

Multiple-Treatment Interference. According to Gay (1981), multiple-treatment interferences are a result of the subjects receiving more than one treatment in succession. Because subjects in this study did not receive multiple treatments, multiple-treatment interferences is not a factor.

Sampling Procedure

The writer randomly selected fourth grade students from two schools determined to be near the center of the

socioeconomic range of their school district. Based on Campbell and Stanley's True Experimental Design (1963), the experimental group (S_e) consisted of 64 students randomly selected from the two schools. The control group (S_c) also consisted of 64 students randomly selected from the two schools as shown in Table I.

TABLE I
SAMPLE POPULATIONS FOR EXPERIMENTAL
AND CONTROL GROUPS

School	Experimental Group (S_e)	Control Group (S_c)
School D	n = 32	n = 32
School F	n = 32	n = 32

Research Procedure

The writer gave the two groups (S_e and S_c) the Torrance Tests of Creative Thinking (Verbal Test, Forms A and B) (Torrance, 1974a, 1974b) as pretests and posttests for a measure in creative thinking. The writer also gave the two groups Torrance's Evaluation of Originality and Interest (Yamamoto, 1964) as pretests and posttests for a measure in creative writing.

The experimental group (S_e) received a dialogue form of computer-assisted instruction (CAI) in creative writing each week during the four-week study. Each session required approximately 20 minutes. The experimental group did not receive classroom instruction in creative writing for the duration of the study.

The writer directed subjects in the control group (S_c) to use the microcomputer programs normally available in the classrooms and to record their time on task and the topic of the software selected (Appendix B). The control group did not receive classroom instruction in creative writing for the duration of the study.

Instrumentation

The process of creative writing does not lend itself easily to evaluation. Therefore, educators measure ability in creative writing by evaluating the end product. However, a review of the literature and the Eighth Mental Measurements Yearbook (Buros, 1978) revealed to the writer few available group tests to measure the creative thinking ability of children and no tests to measure creative writing. A further search and conversations with professionals in the field led the writer to select two Torrance measures because of the particular aspects of creativity measured by the tests.

Torrance Tests of Creative Thinking

Torrance (1974a, 1974b) designed the Torrance Tests of Creative Thinking (Verbal Test, Forms A and B) to measure an individual's potential for creative thought. The tests provide a measure for fluency, flexibility, and originality, and are appropriate for groups of persons as young as fourth grade (Appendix F).

According to Torrance (1974a, 1974b) it is not necessary to have special training to score the tests. An untrained scorer can reliably score the tests when the scorer carefully studies and accepts the scoring guide. The mean reliability coefficients of untrained teachers compared to trained scorers are fluency, 0.99; flexibility, 0.95; and originality, 0.91.

Torrance (1974c) does not provide test reliability information. He suggests, instead, that the usual concepts of test reliability are relevant to the measurement of creative thinking ability, but the nature of the ability creates problems in interpreting reliability data. Torrance explains that the tests are sensitive to emotional, physical, motivational, and mental health factors and that fact "may make them especially useful in certain kinds of situations (p. 16)" such as evaluating experimental methods and experimental instructional materials.

Torrance (1974c) indicates that definitions of creativity are so diversified that "it is impossible to provide all researchers and potential users of tests of

creative thinking satisfactory evidences of validity (p. 21)." Torrance explains that he chose the tasks in his tests because he believed they represent "different parts of a universe of abilities (p. 21)" thought to be creative thinking abilities. According to Torrance, he designed the tests by consistently and deliberately selecting stimuli, tasks, instructions, and scoring on the best theory and research available at the time in an effort to assure content validity.

According to norms for Forms A and B at the fourth grade level, Torrance indicates means and standard deviations as shown in Table II.

TABLE II
MEANS AND STANDARD DEVIATIONS FOR
CREATIVE THINKING

Form	Fluency		Flexibility		Originality	
	Mean	SD	Mean	SD	Mean	SD
A	56.1	26.3	24.3	8.7	25.9	19.4
B	53.4	26.5	25.5	10.4	29.8	18.5

Evaluation of Originality and Interest

Scoring creative writing is a difficult task because it requires a subjective decision by the judge. For that reason, instruments to measure the creative writing ability do not readily exist. The writer chose Torrance's Evaluation of Originality and Interest (Yamamoto, 1964) (Appendix G) because it offers a system of scoring creative writing in the area of originality. The originality portion of the instrument evaluates nine characteristics of creative writing: 1) picturesqueness, 2) vividness, 3) flavor, 4) personal element, 5) original solution or ending, surprising, 6) original setting or plot, 7) humor, 8) invented words, names, etc., and 9) other unusual twist in style or content (Appendix H). The interest portion of the instrument measures mechanical skills involved in writing, therefore, the writer elected not to use the interest portion of the instrument.

Torrance does not provide test reliability and validity information. Reliability of scoring, however, is available in the scoring manual. Torrance used three judges to arrive at inter-scorer reliability. Judge A was an established research worker with more than three years' experience in creative thinking research projects. Judge B had only two month's experience with creative writing projects. Judge C had no training in creative writing projects. Results of inter-scorer reliability on originality between judges A and B indicate a correlation of 0.88 and between judges A and C

a correlation of 0.84. According to Torrance, norms in originality for the fourth grade level indicate a mean of 3.86 and a standard deviation of 1.86.

Judges

Two judges agreed to score the creative thinking tests. After scoring fifteen of the pilot tests; however, one judge withdrew from the study because the scoring was too time-consuming. The remaining judge scored the remaining pilot tests and all the experimental tests. Three judges agreed to score the creative writing stories. The following sections describe the background of judges for the creative thinking tests and the creative writing tests.

Thinking. The judge of the creative thinking pretests and posttests earned a B.S. in Education from the University of Arkansas and a Masters in Reading from Northeastern Oklahoma State University in Tahlequah, Oklahoma. Her teaching experience includes 16 years in the elementary grades with the last five years at Union Public Schools, Tulsa, Oklahoma. She had no previous experience in scoring the standardized tests.

Writing. Three judges scored each pretest and posttest in creative writing, which allowed the writer to use an average of the three judges' ratings for each score. The writer sought judges from three categories: 1) a creative

writing teacher, 2) a teacher of gifted students, and 3) a fourth grade classroom teacher.

Judge A earned a B.S. in Education from Central State University, Edmond, Oklahoma, and an M.A. in Education, and a Ph.D. in Educational Administration from the University of Santo Tomas, Manila. Her background includes teaching elementary school for 20 years and technical writing training to navy employees for three years.

Judge A currently owns an educational publishing house, is a fulltime writer, and teaches writing part-time at Tulsa Junior College, Tulsa, Oklahoma. She is the author of numerous books and articles.

Judge B earned a B.A. in Education from Hendrix College, Conway, Arkansas, and a Master of Teaching Arts with a Reading Specialist Degree from the University of Tulsa, Tulsa, Oklahoma. Her teaching background includes four years teaching speed reading for Tulsa Junior College, and 12 years as an elementary classroom teacher at Jenks Public Schools, Jenks, Oklahoma. She also served three years as the reading and language arts teacher for gifted children in grades four and five.

Judge C earned a B.A. from Central State University, Edmond, Oklahoma, and is working towards a Masters in Counseling at Oklahoma State University, Stillwater, Oklahoma. Her teaching experience includes nine years at Broken Arrow Public Schools, Broken Arrow, Oklahoma, where she currently teaches fourth grade.

Treatment

Treatment consisted of a dialogue form of CAI in creative writing, Let's Go For A TALK! (Appendix I). Subjects in the experimental group received treatment each week for four weeks by using TALK. Subjects used TALK to create an individual wordbank about a chosen topic and then wrote a story using some of the words from the wordbank.

The writer planned the study to be as convenient for the classroom teacher as possible. In order to assist the teachers when problems inevitably arose, the writer provided teachers with helpful information and a sheet to record anecdotal information (Appendix J).

The writer programmed TALK to allow users to choose from a variety of broad topics that interest children. The writer designed questions within each topic that would stimulate the cognitive ability of the users and bring subconscious thoughts and ideas to the conscious mind. The writer arranged the questions within the topics according to the cognitive levels outlined by Bloom (1966). The eight topics selected by the writer for TALK are: 1) All About Me, 2) My Family, 3) School Days, 4) Animal Life, 5) Friends and Others, 6) Games and Sports, 7) On the Go, and 8) Mother Nature. A sample run of TALK is in Appendix K.

Documentation

In order for the program, Let's Go For A TALK!, to operate and in order to use the program in this experimental

study, the writer addressed several specific areas of need. The following sections describe those areas.

Hardware. The hardware used in the experiment consisted of eight Apple IIe microcomputers with single disk drives and color monitors, and eight Epson printers. All hardware used in the study belonged to the participating school district. The fourth grade levels in the two participating schools had available four microcomputer stations in each school.

Content. Content of the software program consisted of questions from eight broad topics determined by the writer to be of interest to children. The writer arranged the questions within each topic into six levels of cognitive ability according to Blooms's (1966) taxonomy. Each level contained eight questions from which the microcomputer randomly selected three questions. Therefore, each user received three questions per level providing a total of 18 questions per treatment.

Size. Because TALK required a large number of questions for each topic, and because the writer needed to keep record-keeping information within the software program, TALK was too large to fit on one disk. Therefore, the writer divided the program so that the introductory portion of the program was on a disk labeled 1-RED, topics 1 and 2 were on Disk 2-WHITE, topics 3 through 5, were on Disk 3-BLUE, and topics 6 through 8 were on Disk 4-YELLOW.

Directions to User. Before subjects used the software program TALK, the writer explained the entire procedure to make sure all subjects understood how to start TALK, how to progress through the program, how to end TALK, and how to complete the writing assignment. The writer also commented on other topics including how to handle the disk, how to select the correct disk, and what to do if problems arose.

The writer used a directions card to demonstrate to the users the entire process of moving through TALK (Appendix L). The writer then attached a directions card on the wall at each computer station.

Operation. The writer programmed the 1-RED disk to automatically start TALK when the user placed the 1-RED disk into the disk drive and turned the computer on. TALK continued by means of automatic, timed movements and by the user pressing an appropriate key on the keyboard.

Data File. The writer programmed TALK to operate only after matching a subject's name and password. To provide a means for checking the information, the writer established a separate file containing the first and last names and corresponding passwords of each subject who would be using TALK. When the name and password matched, the computer signaled a personal greeting.

Time File. To provide information regarding the amount of time each subject used TALK, the writer programmed a time

file into each topic. The writer included the time file to record the user's time on task.

Graphics. The writer created a colorful picture to accompany each topic. Each picture, related in content to the chosen topic, automatically appeared on the monitor for five seconds at the beginning of the topic.

Description

The following sections describe the program, Let's Go For A TALK! with respect to content. In addition, the writer provides background information regarding the selection of questions that TALK presents.

Greeting. TALK began by providing the user with a colorful motivational screen displaying the title and copyright information for three seconds. TALK prompted the user to enter name and password information and then greeted the user with a personal hello message.

The program continued by explaining to the user what was about to happen, how to answer questions by using the keyboard, and about building a wordbank from which the user would write a story. TALK reminded the user how to progress to the next question when ready.

Topic Choice. TALK requested the user to select a topic by pressing the appropriate key. After making the selection, TALK requested the user to take out Disk 1-RED

and replace it with the correct disk according to the topic selected by the user.

Topics. After selecting a topic and changing disks, TALK gave the user a positive reinforcing message about the choice and displayed the appropriate graphic. TALK then asked the user to enter the name, password, and time started.

The writer programmed each topic to contain 48 questions divided into six levels with eight questions in each level. Using a series of loops, TALK asked the user three questions randomly selected by the computer from each of the six levels. The user answered the questions by typing a word, phrase, or sentence on the keyboard. The computer stored the responses until the user completed TALK.

After progressing through 18 questions about the selected topic, the program told the user that TALK would end by printing the responses the user gave, giving directions for using the individual wordbank to write a story, and explaining what to do with the completed story.

After the printer printed the user's responses, TALK provided the user with specific directions and helpful hints for writing the story. TALK requested the user to enter the time. TALK then printed out a closing message to the user to signal the end of the program.

Questions

The writer compiled a list of 498 questions related to

each of the eight topics and submitted the list of questions to three persons who had a thorough knowledge of Bloom's taxonomy. The writer asked each rater to assign each question to the appropriate level of Bloom's taxonomy, and to indicate the quality of each question (Appendix M).

The writer selected questions for TALK according to the ratings given to each question by the team of raters. The writer selected individual questions for TALK based on the raters' indication of a level by agreement of three of the three raters and then by two of the three raters. At that point and when several questions held equal ratings, the writer referred to the quality of each question as indicated by the raters. The writer selected questions preferring good ratings over fair ratings and fair ratings over poor ratings.

Raters

The following sections describe the three individuals who served as raters for the selection of questions that the writer used in TALK. Following the description of the raters is a summary of the results.

Rater A. Rater A is a Professor of Education in general curriculum at the University of Washington at Seattle. He spent the last 25 years investigating the impacts of the use of various types of questions on the thinking and achievement of students. He is currently researching the effects

of the direct teaching of questions and algorithms on the achievement of middle school students.

Rater A is the author of eight books, chapters for the yearbooks of the Association for Supervision and Curriculum Development and the National Council for the Social Studies, and numerous articles in professional journals. Rater A also conducted research funded by the Office of Education.

Rater B. Rater B has a Doctor of Education degree and is currently the Instructional Assistant for the Tulsa Teacher Effectiveness Program for Tulsa Public Schools, Tulsa, Oklahoma. She was an elementary school teacher, a K-12 reading specialist, instructional assistant for elementary schools; developer and writer of district curriculum guides and learning materials for math, reading, and language arts. She is currently the trainer and consultant for Tulsa's district model of effective instruction which focuses on Bloom's taxonomy.

Rater C. Rater C is Assistant Professor at Oklahoma State University, Stillwater, Oklahoma. Her experience includes teaching in an elementary classroom, serving as a reading clinician, and working as a research associate for Oklahoma City Public Schools, Oklahoma City, Oklahoma.

Rater C extended her knowledge of Bloom's taxonomy by conducting workshops to teach others how to develop tests based on the cognitive levels. She also assists others in

identifying and clarifying objectives or items according to their level of the taxonomy.

Results. After the raters submitted their results, the writer found that the number of questions needed in every topic fell short of the number needed within levels. The writer compiled additional questions and added them to the remaining list of original questions. The writer submitted the new list of 176 questions to three new raters who rated the questions in the same manner according to level and quality (Appendix M).

From the second rating, the writer selected the questions that completed TALK. The writer selected original questions evaluated by both teams on the basis of the highest agreement among the six raters. The writer selected new questions submitted only to the second team of raters on the basis of the highest agreement among those three raters.

When several questions held equal ratings, the writer selected questions based on the quality indicated by the majority of the raters preferring good over fair, and fair over poor ratings. When there were more questions meeting the criteria than TALK required, the writer selected questions based on the need for providing a variety within the level or topic.

Control

The control group was pretested and posttested in creative thinking and creative writing. The control group

received no formal classroom instruction in creative writing for the duration of the study.

According to Isaac and Michael (1981), two common sources of error that affect experimental studies are the Hawthorne effect and the placebo effect. The Hawthorne effect includes several influential factors including novelty and the awareness that one is participating in an experiment. The placebo effect recognizes the presence of background elements that affect change more than the actual treatment. Isaac and Michael explain:

For example, in a research study to examine the effects of videotape playback on increasing participation in class discussions using treatment and control groups, it might turn out that the presence of videotape recording equipment and any operators or observers were of equal or greater importance in contrast to the actual videotape playback. Unless the same equipment and personnel are present in at least some of the control classes as a placebo condition, the actual effectiveness of the playback may be misconstrued (p. 87).

In order to avoid any such effects, the control group needed to be able to use the microcomputers along with the experimental group. Since each classroom had at least one microcomputer, the writer instructed the control group to also use the microcomputers and the software of their choice (Appendix B).

Data Analysis Description

According to Bartz (1981) and Gay (1981), the two-way ANOVA allows the researcher to look at the effects of two or more independent variables simultaneously and to also look

at the levels within each variable. Such an analysis allows the researcher to look at each independent variable separately as well as the interactions between them. A multivariate analysis of variance (MANOVA) allows the researcher to study multiple ANOVAs. The writer used information from a MANOVA to provide data for the two univariate analyses of variance of interest in this study.

The purpose of the experiment was to determine if a dialogue form of computer-assisted instruction (CAI) in generating a wordbank for creative writing would improve the creative thinking and writing abilities of fourth grade students more than the abilities of fourth grade students who did not use CAI for that purpose. The study tested the following null hypotheses:

$H_{0\ 1a}$: There is no significant difference between means of the experimental and control groups on the measure of creative thinking.

A_{1a} : There is significant difference between means of the experimental and control groups on the measure of creative thinking.

$H_{0\ 1b}$: There is no significant difference between means of the experimental and control groups on the measure of creative writing.

A_{1b} : There is significant difference between means of the experimental and control groups on the measure of creative writing.

H₀ 2a: There is no significant difference between the pretest and posttest means of creative thinking.

A_{2a}: There is significant difference between the pretest and posttest means of creative thinking.

H₀ 2b: There is no significant difference between the pretest and posttest means of creative writing.

A_{2b}: There is significant difference between the pretest and posttest means of creative writing.

H₀ 3a: There is no significant interaction between the experimental and control groups and the pretest and posttest means of creative thinking.

A_{3a}: There is significant interaction between the experimental and control groups and the pretest and posttest means of creative thinking.

H₀ 3b: There is no significant interaction between the experimental and control groups and the pretest and posttest means of creative writing.

A_{3b}: There is significant interaction between the experimental and control groups and the pretest and posttest means of creative writing.

A 2 x 2 mixed model ANOVA is appropriate to analyze the data where the independent variables are one fixed (between) factor, Treatment (1=CAI; 2=Control), and one repeated (within) factor, Time (1=Pre; 2=Post). The dependent variables are creative thinking ability and creative writing ability as measured by the Torrance Tests of Creative

Thinking (Verbal Test, Forms A and B) (Torrance, 1974a, 1974b) and the Evaluation of Originality and Interest (Yamamoto, 1964).

This study met the assumptions for the MANOVA. According to Barker and Barker (1984), the two basic assumptions underlying the MANOVA are as follows:

1. Normal Distribution. The scores are normally distributed in the populations. The thinking scores were normally distributed. The writing scores were skewed; however, the writer performed a transformation of the scores (pre and post) to reduce the skewness so that the creative writing data were distributed normally.

2. Homogeneity of Variance. The populations from which the samples were drawn must have approximately the same variability. (We assume that the same factor causes the variance in the scores for each subject.) Scores were robust with respect to homogeneity.

Summary

Chapter III presented an overview of the experimental design with respect to the subjects involved in the experiment, the format of the treatment, and the instruments used for data gathering. Following the overview of the experimental design was the description of the analysis of the data. Chapter IV presents the results of the experiment.

CHAPTER IV

ANALYSIS OF THE DATA

Introduction

This experiment determined if using a dialogue form of CAI in generating a wordbank for creative writing improved the creative thinking and writing abilities of fourth grade students more than the abilities of fourth grade students who did not use CAI for that purpose. The study addressed the following questions:

1. Did the students' creative thinking ability improve during the duration of the study? If so, could the improvement be attributed to the use of a dialogue form of CAI?
2. Did the students' creative writing ability improve during the duration of the study? If so, could the improvement be attributed to the use of a dialogue form of CAI?

Subjects in the experimental group received treatment each week for four weeks in creative writing by using Let's Go For A TALK!, a CAI program especially designed for this study. Subjects used TALK to create individual wordbanks about a chosen topic and then wrote a story using some of the words from the wordbanks. Subjects in the experimental

group received no classroom instruction in creative writing for the duration of the study.

The writer established a control group in order to control for the Hawthorne effect, which recognizes influential factors that affect change in the experiment. The control group also allowed the writer to control for the placebo effect, which recognizes the presence of background elements that affect change more than the actual treatment. Because each classroom had at least one microcomputer, the writer directed the control group to use the microcomputers and the software of their choice. The control group received no classroom instruction in creative writing for the duration of the study.

One hundred twenty-eight fourth grade students, randomly selected from two schools near the center of the socioeconomic range of Union School District, Tulsa, Oklahoma, participated in the study. The writer randomly assigned the students to four groups of 32 each. The experimental group consisted of two subgroups, one in each school. The control group consisted of two subgroups, one in each school. Subjects completed pretests in creative thinking and in creative writing. After four weeks, subjects completed posttests in creative thinking and in creative writing.

This chapter includes the research design, research hypotheses, and data analysis. The writer applied a multivariate analysis of variance using the Statistical Program

for the Social Sciences (SPSS-X) to provide data for the two univariate analyses of variance of interest in this study.

Research Design

The research design for the study is as follows:

$$R \begin{array}{ccc} O_{1e} & X & O_{2e} \\ \hline O_{1c} & & O_{2c} \end{array}$$

R = Random Sample

O_{1e} = Pretest/Experimental Group

O_{2e} = Posttest/Experimental Group

O_{1c} = Pretest/Control Group

O_{2c} = Posttest/Control Group

X = Experimental Treatment

Research Hypotheses

This study tested the following null hypotheses:

$H_{0\ 1a}$: There is no significant difference between means of the experimental and control groups on the measure of creative thinking.

A_{1a} : There is significant difference between means of the experimental and control groups on the measure of creative thinking.

$H_{0\ 1b}$: There is no significant difference between means of the experimental and control groups on the measure of creative writing.

- A_{1b}: There is significant difference between means of the experimental and control groups on the measure of creative writing.
- H_{0 2a}: There is no significant difference between the pretest and posttest means of creative thinking.
- A_{2a}: There is significant difference between the pretest and posttest means of creative thinking.
- H_{0 2b}: There is no significant difference between the pretest and posttest means of creative writing.
- A_{2b}: There is significant difference between the pretest and posttest means of creative writing.
- H_{0 3a}: There is no significant interaction between the experimental and control groups and the pretest and posttest means of creative thinking.
- A_{3a}: There is significant interaction between the experimental and control groups and the pretest and posttest means of creative thinking.
- H_{0 3b}: There is no significant interaction between the experimental and control groups and the pretest and posttest means of creative writing.
- A_{3b}: There is significant interaction between the experimental and control groups and the pretest and posttest means of creative writing.

Multivariate Analysis of Variance

According to Norusis (1986), a multivariate analysis of variance (MANOVA) studies the relationships among several interrelated variables. MANOVA allows the researcher to study dependent variables individually and collectively. MANOVA could not allow for pair-wise deletion of variables; therefore, the writer only analyzed those results from subjects for whom all data were available (Appendix N).

The independent variables in this study were one fixed (between) factor, Treatment (1=CAI; 2=Control) and one repeated (within) factor, Time (1=Pre; 2= Post). The dependent variables were creative thinking ability and creative writing ability as measured by the Torrance Tests of Creative Thinking (Verbal Test, Forms A and B) (Torrance, 1974) and Torrance's Evaluation of Originality and Interest (Yamamoto, 1964).

Although the writer tested hypotheses concerning the main effects of time and of treatment, they were of limited interest. The writer's primary concern was with the interaction of time and treatment. A significant interaction would provide the basis for making comparisons among cell means. In particular, a comparison of the differences between the pretest and posttest means of the control and experimental groups would assess the statistical significance of gains or losses for the two groups. The absence of a significant interaction would alert the writer to not make any analyses of differences among cell means.

In order to determine whether the data were distributed normally, the writer used SPSS-X to compute a frequency run using the creative thinking and creative writing scores (pre and post). Thinking scores used in the analyses were taken to be normally distributed as the histograms were bell-shaped and the skewness test was not significant at the .05 level.

The creative writing scores, however, were positively skewed and the skewness was statistically significant at the .01 level. The writer performed a transformation of the variables of creative writing (pre and post) to base 10 logarithm to reduce the skewness so that the creative writing data were distributed normally.

Table III shows cell sizes, means, and standard deviations of treatment by time on the two measures. Transformed variables are in parentheses and noted by an asterisk.

An examination of Table IV indicates that there is no significant difference between means of the experimental and control groups on the measure of creative thinking ($F = .537$; $df = 1,98$; $p > .05$). Consequently, the writer failed to reject Hypothesis 1a at the .05 level of significance.

Table IV indicates no significant difference in creative thinking over time ($F = .056$; $df = 1,98$; $p > .05$). Consequently, the writer failed to reject Hypothesis 2a at the .05 level of significance.

TABLE III
 CELL SIZES, MEANS, AND STANDARD DEVIATIONS
 OF TREATMENT BY TIME.

		Thinking		Writing	
		Pre	Post	Pre	Post
CAI					
	\bar{x}	166.02	164.90	48.04 (1.67)*	44.45 (1.64)*
	s	30.73	30.36	9.00 (0.08)*	6.80 (0.06)*
	n	49	49	49	49
Control					
	\bar{x}	162.85	160.33	47.75 (1.67)*	44.83 (1.65)*
	s	27.83	27.99	8.79 (0.08)*	6.60 (0.06)*
	n	52	52	52	52

* transformed variables

TABLE IV
ANOVA OF THE AFFECTS OF CAI ON THE CREATIVE
THINKING ABILITY OF FOURTH GRADE STUDENTS

Source	SS	df	MS	F
Treatment	843.84	1	843.84	.537
Error	154130.53	98	1572.76	
Time	8.37	1	8.37	.056
Interaction	25.47	1	25.47	.172
Error	14539.26	98	148.36	
Total	169547.47	199		

no F is significant

Table IV also indicates that there is no significant interaction between the experimental and control groups and pretest and posttest means in creative thinking ($F = .172$; $df = 1, 98$; $p > .05$). Consequently, the writer failed to reject Hypothesis 3a at the .05 level of significance.

An examination of Table V indicates that there is no significance between means of the experimental and control groups on the measure of creative writing ($F = .016$; $df 1, 98$; $p > .05$). The writer, therefore, failed to reject Hypothesis 1b at the .05 level of significance.

TABLE V
ANOVA OF THE AFFECTS OF CAI THE CREATIVE WRITING
ABILITY OF FOURTH GRADE STUDENTS

Source	SS	df	MS	F
Treatment	0.0001	1	0.0001	.016
Error	0.67	98	0.007	
Time	0.016	1	0.016	4.81*
Interaction	0.0007	1	0.0007	.202
Error	0.32	98	.003	
Total	1.0068	196		

* $p < .05$

Table V indicates there is a significant difference in creative writing over time ($F = 4.81$; $df = 1, 98$; $p < .05$). Consequently, the writer rejected Hypothesis 2b.

Table V also indicates there is no significant interaction between the experimental and control groups and pretest and posttest means in creative writing ($F = .202$; $df = 1, 98$; $p > .05$). Consequently, the writer failed to reject Hypothesis 3b at the .05 level of significance.

Data for the two univariate ANOVAs were secured from data derived from a multivariate analysis of variance. Results of that analysis were not germane to this study.

Summary

This chapter described results of the experiment. The writer used information from a MANOVA to provide data for the two univariate analyses of variance of interest in this study.

Results indicated no significant difference between means of the experimental and control groups on the measure of creative thinking. Results also indicated no significant difference between means of the experimental and control groups on the measure of creative writing.

No significant difference between the pretest and posttest means in creative thinking existed. However, results indicated a significant difference between the pretest and posttest means in creative writing.

Results also indicated no significant interaction between the experimental and control groups and pretest and posttest means in creative thinking or creative writing.

Of the six hypotheses, the data could not be used to reject five. The only hypothesis that the writer rejected dealt with the main effect of time. This difference is of limited interest in that scores for both experimental and control groups are considered together.

Chapter V contains discussion of the results and interpretations of specific comparisons. Chapter V also includes conclusions from the study and recommendations for further research.

CHAPTER V

SUMMARY, FINDINGS, AND RECOMMENDATIONS

Introduction

Discovering effective methods of bringing together priorities of education for individual students and showing how those priorities relate to each other is an important task for education. Educators need to make efforts that will generate a fusion of the disciplines, stimulate cognitive growth, and result in creative, productive citizens in a modern, technological society.

This study sought to determine the differences in the creative thinking and writing abilities of fourth grade students after participating in an experiment using a dialogue form of CAI. The study addressed the following questions:

1. Did the students' creative thinking ability improve during the duration of the study? If so, could the improvement be attributed to the use of a dialogue form of CAI?
2. Did the students' creative writing ability improve during the duration of the study? If so, could the improvement be attributed to the use of a dialogue form of CAI?

Summary of Research Methods

The writer conducted a pilot study during one week in the spring of 1985. Subjects in the pilot study were 32 fourth grade students randomly selected from the fourth grade classes at School C, which was near the center of the socioeconomic range of Union School District, Tulsa, Oklahoma (Appendix A). Conducting the pilot study provided the writer the opportunity to identify and rectify weaknesses in several areas that included improving testing conditions, providing additional hardware, clarifying directions to experimental subjects, and providing technical assistance during the study. An additional need identified in the pilot study was that of a list of randomly selected alternate subjects who would replace original subjects whose parents refused permission for them to participate in the experiment.

The experimental study took place during the final four weeks of the 1984-1985 school year. Subjects in the study were 128 fourth grade students randomly selected from School D and School E, which were near the center of the socioeconomic range of Union School District, Tulsa, Oklahoma (Appendix A). The writer randomly assigned the students to four groups of 32 each. The experimental group consisted of two subgroups, one in each school. The control group consisted of two subgroups, one in each school.

The writer used Torrance Tests of Creative Thinking (Verbal Test, Forms A and B) (Torrance, 1974a, 1974b) as a

pretest and a posttest in creative thinking. The pretest and posttest in creative writing was Torrance's Evaluation of Originality and Interest (Yamamoto, 1964).

The research design for the study was Campbell and Stanley's (1963) Pretest-Posttest Control Group Design. The writer used information from a multivariate analysis of variance (MANOVA) to provide data for the two univariate analyses of variance of interest in this study. The writer designed the study to detect moderate differences by setting power at 80 percent. The writer set the check for statistical significance at the .05 level.

Findings and Discussion

In order to evaluate the process used in the experimental study as well as the product yielded through the study, the writer requested participating teachers and subjects in the experimental group to complete an evaluation questionnaire (Appendix O). The writer encouraged the teachers to respond freely and did not require teachers or students to identify themselves on the evaluations.

Process

In order to improve testing conditions over those present for the pilot study, the writer requested a specific area in both schools to serve as testing places that would allow for privacy and provide ample room for each subject to work at an individual desk. In both schools, however, the

administrator required the writer to do all testing in the school cafeteria. The rooms were larger than the writer preferred and were subject to intrusion by outsiders who passed through the cafeterias in going from one area of the school to another. Subjects sat at long tables, which hampered the testing in that the writer had to constantly walk among the tables in order to monitor subjects and control for excessive talking during pretesting and post-testing. Some subjects in School D were especially disruptive to other subjects and prompted inappropriate behavior from each other.

Seven of eight participating classroom teachers completed evaluation questionnaires. Teachers indicated the only major problem with the execution of TALK related to the functioning of the printers. Teachers in both schools found that the paper would occasionally feed improperly into the printers. School D was without two printers for two days because another teacher in the building borrowed the electrical outlet connection. School E experienced a power failure one day, which temporarily disrupted the activity.

Remarks by teachers indicated problems concerning students using TALK focused on the students' becoming familiar with the keyboard and the TALK program in general. Teachers also indicated students had to learn to use TALK between regular classroom assignments.

Teachers pointed out that the fourth grade classes were departmentalized and the arrangement caused some limitation

to available time. School D placed a computer station in each classroom and allowed students to work as time permitted. School E placed all computer stations in one classroom. Subjects in that school worked with TALK only during the time they went to that classroom each day.

In response to areas of a problem nature, teachers indicated that some students misspelled their passwords occasionally, which necessitated the teachers' intervention to help the student make the correct password entries. Teachers also indicated time was a problem for some students when more time was needed to finish writing their stories. Similarly, teachers stressed that students felt pressure to complete two stories per week. All teachers indicated, however, that students were able to begin and end TALK without assistance after having completed the program once.

Fifty-five subjects in the experimental group completed a student evaluation form at the end of the experimental study; however, not all subjects answered all questions. Table VI indicates student responses in three areas: their impression to the length of TALK, the amount of help they needed in using TALK, and specific problem areas they encountered when using TALK.

TABLE VI
 SUBJECTS' RESPONSES TO LENGTH OF TALK, AMOUNT OF
 HELP NEEDED, AND SPECIFIC PROBLEM AREAS

Item	Number of Responses
Length of TALK	
Too Long	11
Too Short	3
Just Right	40
Help Using TALK	
Never	18
Few	34*
Many	1
Problems with TALK	
No problems	20
Using the printers	16
Writing the stories	5
Typing on the keyboard	4
Answering the questions	3
Understanding the directions	1
Keeping the CAPS LOCK key locked	1

* Eight subjects specified they asked for help only once.

TABLE VII
 SUBJECTS' RESPONSES TO ITEMS BEST LIKED AND
 NOT LIKED ABOUT TALK

Item	Liked Best	Did not Like
Liked everything	5	
Disliked nothing		14
Using the computers	21	1
Answering the questions	9	5
Using individual topics	4	2
Writing the stories	3	11
Choosing topics	3	1
Using my imagination	1	
Using the printer	1	7
Learning more about myself	1	
Not doing work	1	
Comments: It was fun	3	
Gave me something to do	1	
Took Too Long		4
Couldn't Finish Work		1
Everyone Was Watching		1
Too Much Noise		1

Table VII (shown above) shows the items that subjects indicated they best liked about using TALK. The table also

indicates the items that subjects indicated they did not like about using TALK.

Product

An examination of the data indicated that there was no significant difference between means of the experimental and control groups on the measure of creative thinking. A dialogue form of CAI did not improve the creative thinking ability of fourth grade students. Results also indicated no significant difference in creative thinking from the pretest to the posttest. A dialogue form of CAI did not change the creative thinking ability of fourth grade students over time.

An examination of the data also indicated that there was no significant difference between means of the experimental and control groups on the measure of creative writing. A dialogue form of CAI did not improve the creative writing ability of fourth grade students. Results indicate, however, a statistically significant difference from the pretest to the posttest in creative writing. A dialogue form of CAI did change the creative writing ability of fourth grade students over time.

An examination of the means indicates that the creative writing scores of subjects in the experimental group fell from the pretest ($\bar{x} = 1.67$) to the posttest ($\bar{x} = 1.64$). The creative writing scores of subjects who were in the control

group also fell from the pretest ($\bar{x} = 1.67$) to the posttest ($\bar{x} = 1.65$) (Figure 5).

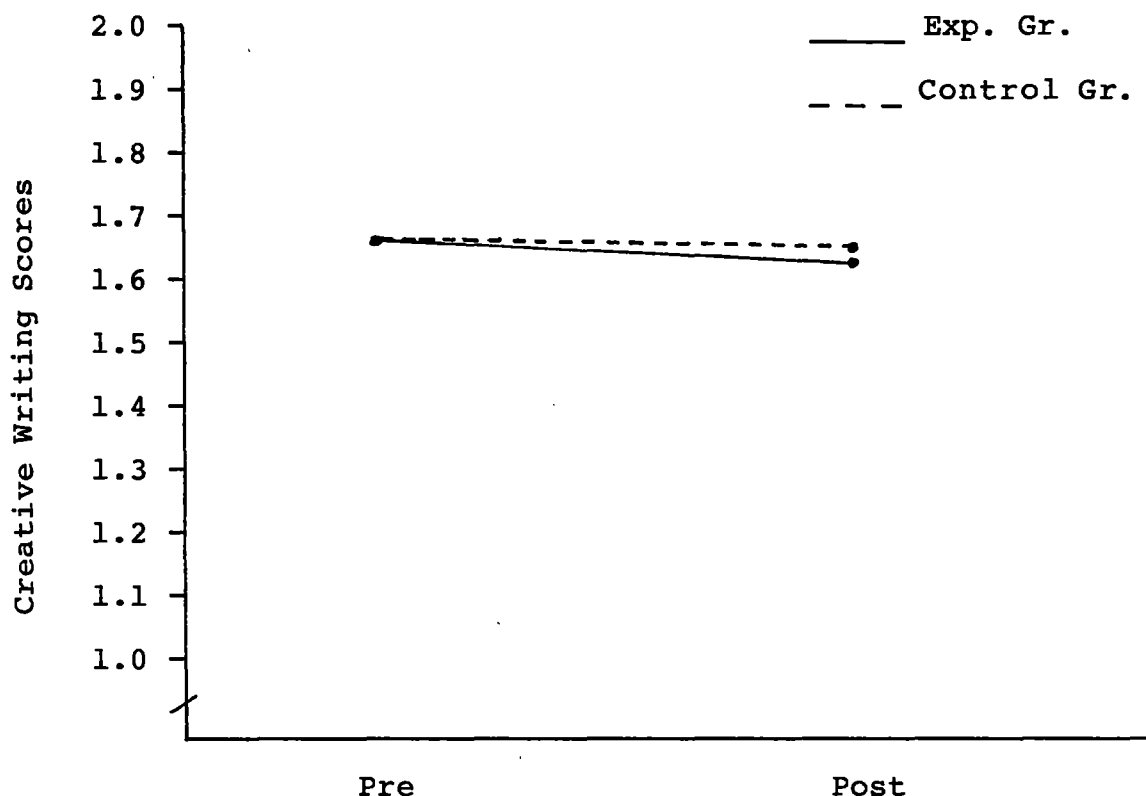


Figure 5. Graph of Creative Writing Means for Experimental and Control Groups

The decrease of means of the experimental and control groups in creative writing prompted the writer to look more closely at the means over time in creative thinking even though there was no significant difference in that measure. According to Table III (Page 78), the creative thinking means over time of the experimental group fell from the pretest ($\bar{x} = 166.02$) to the posttest ($\bar{x} = 164.90$). Creative

thinking means over time of the control group also fell from the pretest ($\bar{x} = 162.85$) to the posttest ($\bar{x} = 160.33$). Figure 6 illustrates the differences in creative thinking means.

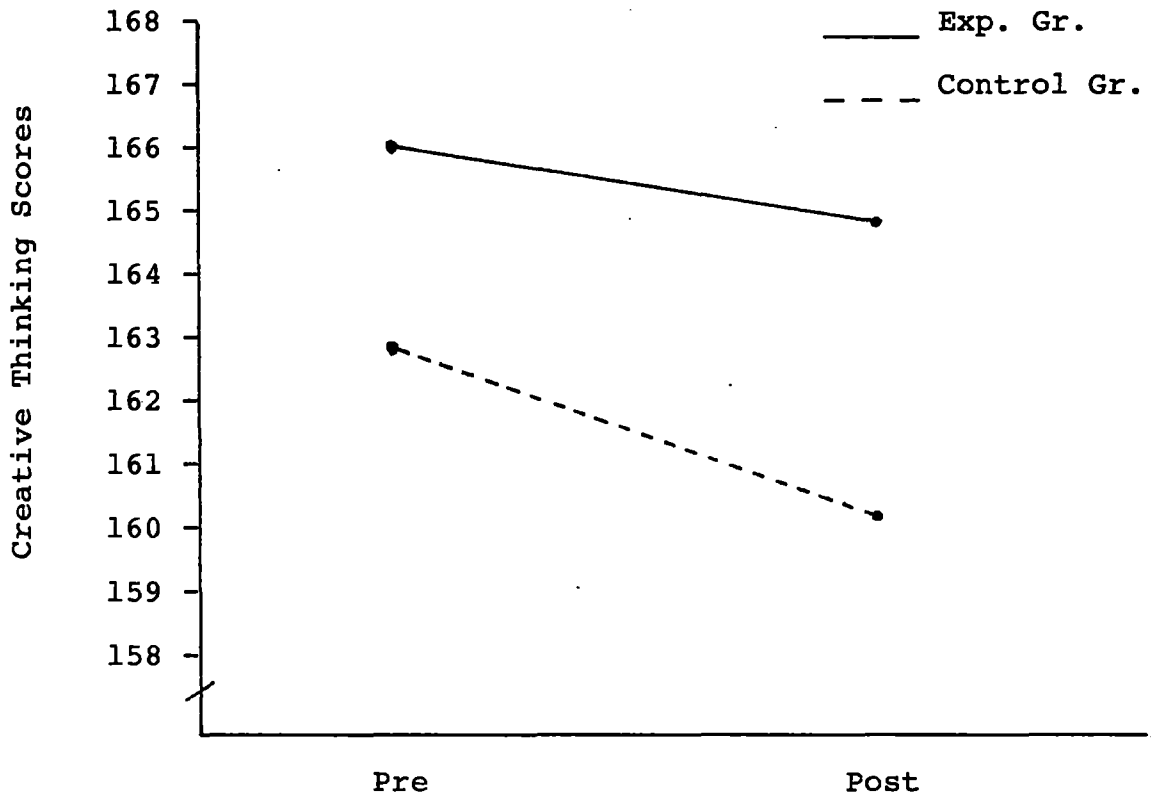


Figure 6. Graph of Creative Thinking Means for Experimental and Control Groups

An explanation for the decrease of means was that the writer conducted the experiment during the final month of the school year and administered the posttests during the final week of school. Because the mean for the control group fell along with the mean for the experimental group,

the writer notes that it is highly likely that subjects in both groups did not participate wholeheartedly in the post-tests for creative thinking or creative writing.

Of greatest importance is the absence of interaction. Results of the two univariate ANOVAs indicated there was no significant interaction between the experimental and control groups and the pretest and posttest means in creative thinking. A dialogue form of CAI did not improve the creative thinking ability of fourth grade students over time.

Similarly, there was no significant interaction between the experimental and control groups and the pretest and posttest means in creative writing. A dialogue form of CAI did not improve the creative writing of fourth grade students over time.

Conclusions and Implications

Creativity in thinking and writing and the importance of promoting creative activities in the classroom should be of interest to educators. Computer-assisted instruction is one tool that educators use to enhance instruction in the areas of thinking and writing.

For this particular study, results suggest that CAI did not improve the creative thinking or creative writing ability of fourth grade students. However, a subjective observation by the writer suggests that students lose interest in creative thinking and writing during the last month of the school year whether they use CAI or not.

Teachers should continue to seek methods of instruction that will foster creativity in thinking and writing. Implications of this study suggest, however, that a dialogue form of CAI may not be the answer to improving the creative thinking and writing abilities of fourth grade students.

Furthermore, because students lose interest in creative and thinking and writing activities during the last month of the school year, teachers should introduce units requiring a creative product of students earlier in the school year when students are fresh and tend to have more interest in school activities.

The literature clearly points out the need for examining alternatives for increasing the creative thinking and writing abilities of students. Although a dialogue form of computer-assisted instruction is in the early stages of development in education, there is some indication CAI will, indeed, play a role in this process. More investigation into the role and impact of a dialogue form of CAI is needed.

Suggestions for Future Research

The results of this study indicated the following suggestions for replicating this study:

1. Researchers in a similar study should conduct the experiment earlier in the school year as opposed to the final month of school. Timing

of this study was inadequate to establish the effectiveness of the dialogue form of CAI.

2. A similar study should require only one creative writing assignment per week from each subject in the experimental group. Time constraints in departmentalized elementary classrooms do not readily allow time for extra activities by a portion of the students. Requiring only one story would reduce the pressure students tend to feel.
3. A similar study should provide for additional hardware that will allow the subjects the opportunity for more participation in the experiment. Requiring subjects to forgo recess in order to use the available hardware is not conducive to promoting goodwill between the researcher and the subjects.
4. Researchers in a similar study should test subjects in small groups of approximately 15 subjects, as recommended in the testing manual. The size of groups tested in this study were too large to control for excessive talking among the subjects.
5. A similar study should provide for a testing site that is appropriate for the size of the group being tested, is removed from intruders and other interferences, and allows each

subject to sit at an individual desk. The testing procedure should allow each participant the chance for an accurate measure of achievement. The testing procedure should also provide the researcher with the best measures of achievement.

6. Judges for the creative writing instrument should be carefully selected for their expertise and experience in creative writing. The researcher should perhaps even run a check for inter-rater reliability
7. Researchers in a similar study might want to look at the students whose parents denied their permission for participation in the study and to identify the reasons for that decision.

Researchers who are interested in further investigation of using a dialogue form of CAI to improve creativity in thinking and writing should consider the following:

1. Is there a difference in the results between male and female subjects?
2. Do the results vary from school to school?
3. Do teacher attitudes affect the outcome?
4. Is there a difference in the results between fourth graders and students from another grade level?

5. Is there a difference in the results between subjects who obtain a printed wordbank after using a dialogue form of CAI and subjects who use a dialogue form of CAI but do not receive a printed wordbank?
6. Subjects in this study expressed displeasure in having to write the creative stories. Is there a difference in the results between subjects who write a creative story after using CAI and subjects who only use CAI?
7. Is there a known relationship between wordbanks and creative writing?
8. Does the keyboarding skill interact with a dialogue form of CAI and thus affect scores in creative thinking or creative writing?

Concluding Remarks

In spite of the results of this study, the writer continues to believe that a dialogue form of CAI can contribute to the improvement of creative thinking and writing for students. The notion of computer-assisted instruction as a tool for writing is gaining with time and, as it is with any new technique in education, researchers will need to conduct many experiments and give many tests before they can determine the advantages and usefulness of the method of instruction.

SELECTED BIBLIOGRAPHY

- Adams, J. L. (1979). Conceptual blockbusting (2nd ed.). New York: W. W. Norton.
- Anderson, P. S. (1964). Language skills in elementary education. New York: Macmillan.
- Applebee, A. N. (1981). Looking at writing. Educational Leadership, 38(6), 458-462.
- Applegate, M. (1960). Easy in English. New York: Harper & Row.
- Barker, H. R., & Barker, B. M. (1984). Multivariate analysis of variance (MANOVA). University, AL: University of Alabama Press.
- Bartz, A. E. (1981). Basic statistical concepts (2nd ed.). Minneapolis: Burgess.
- Bereiter, C. (1984). How to keep thinking skills from going the way of all frills. Educational Leadership, 42, 75-77.
- Beyer, B. K. (1983). Common sense about teaching thinking skills. Educational Leadership, 41, 50-51.
- Bloom, B. S. (Ed.). (1956). Taxonomy of educational objectives: Book 1 cognitive domain. New York: Longman.
- Boesch, D., & Cox-Chapman, M. (1983). I'm worth writing about! Instructor, 43, 43-44.
- Bork, A. (1986). Let's test the power of interactive technology. Educational Leadership, 43, 36-37.
- Bradley, V. N. (1982). Improving students' writing with microcomputers. Language Arts, 59(7), 732-743.
- Brandt, R. (1983). Teaching for thinking. Educational Leadership, 40, pp. 3,80.
- Bull, K. S. (1979). Maximizing creative potential. In R. E. Clasen & B. Robinson (Eds.), Simple Gifts: The education of the gifted, talented, and creative (pp. 211-228). Madison, WI: UWEX.

- Burns, H. (1980). Education's new management: The personal computing underground. Pipeline, 5, pp. 20-21, 42.
- Burns, H. L., & Culp, G. H. (1980). Stimulating invention in English composition through computer-assisted instruction. Educational Technology, 20, 5-10.
- Buros, O. K. (Ed.). (1978). Eighth mental measurements yearbook (Vols. 1-2). Highland Park, NJ: Gryphon Press.
- Campbell, D. T., & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research. Boston: Houghton Mifflin.
- Carlson, R. K. (1961). Seventeen qualities of original writing. Elementary English, 38(8), 576-579.
- Clark, G. R. (1954). Writing situations to which children respond. Elementary English, 31(3), 150-155.
- Cohen, J. (1969). Statistical power analysis for the behavioral sciences. New York: Academic Press.
- Combs, A. W. (1982). A personal approach to teaching. Boston: Allyn & Bacon.
- Copeland, B. D. (1984). The relationship of cognitive style to the evaluation of university art instructors. Studies in Art Education, 25, 109-114.
- Crandall, V. C., Katkovsky, W., & Crandall, V. J. (1965). Children's beliefs in their own control of reinforcements in intellectual-academic achievement situations. Child Development, 36, 91-109.
- Dede, C. (1983). Symposium: The future of computers in education. Educational Leadership, 41, 22-24.
- DeHaven, E. P. (1979). Teaching and learning the language arts. Boston: Little, Brown.
- Dehouske, E. J. (1982). Story writing as a problem-solving vehicle. Teaching Exceptional Children, 15, 11-17.
- Dence, M. (1980). Toward defining the role of CAI: A review. Educational Technology, 20, 50-54.
- Dunn, R. (1981). Teaching in a purple fog: What we don't know about learning style. NASSP Bulletin, 65, 33-36.
- Dunn, R. (1984). Learning style: State of the science. Theory Into Practice, 23, 10-19.

- Dunn, R. S., & Dunn, K. J. (1979). Learning styles/teaching styles: Should they...can they...be matched? Educational Leadership, 36(4), 238-244.
- Eby, J. W. (1983). Gifted behavior: A nonelitist approach. Educational Leadership, 40, 30-36.
- Eisele, J. E. (1979). Classroom use of microcomputers. Educational Technology, 19, 13-15.
- Elbow, P. (1983). Teaching thinking by teaching writing. Change, 15, 37-40.
- Emig, J. (1982). Inquiry paradigms and writing. College Composition and Communication, 33(1), 64-75.
- Friedman, M. I., & Rowls, M. D. (1980). Teaching reading and thinking skills. New York: Longman.
- Gay, L. R. (1981). Educational research: Competencies for analysis & application (2nd ed.). Columbus, OH: Charles E. Merrill.
- Gillin, C. J., Kysilka, M. L., Rogers, V. M., & Smith, L. B. (1972). Questioneze. Columbus, OH: Bell & Howell.
- Glatthorn, A. A. (1982). Demystifying the teaching of writing. Language Arts, 59(7), 722-725.
- Gleason, G. T. (1981). Microcomputers in education: The state of the art. Educational Technology, 21, 7-18.
- Gregorc, A. F. (1979). Learning/teaching styles: Potent forces behind them. Educational Leadership, 36(4), 234-236.
- Haley-James, S. (1982). Helping students learn through writing. Language Arts, 59(7), 726-731.
- Hansen, J. M. (1982). Thinking skills in the classroom: A needed basic in education. The Clearing House, 56, 60-63.
- Hill, S. A. (1983). The microcomputer in the instructional program. Arithmetic Teacher, 30, pp. 14-15, 54-55.
- Hoskisson, K. (1973). "False" questions and "right" answers. The Reading Teacher, 27(2), 159-162.
- Hunkins, F. P. (1972). Questioning strategies and techniques. Boston: Allyn & Bacon.
- Hunt, M. (1982). The universe within. New York: Simon & Schuster.

- Iakovlev, N. (1976). The happy state of creativity. Soviet Education, 18, 21-24.
- Isaac, S., & Michael, W. B. (1981). Handbook in research and evaluation (2nd ed.). San Diego: EdITS.
- James, W. (1983). Talks to teachers on psychology. Cambridge, MA: Harvard University.
- Kuchinskas, G. (1982). Developing interactive language experiences for the computer. The Computing Teacher, 10, 54-56.
- Kuchinskas, G. (1983). 22 ways to use a microcomputer in reading and language arts classes. Computers, Reading, and Language Arts, 1, 11-16.
- Lesgold, A. M. (1986). Preparing children for a computer-rich world. Educational Leadership, 43, 7-11.
- Lockhart, D., & Schmeck, R. R. (1983). Learning styles and classroom evaluation methods: Different strokes for different folks. College Student Journal, 17, 94-100.
- Malone, T. W. (1981). Toward a theory of intrinsically motivating instruction. Cognitive Science, 5(4), 333-369.
- Marashio, P. (1981). What I've learned about writing. Educational Leadership, 38(6), 465.
- Marksberry, M. L. (1963). Foundation of creativity. New York: Harper & Row.
- Mason, G. E. (1983). The computer in the reading clinic. The Reading Teacher, 36(6), 504-507.
- Mason, G. E., & Blanchard, J. S. (1982). Reading teachers put the computer to work. Classroom Computer News, 2, 44-45.
- Mehan, H., Miller-Souviney, B., & Riel, M. M. (1984). Research currents: Knowledge of text editing and control of literacy skills. Language Arts, 61(5), 510-515.
- MICROgram. (1985, February). Educational Products Information Exchange, pp. 3-4.
- Moffett, J. (1983). Reading and writing as meditation. Language Arts, 60(3), 315-322.
- Moffett, J., & Wagner, B. J. (1976). Student-centered language arts and reading, K-13: A handbook for teachers. Boston: Houghton Mifflin.

- Newman, J. M. (1984). Language learning and computers. Language Arts, 61(5), 494-497.
- Nickerson, R. S. (1984). Kinds of thinking taught in current programs. Educational Leadership, 42, 26-36.
- Norusis, M. J. (1986). The SPSS guide to data analysis. Chicago: SPSS.
- Oliver, L. J., Jr. (1982). Helping students overcome writer's block. Journal of Reading, 26(2), 162-168.
- Osborn, A. F. (1963). Applied imagination (3rd rev. ed.). New York: Charles Scribner.
- Papert, S. (1981). People. Electronic Learning, 1, 18.
- Parnes, S. J., & Meadow, A. (1959). Effects of "brainstorming" instructions on creative problem solving by trained and untrained subjects. Journal of Educational Psychology, 50, 171-176.
- Perkins, D. N. (1984). Creativity by design. Educational Leadership, 42, 18-25.
- Petty, W. T., Petty, D. C., & Becking, M. F. (1976). Experiences in language (2nd ed.). Boston: Allyn & Bacon.
- Reckinger, N. (1979). Choice is a way to quality learning. Educational Leadership, 36(4), 255-256.
- Rhodes, L. A. (1986). On computers, personal styles, and being human: A conversation with Sherry Turkle. Educational Leadership, 43, 12-16.
- Robinson, S. P. (1982). Questions for teachers. Today's Education, 71, 27-28.
- Rogers, C. R. (1954). Toward a theory of creativity. ETC: A Review of General Semantics, 11(4), 249-260.
- Rotenberg, L. (1984). Booting up for reading. Teaching and Computers, 1, 16-19.
- Sanders, N. M. (1966). Classroom questions: what kinds? New York: Harper & Row.
- Sears, P. S., & Hilgard, E. R. (1964). The teacher's role in the motivation of the learner. In E. R. Hilgard (Ed.), Theories of learning and instruction (pp. 182-209). Chicago: University of Chicago.

- Seidel, R. J. (1980). It's 1980: Do you know where your computer is? Phi Delta Kappan, 61(7), 481-485
- Senter, J. (1981). Computer technology and education. The Educational Forum, 46, 55-64.
- Shostak, R. (1981). Computers and teaching English: Bits 'n' pieces. The Computing Teacher, 9, 49-51.
- Suhor, C. (1983). Cars, computers, and curriculum. Educational Leadership, 41, 30-32.
- Taba, H. (1965). The teaching of thinking. Elementary English, 42(5), 534-542.
- Taylor, H. (1956). Creative thinking and the common man. Educational Leadership, 14(1), 7-11.
- Tompkins, G. E. (1982). Seven reasons why children should write stories. Language Arts, 59(7), 718-721.
- Torrance, E. P. (1961). Priming creative thinking in the primary grades. The Elementary School Journal, 62, 34-41.
- Torrance, E. P. (1971). Creativity and infinity. Journal of Research and Development, 4, 35-41.
- Torrance, E. P. (1974a). Torrance tests of creative thinking: Directions manual and scoring guide (Form A). Bensenville, IL: Scholastic Testing Service.
- Torrance, E. P. (1974b). Torrance tests of creative thinking: Directions manual and scoring guide (Form B). Bensenville, IL: Scholastic Testing Service.
- Torrance, E. P. (1974c). Torrance tests of creative thinking: Norms-technical manual. Bensenville, IL: Scholastic Testing Service.
- Torrance, E. P., & Myers, R. E. (1970). Creative learning and teaching. New York: Harper & Row.
- Tyler, R. W. (1949). Basic principles of curriculum and instruction. Chicago: University of Chicago.
- Valdez, G. (1986). Realizing the potential of educational technology. Educational Leadership, 43, 4-6.
- Wall, S. M., & Taylor, N. E. (1982). Using interactive computer programs in teaching higher conceptual skills: An approach to instruction in writing. Educational Technology, 22, 13-17.

- Watts, N. (1981). A dozen uses for the computer in education. Educational Technology, 21, 18-22.
- Weisskopf, E. A. (1951). Some comments concerning the role of education in the "creation of creation." The Journal of Educational Psychology, 42(3), 185-189.
- White, R. W. (1959). Motivation reconsidered: The concept of competence. Psychological Review, 66, 297-333.
- Whitehead, A. N. (1957). The aims of education. New York: Macmillan.
- Wilhide, J. A. (1986). The relationship between prewriting prompts and composition performance (Doctoral dissertation, University of South Carolina, 1985). Dissertation Abstracts International, 46, 2913A.
- Witty, P. (1957). Some values of creative writing. Elementary English, 34(3), 139-145.
- Wlodkowski, R. J. (1977). Motivation. Washington, D.C.: National Education Association.
- Worsham, A. W., & Austin, G. R. (1983). Effects of teaching thinking skills on SAT scores. Educational Leadership, 41, 50-51.
- Wyatt, N. M. (1962). Research in creative writing. Educational Leadership, 19(5), 307-310.
- Yamamoto, K. (1964). Experimental scoring manuals for the Minnesota tests of creative thinking and writing. Kent, OH: Bureau of Educational Research, Kent State University.
- Zacchei, D. (1982). The adventures and exploits of the dynamic storymaker & textman. Classroom Computer News, 2, 28-30.
- Zais, R. S. (1976). Curriculum principles and foundations. New York: Harper & Row.
- Zaharias, J. A. (1983). Microcomputers in the language arts classroom: Promises and pitfalls. Language Arts, 60(8), 990-995.

APPENDIXES

APPENDIX A

UNION SCHOOL DISTRICT REAL ESTATE VALUES

Home Values

Union School District
Tulsa, Oklahoma

<u>School</u>	<u>No. Sold*</u>	<u>Total Value</u>	<u>Average Value</u>
A. Darnaby	65	\$ 7,781,287	\$ 119,712
B. Peters	46	\$ 3,987,000	\$ 86,674
C. Grove	57	\$ 4,598,025	\$ 80,667
D. Briarglen	32	\$ 2,075,796	\$ 64,868
E. Boevers	53	\$ 3,434,225	\$ 64,797
F. Clark	26	\$ 1,634,792	\$ 62,877

* March 30, 1982 thru October 21, 1982

APPENDIX B

CONTROL GROUP CAI SHEET

APPENDIX C

PILOT STUDY EVALUATIONS

(STUDENT / TEACHER)

STUDENT EVALUATION

1. What did you like best about TALK? _____

2. What did you not like about using TALK? _____

3. Was the program too long, too short, or just right? _____
4. Were the directions clear, or did you have problems understanding what to do? _____

5. If you had problems, what were they? _____

EVALUATION QUESTIONNAIRE

Pilot Study

Your views regarding the process and product of the pilot study are important as I make final plans to conduct the actual study. Please respond to the following questions. Feel free to use the back side of the paper. It is not necessary to identify yourself. Thank you for your help.

1. What specific problems did you encounter with the execution of the TALK program?
2. What specific problems did you encounter with the students as they used the TALK program?
3. What problems did you encounter with students when they were writing their stories?
4. What specific problems did the students encounter when using the TALK program?
5. What problems did students encounter when they were writing their stories?
6. How well were students able to begin and complete the TALK program without assistance?

7. How did students respond to the TALK program? What was their attitude toward using the program?

8. How acceptable was the length of the TALK program? Were there too few or too many questions per session?

9. What strengths in the TALK program did you notice?

10. What weaknesses in the TALK program did you notice?

11. What information did you need to know that was not provided?

12. What changes do you suggest in the way the study should be conducted?

13. What changes could be made to ease the experience for you?

14. What changes could be made to ease the experience for the students?

15. What is your overall impression of the TALK program?

APPENDIX D

PARENT LETTERS OF PERMISSION



Oklahoma State University

DEPARTMENT OF CURRICULUM AND INSTRUCTION

STILLWATER, OKLAHOMA 74078
GUNDERSEN HALL
(405) 624-7125

April 1, 1985

Dear Parents,

I have been given permission by administrators and teachers in Union Public Schools to conduct a study required for my Doctor of Education degree from Oklahoma State University.

The study involves fourth grade students using microcomputers in creative writing.

In order to determine what final details need to be added to the study and what questions still need to be answered, I am conducting a one-week trial study at Grove Elementary School.

Your child is one of thirty-two students from Grove Elementary selected to participate in this trial study. This study is being conducted within strict guidelines of educational research. When the results are tabulated, no student will be identified by name.

Please sign the enclosed permission slip and return it to your child's teacher tomorrow. Feel free to call me if you have any questions (251-1157 or collect, 1-405-377-6279).

Sincerely,

Sheryl M. Shanahan

Enclosure



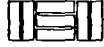
My child, _____,

_____ has my permission

_____ does not have my permission

to participate in a one-week trial study in creative writing, April 8 - April 12, 1985.

Parent Signature



Oklahoma State University

DEPARTMENT OF CURRICULUM AND INSTRUCTION

STILLWATER, OKLAHOMA 74078
GUNDERSEN HALL
(405) 624-7125

April 15, 1985

Dear Parents,

I have been given permission by administrators and teachers in Union Public Schools to conduct a study required for my Doctor of Education degree from Oklahoma State University.

The study involves fourth grade students using microcomputers in creative writing.

Your child is one of sixty-four students from Boevers Elementary selected to participate in this four-week study. I am conducting the study within strict guidelines of educational research. When the results are tabulated, no student will be identified by name.

Please sign the enclosed permission slip and return it to your child's teacher tomorrow. Feel free to call me if you have any questions (251-1157 or collect, 1-405-377-6279).

Sincerely,

Sheryl M. Shanahan

Enclosure





Oklahoma State University

DEPARTMENT OF CURRICULUM AND INSTRUCTION

STILLWATER, OKLAHOMA 74078
GUNDERSEN HALL
(405) 624-7125

April 15, 1985

Dear Parents,

I have been given permission by administrators and teachers in Union Public Schools to conduct a study required for my Doctor of Education degree from Oklahoma State University.

The study involves fourth grade students using microcomputers in creative writing.

Your child is one of sixty-four students from Briarglen Elementary selected to participate in this four-week study. I am conducting the study within strict guidelines of educational research. When the results are tabulated, no student will be identified by name.

Please sign the enclosed permission slip and return it to your child's teacher tomorrow. Feel free to call me if you have any questions (251-1157 or collect, 1-405-377-6279).

Sincerely,

Sheryl M. Shanahan

Enclosure



My child, _____,

_____ has my permission

_____ does not have my permission

to participate in a four-week study in creative writing, April 22 - May 17, 1985.

Parent Signature

APPENDIX E

DIRECTIONS FOR CREATIVE WRITING

PRETESTS AND POSTTESTS

(creative writing story)

STUDENT'S NAME - First & Last

DATE

TITLE OF STORY

TEACHER'S NAME

SCHOOL'S NAME

TITLE

Note: This activity needs to be done at the beginning of the study and again on the final Friday.

These stories are to be written in class under your supervision. Under no circumstances are the students to take them home.

A coversheet containing identifying information should be stapled to the top of each story. Names and dates are not to be on the actual story pages.

Explain to the students that the stories generally should be one to two pages long (front/back), but it is fine if they are longer.

DIRECTIONS

SAY - "I'd like for you to think about something that you have on your mind from time to time. Think about it carefully, and decide what you might like to say about it.

Then, I want you to write a story about it. Use your imagination, and don't worry about things like spelling. If you have trouble spelling a word, just spell it like it sounds. I'm more interested in what you have to say than how you spell some words.

Think of your story like a hamburger: a top (the beginning), the meat (the middle - the "meat" of your story), and the bottom (the end). Your story might be true or it might be fantasy. It might be an adventure story or a science fiction story. Whatever you choose, remember to write it so that any reader can understand what is happening.

This story should be your own work. Don't talk to your friends about your ideas and about what you are writing.

When you are finished, give your story a title. Then, write your name, title, date, teacher, and school on another sheet of paper I have for you, and staple the cover sheet on top of your story. Put your stories right here when you are finished (show them where you want them to put the stories)."

APPENDIX F

CREATIVE THINKING SCORE SHEET

SCORING WORKSHEET
TORRANCE TESTS OF CREATIVE THINKING, VERBAL FORMS A and B

Pupil's Name _____ School _____ Test Date _____
 Age _____ Grade _____ Sex _____ Score _____ Form _____

Resp. No.	Activity 1		Activity 2		Activity 3		Activity 4		Activity 5		Act. 6	Activity 7	
	Orig.	Cat.	Orig.	Cat.	Orig.	Cat.	Orig.	Cat.	Orig.	Cat.	Orig.	Shf.	Orig.
1													
2													
3													
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24													
25													
26													

SCORE SUMMARY

	FLU	FLEX	ORIG
Act. 1			
Act. 2			
Act. 3			
Act. 4			
Act. 5			
Act. 6		X	
Act. 7			
TOTAL			
SCORE			

COMMENTS:

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MNOPQRS—079

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APPENDIX G

TORRANCE'S LETTER OF PERMISSION

Georgia Studies of Creative Behavior
185 RIVERHILL DRIVE
ATHENS, GA 30606

February 15, 1985

Ms. Sheryl M. Shanahan
2320 E. Oakridge
Broken Arrow, OK 7403

Dear Ms. Shanahan:

I am glad to grant permission for use in your research
SUPPLEMENTARY SCORING GUIDE FOR THE EVALUATION OF
ORIGINALITY AND INTEREST.

Best wishes for the success of your research.

Sincerely,

E. Paul Torrance
E. Paul Torrance



Department of Educational Psychology,
Research and Measurement

THE UNIVERSITY OF GEORGIA
Athens, Georgia 30602
(404) 542-4110

College of Education
325 Aderhold Hall

Dear Colleagues:

I appreciate very much your interest in my work and your inquiry.

On October 1, 1984 I retired from the University of Georgia. On November 10, I had a stroke which has affected my speech, my right side, ability to judge distance, and numerous other functions. Nothing is automatic; I have to think deliberately. For this reason, I have to simplify everything, including my response to your request. I hope that it is adequate.

After you have read the brochure, reprint, paper, comment, or whatever else I have enclosed, if it is not adequate let me know. At least you may be able to simplify the question, limit your request, or better define your question.

My doctor tells me that my functioning is not likely to improve but I will learn better ways of coping with them. I am not giving up on improving my functioning. I am taking speech therapy, working with a Feldenkreis therapist and a chiropractor, doing exercises, and using everything I learned for my research and survival and creativity. I am shifting my emphasis to coping. I hope you understand.

Good luck!

Sincerely,

E. Paul Torrance

E. Paul Torrance
Retired Alumni Foundation Distinguished Professor



APPENDIX H

CREATIVE WRITING SCORE SHEET

APPENDIX I

PRINTOUT FOR LET'S GO FOR A TALK!

JLOAD SET UP FILE
JLIST

```
10 DOS$ = CHR$ (4)
15 DIM N$(40),L$(40),P$(40)
20 FOR X = 1 TO 40
30 INPUT "FIRST NAME? ";N$(X)
40 INPUT "LAST NAME? ";L$(X)
50 INPUT "PASSWORD? ";P$(X)
60 PRINT
70 NEXT X
80 PRINT DOS$;"OPEN NAMEPASS"
90 PRINT DOS$;"WRITE NAMEPASS"
100 FOR J = 1 TO 40
110 PRINT N$(J)
120 PRINT L$(J)
130 PRINT P$(J)
140 NEXT J
150 PRINT DOS$;"CLOSE NAMEPASS"
160 PRINT "THE INFORMATION IS IN THE FILE."
```

JLOAD SET UP TIME
JLIST

```
10 HOME
20 REM ==== THIS PROGRAM SETS UP THE TIME FILE ====
30 HTAB 6: PRINT "PASSWORD"
40 HTAB 6: INPUT PW$: PRINT
50 HTAB 6: PRINT "FIRST NAME"
60 HTAB 6: INPUT NAME$: PRINT
70 HTAB 6: PRINT "HOUR STARTED"
80 HTAB 6: INPUT HS: PRINT
90 HTAB 6: PRINT "MINUTES STARTED"
100 HTAB 6: INPUT MS: PRINT
105 HTAB 6: PRINT "HOUR ENDED"
106 HTAB 6: INPUT HE: PRINT
107 HTAB 6: PRINT "MINUTE ENDED"
108 HTAB 6: INPUT HE
110 PRINT CHR$ (4);"OPEN TIME"
120 PRINT CHR$ (4);"WRITE TIME"
130 PRINT PW$
140 PRINT NAME$
150 PRINT HS: REM HS IS HOUR STARTED
160 PRINT MS: REM MS IS MINUTES STARTED
162 PRINT HE
164 PRINT HE
170 PRINT CHR$ (4);"CLOSE TIME"
180 HOME
190 PRINT "THE INFO IS IN THE FILE."
```

LOAD HELLO
LIST

10 PRINT CHR\$(4);"RUN TALK"

LOAD TALK
LIST

10 HOME
20 REM === BOX OUTLINE ===
30 GR : COLOR= 2
40 HLIN 0,39 AT 1: HLIN 0,39 AT 38
50 VLIN 1,38 AT 39: VLIN 1,38 AT 0
60 REM === BOX BACKGROUND ===
70 COLOR= 10
80 HLIN 1,38 AT 2: HLIN 1,38 AT 3: HLIN 1,38 AT 4
90 HLIN 1,38 AT 5: HLIN 1,38 AT 6: HLIN 1,38 AT 8: HLIN 1,38 AT 7
100 HLIN 1,38 AT 8: HLIN 1,38 AT 9: HLIN 1,38 AT 10
110 HLIN 1,38 AT 11: HLIN 1,38 AT 12: HLIN 1,38 AT 13
120 HLIN 1,38 AT 14: HLIN 1,38 AT 15: HLIN 1,38 AT 16
130 HLIN 1,38 AT 17: HLIN 1,38 AT 18: HLIN 1,38 AT 19
140 HLIN 1,38 AT 20: HLIN 1,38 AT 21: HLIN 1,38 AT 22
150 HLIN 1,38 AT 23: HLIN 1,38 AT 24: HLIN 1,38 AT 25
160 HLIN 1,38 AT 26: HLIN 1,38 AT 27: HLIN 1,38 AT 28
170 HLIN 1,38 AT 29: HLIN 1,38 AT 30: HLIN 1,38 AT 31
180 HLIN 1,38 AT 32: HLIN 1,38 AT 33: HLIN 1,38 AT 34
190 HLIN 1,38 AT 35: HLIN 1,38 AT 36: HLIN 1,38 AT 37

200 REM === FIRST WORD IN TITLE - LET'S ===
210 COLOR= 2
220 VLIN 8,15 AT 5: HLIN 6,8 AT 15: HLIN 10,12 AT 13: VLIN 13,11 AT 12
230 HLIN 12,10 AT 11: HLIN 12,10 AT 15
240 VLIN 11,15 AT 10: VLIN 9,15 AT 15
250 HLIN 14,16 AT 11: HLIN 17,18 AT 8
260 PLOT 18,9: HLIN 21,19 AT 11: VLIN 11,12 AT 19
270 HLIN 19,21 AT 13: VLIN 14,15 AT 21: HLIN 21,19 AT 15
280 REM === SECOND WORD IN TITLE - GO ===
290 VLIN 9,8 AT 29: HLIN 29,26 AT 8: VLIN 8,15 AT 26
300 HLIN 26,29 AT 15: VLIN 15,11 AT 29: PLOT 28,11
310 HLIN 33,31 AT 11: VLIN 11,15 AT 31: HLIN 32,33 AT 15: VLIN 14,12 AT 33
320 REM === THIRD WORD IN TITLE - FOR ===
330 VLIN 24,31 AT 3
340 HLIN 4,6 AT 24: HLIN 4,5 AT 27: HLIN 9,7 AT 27
350 VLIN 27,31 AT 7: HLIN 8,9 AT 31
360 VLIN 30,28 AT 9: VLIN 27,31 AT 11
370 HLIN 12,13 AT 27: PLOT 13,28
380 REM === FOURTH WORD IN TITLE - A ===
390 VLIN 24,31 AT 17: HLIN 18,19 AT 24
400 VLIN 24,31 AT 19: PLOT 18,27
410 REM === FIFTH WORD IN TITLE - TALK ===
420 VLIN 25,31 AT 24
430 HLIN 22,26 AT 24: HLIN 27,29 AT 27
440 VLIN 27,31 AT 29: HLIN 27,28 AT 29
450 VLIN 30,31 AT 27: PLOT 28,31
460 VLIN 24,31 AT 31: VLIN 24,31 AT 33
470 PLOT 34,29: PLOT 35,28: PLOT 36,27
480 PLOT 35,30: PLOT 36,31
490 REM ===== COPYRIGHT/AUTHOR =====
500 PRINT " Copyright (c) 1985"
510 PRINT
520 PRINT " Sheryl M. Shanahan"
530 FOR X = 1 TO 2000
540 NEXT X
550 TEXT
560 HOME

```

570 REM ==== GREETING ====
580 VTAB 8: PRINT "Please type your LAST name and <RETURN>." : PRINT
590 HTAB 6: INPUT LAST$: PRINT : PRINT
600 PRINT "Please type your PASSWORD and <RETURN>." : PRINT : PRINT
610 HTAB 6: INPUT PASS$
620 PRINT CHR$(4);"OPEN NAMEPASS"
630 FOR I = 1 TO 40
640 PRINT CHR$(4);"READ NAMEPASS"
650 INPUT N$,L$,P$
660 IF P$ = PASS$ AND L$ = LAST$ THEN 720
670 NEXT I
680 PRINT CHR$(4);"CLOSE NAMEPASS"
690 F = F + 1
700 IF F < > 2 THEN 580
710 VTAB 22: HTAB 8: PRINT "CHECK WITH YOUR TEACHER.": END
720 HOME
730 VTAB 10: HTAB 6: PRINT "Hi, "N$;"!": PRINT
740 VTAB 12: HTAB 6: PRINT "I'm glad you're here today."
750 FOR X = 1 TO 3000
760 NEXT X
770 PRINT CHR$(4);"CLOSE NAMEPASS"
780 HOME
790 VTAB 8: HTAB 10: PRINT "LET'S GO FOR A TALK!"
800 FOR X = 1 TO 1600
810 NEXT X
820 HOME
830 REM ==== DIRECTIONS ====
840 VTAB 2: HTAB 3: PRINT N$;"": PRINT
850 HTAB 6: PRINT "I will ask you some questions.": PRINT
860 HTAB 3: PRINT "You can answer by typing words on": PRINT
870 HTAB 3: PRINT "the keyboard.": PRINT : PRINT
880 HTAB 6: PRINT "I will use your words to build a": PRINT
890 HTAB 3: PRINT "word bank. You can use the word": PRINT
900 HTAB 3: PRINT "bank to write a story."
910 VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue."
920 VTAB 22: HTAB 6: GET P$
930 HOME

```

```

940 REM ==== REMINDER TO <SB> ====
950 VTAB 3: HTAB 15: PRINT "REMEMBER!!": PRINT : PRINT
960 HTAB 6: PRINT "Press the <SPACE BAR> between": PRINT
970 HTAB 3: PRINT "words.": PRINT : PRINT
980 HTAB 6: PRINT "Press <RETURN> to go to the next": PRINT
990 HTAB 3: PRINT "question."
1000 VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue."
1010 VTAB 22: HTAB 6: GET P$
1020 PRINT
1030 PRINT CHR$(4);"RUN TOPIC CHOICE"

```

```

J LOAD TOPIC CHOICE
JLIST

```

```

10 TEXT
20 HOME
30 REM ==== TOPIC CHOICE ====
40 PRINT "What would you like to talk about today?"
50 PRINT : PRINT : PRINT
60 PRINT " 1. All About Me    3. School Days"
70 PRINT " 2. My Family      4. Animal Life"
80 PRINT : PRINT : PRINT
90 PRINT " 5. Friends and Others"
100 PRINT " 6. Games and Sports"
110 PRINT " 7. On the Go"
120 PRINT " 8. Mother Nature"
130 PRINT : PRINT : PRINT
140 VTAB 20: HTAB 3: PRINT "Type the number of your choice (1-8)"
150 VTAB 22: HTAB 10: PRINT "and press <RETURN>." : INPUT C
160 REM ==== C IS CHOICE OF TOPIC ====

```



```

170 REM ==== LIMIT OF SELECTION ====
180 PRINT
200 IF C < 1 OR C > 8 GOTO 20
210 IF C > 0 AND C < 3 THEN HOME : VTAB 8: HTAB 6: PRINT "Take out Disk 1-RED.": PRINT : PRINT : HTAB 6: PRINT "Replace it
with Disk 2-WHITE.": VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue.": VTAB 22: HTAB 6: GET P$
215 IF C > 2 AND C < 6 THEN HOME : VTAB 8: HTAB 6: PRINT "Take out Disk 1-RED.": PRINT : PRINT : HTAB 6: PRINT "Replace it
with Disk 3-BLUE.": VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue.": VTAB 22: HTAB 6: GET P$
220 IF C > 5 AND C < 9 THEN HOME : VTAB 8: HTAB 6: PRINT "Take out Disk 1-RED.": PRINT : PRINT : HTAB 6: PRINT "Replace it
with Disk 4-YELLOW.": VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue.": VTAB 22: HTAB 6: GET P$
230 ONERR GOTO 210
240 HOME
250 VTAB 8: HTAB 16: PRINT "LOADING!": VTAB 10: HTAB 14: PRINT "Please wait."
260 ON C GOTO 270,280,290,300,310,320,330,340
270 PRINT CHR$(4);"RUN MYSELF"
280 PRINT CHR$(4);"RUN MY FAMILY"
290 PRINT CHR$(4);"RUN SCHOOL"
300 PRINT CHR$(4);"RUN ANIMALS"
310 PRINT CHR$(4);"RUN FRIENDS"
320 PRINT CHR$(4);"RUN GAMES AND SPORTS"
330 PRINT CHR$(4);"RUN ON THE GO"
340 PRINT CHR$(4);"RUN MOTHER NATURE"

```

```

10 REM ==== TOPIC 4 - ANIMALS ====
20 REM Q$ IS QUESTION
30 REM R$ IS USER'S RESPONSE
40 REM I IS LEVEL OF QUESTIONING (6)
50 REM J IS POSSIBLE QUESTIONS WITHING EACH LEVEL (8)
60 REM K IS COUNTER TO RESEET RANDOM SELECTION TO NEW LEVEL
70 REM F IS COUNTER TO CHECK TIMES PASSWORD ENTERED
80 REM RI$( , ) IS 2-DIM ARRAY TO STORE USER'S RESPONSES
90 REM PW$ IS USER'S PASSWORD
110 REM NAME$ IS USER'S FIRST NAME
120 REM =====
130 DIM Q$(6,8),Z1(6,8),R1$(6,8),F$(3),Z(8)
140 REM ==== ANIMALS == LEVEL 1 QUESTIONS ====
150 DATA "Who takes care of animals when they get sick?"
160 DATA "Where do animals get their food?"
170 DATA "When do animals sleep?"
180 DATA "What do animals eat?"
190 DATA "Where do animals live?"
200 DATA "How do animals wash themselves?"
210 DATA "What happens to animals that live in the zoo?"
220 DATA "What are important things to remember
    about taking care of animals?"
230 REM ==== ANIMALS == LEVEL 2 QUESTIONS ====
240 DATA "Why do you think we have animals?"
250 DATA "How are farm animals helpful to people?"
260 DATA "Why is it important to take care of animals?"
270 DATA "How are people helpful to animals?"
280 DATA "Why is it good for some animals to live in forests?"
290 DATA "Why do you think some animals are in zoos?"
300 DATA "How can animals help people?"
310 DATA "Why do you think some people have pets?"

320 REM ==== ANIMALS == LEVEL 3 QUESTIONS ====
330 DATA "What are the chances that zoo animals will move in with you?"
340 DATA "What happens when hunters kill all of one kind of animal?"
350 DATA "How would you take care of a creature from outer space?"
360 DATA "What are the chances that you will have a pet?"
370 DATA "What would it be like if dinosaurs lived today?"
380 DATA "What would you see if you were an eagle?"
390 DATA "How could you help an animal that was hurt?"
400 DATA "How are people harmful to animals?"
410 REM ==== ANIMALS == LEVEL 4 QUESTIONS ====
420 DATA "How is a zoo animal different from a wild animal?"
430 DATA "How are imaginary creatures different from animals?"
440 DATA "How are circus animals different from zoo animals?"
450 DATA "How are animals that live in water like animals that live on land?"
460 DATA "How are whales like people?"
470 DATA "What would happen if birds and cats were friends?"
480 DATA "What is your favorite animal like?"
490 DATA "How are turtles like some people?"
500 REM ==== ANIMALS == LEVEL 5 QUESTIONS ====
510 DATA "What would you do if you were an animal in the zoo?"
520 DATA "What would happen if your imaginary creatures were real?"
530 DATA "What would you do if you were a bear?"
540 DATA "What would happen if animals could talk?"
550 DATA "What would happen if dogs grew to be giants?"
560 DATA "What would happen if horses had wings?"
570 DATA "What would it be like if there were no animals?"
580 DATA "What would happen if you were a fish?"
590 REM ==== ANIMALS == LEVEL 6 QUESTIONS ====
600 DATA "What animals make you the happiest?"
610 DATA "Why are pets nice to have?"
620 DATA "What is the funniest thing you ever saw an animal do?"
630 DATA "What are your favorite forest animals?"
640 DATA "What nice things do you do for animals?"
650 DATA "What are your favorite farm animals?"
660 DATA "Why should you not pet strange animals?"
670 DATA "What pets are better than other pets?"

```

```

680 REM ==== FEEDBACK TO USER ====
690 DATA "That's interesting!"
700 DATA "Please tell me more!"
710 DATA "I'd like to hear more about this!"
720 REM ==== READING IN QUESTIONS ====
730 FOR I = 1 TO 6: REM 6 IS LEVELS
740 FOR J = 1 TO 8: REM 8 IS QUESTIONS PER LEVEL
750 READ Q$(I,J)
760 NEXT J
770 NEXT I
780 REM ==== LOOP TO READ IN FEEDBACK ====
790 FOR I = 1 TO 3
800 READ F$(I)
810 NEXT I
820 REM ==== GOOD CHOICE GREETING ====
830 HOME
840 VTAB 6: HTAB 5: PRINT "Good choice!": PRINT
850 VTAB 8: HTAB 5: PRINT "I'd like to know more about animals."
860 FOR X = 1 TO 3000
870 NEXT X
880 HOME
890 VTAB 4: PRINT "Type your PASSWORD and <RETURN>." : PRINT
900 HTAB 6: INPUT PW$
910 VTAB 9: PRINT "Type your FIRST name and <RETURN>." : PRINT
920 HTAB 6: INPUT NAME$
930 VTAB 14: PRINT "Type the HOUR (1-12) and <RETURN>." : PRINT
940 HTAB 6: INPUT HS: REM HS IS HOUR STARTED
945 IF HS < 1 OR HS > 12 GOTO 930
950 VTAB 19: PRINT "Type the MINUTES after the hour (0-59)": PRINT
960 VTAB 20: PRINT "and <RETURN>." : PRINT
970 HTAB 6: INPUT MS: REM MS IS MINUTES STARTED
975 IF MS < 0 OR MS > 59 GOTO 950
980 HOME

```

```

990 VTAB 8: HTAB 15: PRINT "Thank you!"
1000 FOR X = 1 TO 1200
1010 NEXT X
1020 HOME
1030 VTAB 8: HTAB 10: PRINT "LET'S GO FOR A TALK!"
1040 FOR X = 1 TO 1600
1050 NEXT X
1060 HOME
1070 REM ==== TOPIC 4 PICTURE ====
1080 HOME
1090 HGR2
1100 PRINT CHR$(4);"BLOAD PICTR.ANIMALS"
1110 FOR X = 1 TO 5000
1120 NEXT X
1130 TEXT
1140 HOME
1150 REM ==== TOPIC 4 QUESTIONS ====
1160 REM ==== LOOP FOR RANDOM SELECTION ====
1170 FOR I = 1 TO 6: REM 6 IS LEVELS
1180 FOR J = 1 TO 3: REM 3 IS QUESTIONS ASKED AT EACH LEVEL
1190 X = INT (8 * RND (1) + 1)
1200 IF Z(X) = 1 THEN 1190
1210 Z(X) = 1
1220 VTAB 8: PRINT Q$(I,X): PRINT
1230 INPUT R$
1240 RI$(I,X) = R$
1250 Z1(I,X) = 1
1260 HOME
1270 NEXT J
1280 FOR K = 1 TO 8
1290 Z(K) = 0
1300 NEXT K
1310 NEXT I
1320 HOME

```

```

1330 REM ==== CLOSING STATEMENT ====
1340 VTAB 5: HTAB 6: PRINT NAME$;","; PRINT
1350 HTAB 9: PRINT "I've enjoyed talking with": PRINT
1360 HTAB 6: PRINT "you about animals. I hope": PRINT
1370 HTAB 6: PRINT "we can do this again sometime": PRINT
1380 HTAB 6: PRINT "soon."
1390 VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue."
1400 VTAB 22: HTAB 6: GET P$
1410 HOME
1420 VTAB 3: HTAB 9: PRINT "I'll print a list of your": PRINT
1430 HTAB 6: PRINT "responses to my questions.": PRINT
1440 PRINT
1450 HTAB 9: PRINT "Please take the list to": PRINT
1460 HTAB 6: PRINT "your desk and write a story": PRINT
1470 HTAB 6: PRINT "about animals using some": PRINT
1480 HTAB 6: PRINT "of the words from the list."
1490 VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue."
1500 VTAB 22: HTAB 6: GET P$
1510 HOME
1520 VTAB 3: HTAB 9: PRINT "I'll also print some hints": PRINT
1530 HTAB 6: PRINT "for you to use to make your": PRINT
1540 HTAB 6: PRINT "story look nice.": PRINT
1550 VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue."
1560 PRINT CHR$(4);"PR#1"
1570 PRINT CHR$(15): PRINT CHR$(9);"13ON"
1580 PRINT CHR$(4);"PR#1"
1590 VTAB 22: HTAB 6: GET P$: HOME
1600 REM ==== LIST OF RESPONSES ====
1610 HOME
1620 HTAB 5: PRINT NAME$;","; you used these words
    when you talked about animals.": PRINT
1630 REM ==== PRINT RESPONSES ====
1640 FOR I = 1 TO 6
1650 FOR J = 1 TO 8
1660 IF Z1(I,J) < > 1 THEN 1680
1670 PRINT R1$(I,J): PRINT

```

```

1680 NEXT J
1690 NEXT I
1700 PRINT CHR$(4);"PR#0"
1710 VTAB 23: HTAB 8: PRINT "Press <RETURN> to continue."
1720 VTAB 23: HTAB 6: GET P$
1730 PRINT
1740 HOME
1750 REM ==== LAST STATEMENT ====
1760 PRINT CHR$(4);"PR#1"
1770 PRINT : PRINT : PRINT
1780 VTAB 2: HTAB 15: PRINT "DIRECTIONS": PRINT
1790 PRINT
1800 HTAB 3: PRINT "1. Put your name and today's date on"
1810 HTAB 6: PRINT "the first line of your paper.": PRINT
1820 HTAB 3: PRINT "2. Skip one line.": PRINT
1830 HTAB 3: PRINT "3. Write a title for your story on"
1840 HTAB 6: PRINT "the next line.": PRINT
1850 HTAB 3: PRINT "4. Skip another line.": PRINT
1860 HTAB 3: PRINT "5. Write a story using some of the"
1870 HTAB 6: PRINT "words from your list."
1880 PRINT : PRINT : PRINT
1890 PRINT CHR$(4);"PR#0"
1900 VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue."
1910 PRINT CHR$(4);"PR#1"
1920 VTAB 22: HTAB 6: GET P$: HOME
1930 VTAB 3: HTAB 16: PRINT "REMEMBER": PRINT : PRINT
1940 HTAB 3: PRINT "1. Begin every sentence with a"
1950 HTAB 6: PRINT "capital letter.": PRINT
1960 HTAB 3: PRINT "2. End every sentence with the"
1970 HTAB 6: PRINT "correct punctuation.": PRINT
1980 HTAB 3: PRINT "3. Indent paragraphs.": PRINT
1990 HTAB 3: PRINT "4. Use your best handwriting.": PRINT
2000 HTAB 3: PRINT "5. Give your story and your word"
2010 HTAB 6: PRINT "list to your teacher when you are"
2020 HTAB 6: PRINT "finished."
2030 PRINT CHR$(4);"PR#0"

```

```

2040 VTAB 22: HTAB 8: PRINT "Press <RETURN> to continue."
2050 VTAB 22: HTAB 6: GET P$: HOME
2060 VTAB 4: PRINT "Type the HOUR (1-12) and <RETURN>."
2070 VTAB 6: HTAB 6: INPUT HE: REM HE IS HOUR ENDED
2075 IF HE < 1 OR HE > 12 GOTO 2060
2080 VTAB 9: PRINT "Type the MINUTES after the hour (0-59)"
2090 VTAB 10: PRINT "and <RETURN>."
2100 VTAB 12: HTAB 6: INPUT ME: REM ME IS MINUTES ENDED
2105 IF ME < 0 OR ME > 59 GOTO 2080
2110 PRINT CHR$(4);"APPEND TIME"
2120 PRINT CHR$(4);"WRITE TIME"
2130 PRINT PWS
2140 PRINT NAMES
2150 PRINT HS: REM HS IS HOUR STARTED
2160 PRINT MS: REM MS IS MINUTES STARTED
2170 PRINT HE: REM HE IS HOUR ENDED
2180 PRINT ME: REM ME IS MINUTES ENDED
2190 PRINT CHR$(4);"CLOSE TIME"
2200 HOME
2210 PRINT CHR$(4);"PR#1"
2220 PRINT : PRINT : PRINT
2230 VTAB 8: HTAB 6: PRINT "Thank you for coming today.": PRINT : PRINT
2240 HTAB 6: PRINT "Come again soon."
2250 PRINT CHR$(4);"PR#0"
2260 END

```

APPENDIX J

TEACHER HELPS AND COMMENT SHEET

HELP!!

What if the last name and password don't match?

1. Check to see if the last name is spelled correctly.
2. Check to see if the correct password is being used, and if it is spelled correctly.
3. If you find a mistake, press CONTROL/RESET to restart the program. Enter the last name and password carefully.
4. If there is no mistake and you restarted the program and reentered the name and password just to be sure, put the disk aside and use one of the backup disks. (Please make a note for me to check the problem disk.)

What if the printer won't print the responses?

1. Check to see if the printer is turned on (on the side).
2. Check to see if the 3 green lights are on. If not, press ON LINE.
3. If you're sure the printer is on and the 3 green lights are on, and the responses still don't print, there is probably something wrong with the disk. If so, the responses are lost and the student will have to start over some other time.
4. If this happens, please put the disk aside and replace it with a backup disk. Please make a note for me to check the problem disk.

What if you put Disk 2-WHITE or 3-BLUE in the drive and it doesn't do anything?

1. Check to see if the correct disk is in the drive.
2. If the correct disk is in the drive and it still won't do anything, press CONTROL/RESET.
3. If that doesn't get what you want, have the student start over with Disk **1-RED**.

What if you're changing Disk 1-RED with one of the other disks and you accidentally press a key with your elbow?

1. Go ahead and put the correct disk in the drive and it should be okay.
2. If it doesn't take off then start over with Disk **1-RED** and make a note of it for me.

Week _____

Week of _____

TEACHER ACTIVITY SHEET

MONDAY

--

TUESDAY

--

WEDNESDAY

--

THURSDAY

--

FRIDAY

--

ADDITIONAL COMMENTS

--

APPENDIX K

LET'S GO FOR A TALK!

(SAMPLE RUN)

This appendix presents a sample run of Let's Go For A TALK! The illustrations show the computer screen at each point in the program as seen by the user. Next to the illustrations are explanations of the event occurring within the computer.

The sample run replicates an exact session experienced by a subject during the experimental study; however, the sample identifies the subject by a fictitious name.

LET'S GO FOR
A TALK

Copyright (c) 1985
Sheryl M. Shanahan

Please type your LAST name and <RETURN>.
DOE

Please type your PASSWORD and <RETURN>.
GLOVE

Hi, John! I'm glad you're here today.

LET'S GO FOR A TALK!

1. Title Screen - Automatically appears for two seconds when user puts disk into the disk drive. The computer automatically generates the next screen.
2. Name and Password - The computer asks for the user's last name and password. After matching the information stored in the data file (Appendix I), the computer automatically generates the next screen.
3. Personal Greeting - Having matched the user's last name and password, the computer displays the user's first name in a personal greeting for three seconds and then automatically generates the next screen.
4. Title - The computer displays the title for 1.6 seconds as a transition into the program. The computer automatically generates the next screen.

John,

I will ask you some questions.
You can answer by typing words on
the keyboard.

I will use your words to build a
word bank. You can use the word
bank to write a story.

Press <RETURN> to continue.

REMEMBER!!

Press the <SPACE BAR> between
words.

Press <RETURN> to go on to the next
question.

Press <RETURN> to continue.

What would you like to talk about today?

- | | |
|-----------------|----------------|
| 1. All About Me | 3. School Days |
| 2. My Family | 4. Animal Life |

- | |
|-----------------------|
| 5. Friends and Others |
| 6. Games and Sports |
| 7. On the Go |
| 8. Mother Nature |

Type the number of your choice (1-8)
and press <RETURN>.

Take out Disk 1-RED.

Replace it with Disk 3-BLUE.

Press <RETURN> to continue.

5. Directions - This screen tells the user what will happen during the program. The user presses the RETURN key when ready to continue.

6. Reminder - This screen reminds the user of the different functions of the SPACE BAR key and the RETURN key. The user presses the RETURN key when ready to continue.

7. Topic Choice - At this point, the user selects the choice of topic by typing the appropriate numeral and pressing RETURN to continue.

8. Changing Diskettes - the computer reads the selection and instructs the user to take out the introductory disk and replace it with the appropriate disk according to the choice of topic made by the user. After changing diskettes, the user continues by pressing RETURN.

LOADING!
Please wait.

9. The computer tells the user to wait until the program is loaded. After the program is loaded, the computer automatically generates the next screen.

Good choice!
I'd like to know more about animals.

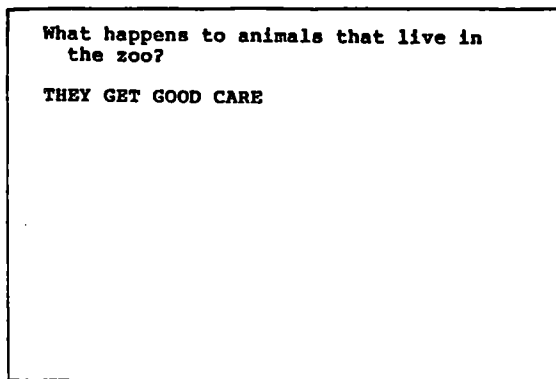
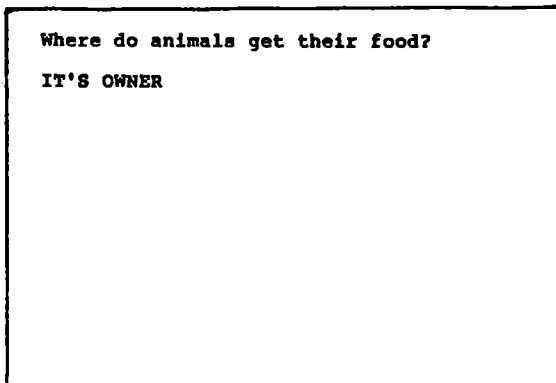
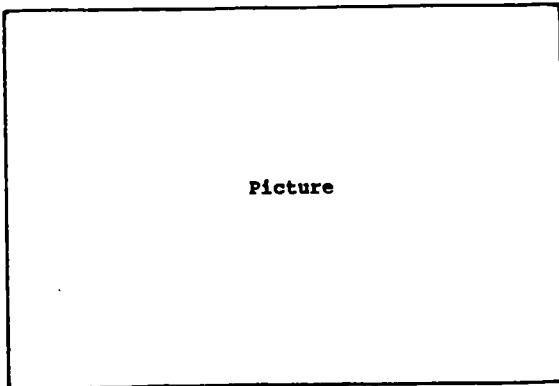
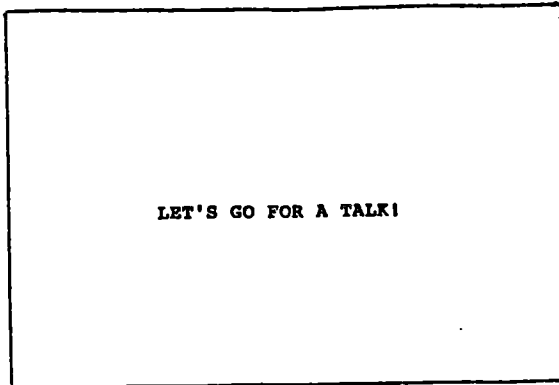
10. Good Choice Greeting - The computer reinforces the user's choice by providing positive feedback according to the topic selected. After three seconds, the computer automatically generates the next screen.

Type your PASSWORD and <RETURN>.
GLOVE
Type your FIRST name and <RETURN>.
JOHN
Type the HOUR (1-12) and <RETURN>.
10
Type the MINUTES after the hour (0-59) and <RETURN>.
23

11. User Information - The computer asks for information needed by the researcher. Providing the first name allows a personal greeting throughout the program. After the user enters the information, the computer automatically generates the next screen.

Thank you!

12. Thank You - The computer continues positive feedback to the user for 1.2 seconds.



13. Title - The computer provides the title for 1.6 seconds as a transition from the record-keeping information to the questions within the program. The computer automatically generates the next screen.

14. Picture - The computer provides a colorful picture for 5 seconds. Content of pictures are appropriate to the topic. The computer automatically generates the next screen.

15. Level 1, Question 1 - The user answers by typing words, phrases or sentences on the keyboard. The computer stores the responses and automatically generates the next question when the user presses RETURN.

16. Level 1, Question 2

What are important things to remember about taking care of animals?
FEED THEM EVERYDAY

17. Level 1, Question 3

Why is it good for some animals to live in forests?
THEY HAVE A BIG SPACE TO LIVE

18. Level 2, Question 1

How can animals help people?
THEY CAN

19. Level 2, Question 2

Why do you think some people have pets?
SO THEY CAN TAKE CARE OF AND PLAY WITH

20. Level 2, Question 3

What happens when hunters kill all of one kind of animal?

THEY BECOME EXTINCT

21. Level 3, Question 1

What would it be like if dinosaurs lived today?

EVERYTHING WOULD BE A MESS

22. Level 3, Question 2

How could you help an animal that was hurt?

TAKE IT TO A VETERANARIAN

23. Level 3, Question 3

How is a zoo animal different from a wild animal?

SOME OF THEM ARE BIGGER

24. Level 4, Question 1

How are animals that live in water like animals that live on land?

THEY ALL HAVE BODYS

25. Level 4, Question 2

How are turtles like some people?

THEY CAN WALK

26. Level 4, Question 3

What would you do if you were an animal in the zoo?

I WOULD TRY TO GET ENOUGH ATTENTION AS I COULD

27. Level 5, Question 1

What would you do if you were a bear?

I WOULD EAT ALL THE FOOD I SAW

28. Level 5, Question 2

What would happen if dogs grew to be giants?

IT WOULD BE TERRIBLE

29. Level 5, Question 3

What animals make you the happiest?

RABBITS

30. Level 6, Question 1

What nice things do you do for animals?

GIVE THEM ATTENTION

31. Level 6, Question 2

Why should you not pet strange animals?

THEY COULD BITE

32. Level 6, Question 3

John,

I've enjoyed talking with you about animals. I hope we can do this again sometime soon.

Press <RETURN> to continue.

I'll print a list of your responses to my questions.

Please take the list to your desk and write a story about animals using some of the words from the list.

Press <RETURN> to continue.

I'll also print some hints for you to use to make your story look nice.

Press <RETURN> to continue.

John, you used these words when you talked about animals:

IT'S OWNER

THEY GET GOOD CARE

FEED THEM EVERYDAY

THEY HAVE A BIG SPACE TO LIVE

THEY CAN

SO THEY CAN TAKE CARE OF AND PLAY WITH

THEY BECOME EXTINCT

33. Closing Statement - The computer signals the user in a positive manner that all questions have been asked. The user presses RETURN when ready to continue.

34. Closing statement continues by explaining to the user what the computer is about to do. The user presses RETURN when ready to continue.

35. Closing statement continues. The user presses RETURN when ready to continue.

36. Print Responses - the printer turns on and begins printing the responses recorded by the user. The responses scroll upwards on the screen as the printer prints them.

EVERYTHING WOULD BE A MESS
 TAKE IT TO A VETANARIAN
 SOME OF THEM ARE BIGGER
 THEY ALL HAVE BODY'S
 THEY CAN WALK
 I WOULD TRY TO GET ENOUGH ATTENTION AS
 I COULD
 I WOULD EAT ALL THE FOOD I SAW
 IT WOULD BE TERRIBLE

37. Responses continue scrolling upwards as printer prints them.

RABBITS
 GIVE THEM ATTENTION
 THEY COULD BITE

38. Responses continue scrolling upwards as printer prints them. After the last response, the scrolling stops and the printer turns off. The user presses RETURN to continue.

Press <RETURN> to continue.

DIRECTIONS

1. Put your name and today's date on the first line of your paper.
2. Skip one line.
3. Write a title for your story on the next line.
4. Skip another line.
5. Write a story using some of the words from your list.

39. Directions - The printer turns on and begins printing directions to the user explaining how to use the individual wordbank created by the program. At the end of the directions the printer turns off. The user presses RETURN to continue.

Press <RETURN> to continue.

REMEMBER

1. Begin every sentence with a capital letter.
2. End every sentence with the correct punctuation.
3. Indent paragraphs.
4. Use your best handwriting.
5. Give your story and your word list to your teacher when you are finished.

40. Reminder - The computer turns on and prints reminders to the user to consider when writing the story. At the end of the reminders, the printer turns off. The user presses RETURN to continue.

Press <RETURN> to continue.

Type the HOUR (1-12) and <RETURN>.

10

Type the MINUTES after the hour (0-59)
and <RETURN>.

45

Thank you for coming today.

Come again soon.

41. Time Information -
The computer asks the user to enter the time of day. The computer automatically continues to the last screen after the user enters the information.

42. Exit Greeting - the computer turns on and prints the exit greeting as it appears on the screen. After printing the greeting, the printer turns off and the program ends.

APPENDIX L

DIRECTIONS CARD FOR TALK

HOW TO USE TALKTO BEGIN

1. Put the Disk **1-RED** in the disk drive.
2. Close the door on the disk drive.
3. Put the paper cover on top of the disk drive.
4. Turn on the printer (on the side).

Make sure 3 green lights are on.
If not, press ON LINE.



5. Turn on the monitor (on the front).
6. Turn on the computer (on the back).

TO END

1. Make sure RED LIGHT is OFF!
2. Take the disk out of the disk drive.
3. Put the disk in the paper cover.
4. Return all **⏏** disks to the TALK folder.
5. Take your word list out of the computer.

Press ON LINE.
When only one green light is on, press LF several times.

6. Turn off the printer (on the side).
7. Turn off the monitor (on the front).
8. Turn off the computer (on the back).

***** WARNING ***** Always wait until the RED LIGHT is OFF before taking any disk out of the disk drive.

APPENDIX M

DIRECTIONS FOR RATING QUESTIONS

DIRECTIONS

Please give each item two ratings: (1) a numerical rating indicating the level of Bloom's taxonomy in which the item falls, and (2) a word or letter rating indicating the quality of the item within the level.

Example: Level = 1, 2, 3, 4, 5, or 6

Quality = Good, Fair, or Poor (G, F, or P)

Level

- 1 = KNOWLEDGE - recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting.
- 2 = COMPREHENSION - a type of understanding such that the individual knows what is being communicated and can make use of the material or idea. It involves changing information into different forms and discovering relationships among facts, generalizations, values, skills, etc.
- 3 = APPLICATION - the use of abstractions in concrete situations. It is solving life-like problems that require the identification of the issue and the selection and use of appropriate generalizations and skills.
- 4 = ANALYSIS - the breakdown of a communication into its elements or parts. It is solving a problem in the light of conscious knowledge of the parts.
- 5 = SYNTHESIS - the putting together of elements and parts so as to form a whole. It is solving a problem that requires original, creative thinking.
- 6 = EVALUATION - judgments about the value of material and methods for given purposes. Quantitative and qualitative judgments about the extent to which material and methods satisfy criteria. Use of a standard of appraisal. The criteria may be those determined by the student or those which are given to him.

Quality

Good = this item is a Good example of the level indicated

Fair = this item is a Fair example of the level indicated

Poor = this item is a Poor example of the level indicated

Note: Definitions from B. Bloom, F. Hunkins, and N. Sanders

APPENDIX N

RAW DATA

Subject	Group	<u>Thinking Scores</u>		<u>Writing Scores</u>	
		Pre	Post	Pre	Post
033	E			53	40
034	E	151	165	78	40
035	E	168	185	62	49
036	C	159	162	63	42
037	E	215	188	62	53
038	E	159	152	49	40
040	E	167	149	56	38
041	E	210	161	53	47
042	E	208	151	40	53
043	C	177	156	44	42
044	C	192	180	62	47
045	C	154	168	38	38
046	C	201	182	36	42
047	C	188	196	51	56
048	C	143	158	47	45
049	C	200	225	47	44
050	C	188	149	49	49
051	C	185	155	53	45
052	C	162	139	65	42
053	E	194	189	36	54
054	E	161	170		
055	E	160	166	53	40
056	C	159	169		
057	E	161	188	47	36
058	E	156	179	44	44
059	E	156	151	40	38
060	C	152	154	51	36
061	C	159	169	49	44
062	C	139	139	42	42
063	C	136	160	36	33
064	C	170	169	65	36
065	C	183	181	51	40
066	E	179	184		
067	E	211	212	40	44
068	E			44	51
069	E	154	184	40	45
070	E	167	185	42	42
071	E	181	186	40	40
072	E	223	228	45	45
073	E			40	49
074	E	186	205	62	60
075	E	157	168	40	42
076	E	242	239	54	47
077	E	181	170	40	40
078	E	187	208	44	51

Subject	Group	<u>Thinking Scores</u>		<u>Writing Scores</u>	
		Pre	Post	Pre	Post
079	E	210	190	49	42
080	C	173	175	45	40
081	C	162	163	44	42
082	C	204	236	40	44
083	C	153	165	40	47
084	C	191	198	44	44
085	C	161	163		
086	C	200	180	42	44
087	C	158	182	53	62
088	C	212	198		
089	C	194	181	42	44
090	C	131	120	42	40
091	C	188	196	44	44
092	E	132	132		
093	E	177	170		
097	E	128	128	36	42
098	E	100	99	44	38
099	E			38	42
100	C	125	144	45	35
101	C	88	89	29	31
102	C	127	133	40	33
103	C	111	119	33	38
104	E	135	118	49	44
105	E	120	133	56	36
106	E	159	159		
107	E	112	117	54	42
108	C	124	122	42	44
109	C	152	149	42	45
110	E	132	139	44	58
111	E	130	135	58	44
112	E	152	157	58	40
113	E	160	161	51	40
114	E			51	47
115	E	158	180	44	47
116	C	206	199	60	65
117	E	164	181		
118	E	164	157	40	45
119	C			45	42
120	C	148	153	53	49
121	C			38	40
122	C	166	161	54	45
123	C	143	140	51	51
124	C	190	185	60	60
125	C			53	36
126	C			58	38
127	E	196	160	47	40

Student	Group	<u>Thinking Scores</u>		<u>Writing Scores</u>	
		Pre	Post	Pre	Post
128	E	148	130	40	47
129	E	192	176	44	36
130	E			45	44
131	E	134	135	38	40
132	E	160	150	42	42
133	E	176	174	44	44
134	E	129	138	44	47
135	E	172	196	49	44
136	E	125	127	40	36
137	E	133	100	53	53
138	E	131	121	35	33
139	E			42	49
140	C	163	152	58	47
141	C	125	133	49	45
142	C	139	133	44	49
143	C	173	158	40	49
144	C	160	177	56	54
145	C	146	140	44	36
146	C	193	182	51	51
147	C	182	151	35	47
148	C	175	147	56	53
149	C	148	138	56	47
150	C	198	207	60	53
151	C	188	190	67	58
152	C	145	140	44	51
153	C	207	188	49	45
154	E	137	156	58	38
155	E	194	173	45	53
156	E			54	54
157	C			44	44
159	C	159	143	65	51
160	C	158	147	40	44

APPENDIX O

EXPERIMENTAL STUDY EVALUATIONS

(STUDENT / TEACHER)

EVALUATION QUESTIONNAIRE**Doctoral Study**

Your views regarding the process and product of this study are important. Please respond to the following questions. Feel free to use the back side of the paper. It is not necessary to identify yourself. Thank you for your help.

1. What specific problems did you encounter with the execution of the TALK program?
2. What specific problems did you encounter with the students as they used the TALK program?
3. What problems did you encounter with students when they were writing their stories?
4. What specific problems did the students encounter when using the TALK program?
5. What problems did students encounter when they were writing their stories?
6. How well were students able to begin and complete the TALK program without assistance?

7. How did students respond to the TALK program? What was their attitude toward using the program?

8. How acceptable was the length of the TALK program? Were there too few or too many questions per session?

9. What strengths in the TALK program did you notice?

10. What weaknesses in the TALK program did you notice?

11. What information did you need to know that was not provided?

12. What changes do you suggest in the way the study should be conducted?

13. What changes could be made to ease the experience for you?

14. What changes could be made to ease the experience for the students?

15. What is your overall impression of the TALK program?

STUDENT EVALUATION

1. What did you like best about using TALK? _____

2. What did you not like about using TALK? _____

3. Was each topic too long, too short, or just right? _____

4. Were the directions clear, or did you have problems understanding what to do? _____

5. If you had problems, what were they? _____

6. Did you ask your teacher for help - never, a few times, many times, or always? _____
7. Which topics did you use? Yes or No
 - 1) Myself _____
 - 2) My Family _____
 - 3) School Days _____
 - 4) Animal Life _____
 - 5) Friends and Others _____
 - 6) Games and Sports _____
 - 7) On the Go _____
 - 8) Mother Nature _____

8. What was your favorite topic in TALK? _____

9. What topic did you not like? _____

10. Are you a boy or a girl? _____

11. What topic did you want to talk about that was not in TALK?

12. How could TALK be changed to make it better? _____

VITA

Sheryl Marie Shanahan

Candidate for the Degree of
Doctor of Education

Thesis: COMPUTER-ASSISTED INSTRUCTION AND THE CREATIVE
THINKING AND WRITING ABILITIES OF FOURTH GRADE
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