# THE EFFECTS OF COGNITIVE ORGANIZERS ON THE COMPREHENSION AND RETENTION ABILITY FOR HIGH SCHOOL STUDENTS WITH LEARNING DISABILITIES

by

Jill C. Chalk

(Under the Direction of Richard Boon)

## ABSTRACT

Students with learning disabilities often struggle to meet the demands of content learning at the secondary level. In spite of this growing concern, there is limited research on teaching methods and techniques to help these students. To address this challenge, teachers must apply strategies that help students facilitate the learning and academic performance in order for them to be successful in earning a regular education diploma. Computerized cognitive organizers, which have been widely used and documented for improving reading comprehension for students at the elementary level, is one technique that can be adapted to assist students at the secondary level. The purpose of this study was to examine the effects of cognitive organizers using Inspiration 6 software as a tool to enhance content learning in a world history classroom for students with learning disabilities. Specifically, students were taught to apply the cognitive organizer as a strategy for comprehending and retaining learning. The effects of cognitive organizers were examined using a single subject multiple baseline design. The dependent measure included a comprehension quiz after each lesson. The results of this study indicated that the use of computer-based cognitive organizers increased the social studies comprehension and retention for students with disabilities.

INDEX WORDS: Cognitive organizers, Inspiration 6 software, Learning disabilities, High school, Social studies

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# CHAPTER 1

# INTRODUCTION

Education reform efforts related to equal access and high standards for all students, as well as school accountability, are the most recent mandates to improve school quality. This has resulted in a closer investigation of current curriculum requirements and teaching practices through high stakes assessments. With this reform effort for all students to achieve at high levels, special education teachers must prepare students with disabilities to meet and hopefully exceed these standards. For this to be done, teachers must grasp an understanding of how students learn best.

Traditional teaching methods consist of a teacher standing at the front of the room lecturing as the students take notes on what they feel are the most important concepts of the lesson. Such teacher-centered methods have proven to be ineffective for student learning, retention, and motivation (Hudson, 1997). On the other hand, when teachers act as facilitators rather than instructors, students become active participants in the learning process. When a student takes on this role and responsibility, their academic knowledge and development are enhanced (Lipsky & Gartner, 1992). This type of teaching method requires the students to be actively engaged in the learning process, allowing them to become creators of knowledge rather than passive learners.

Not only is it important for teachers to alter their methods of teaching so that students will achieve at high levels, it is equally important that resources are used to enhance the

curriculum. One way to add to the curriculum is to incorporate cognitive organizers into the lessons. Cognitive organizers are a way to visually depict the relationship between facts, terms, and ideas within a learning objective. They vary in design but are frequently depicted through the use of spider webs, hierarchal diagrams, fishbone maps, and thematic graphs. Cognitive organizers have been widely researched across subject areas for their effectiveness in improving student outcomes and increasing active engagement (Boyle, 1996; Boyle & Weishaar, 1997; Gardill & Jitendra, 1999; Herl, O'Neil, Chung, Schacter, 1999).

Cognitive organizers have been researched in a range of subject areas and across most grade levels. In all, reading comprehension has been the most studied application for using cognitive organizers (Kim, Vaughn, Wanzek, & Wei, 2004), while social studies is a content area that is also represented in the literature (Blankenship, Ayres, & Langone, 2005; Boon, Burke, Fore, & Spencer, 2006; Doyle, 1999). Through the use of cognitive organizers, students have been able to effectively use mapping to understand timelines in history, comparing and contrasting historical events and people, and the cause and effect of wars and other notable conflicts.

Although cognitive organizers have proven to be successful in many subject areas for a number of years, they were initially limited to use on paper, chalkboard, or the overhead projector. Over time, technology has increasingly been used as an instructional tool to aid in constructing cognitive organizers. With the release of the Inspiration Software, students no longer have to spend unwarranted time hand-drawing the graphics. This software allows students to create various maps, webs, and charts with a click of the mouse. Research shows that students are more likely to make corrections to the organizer on a computer since deletions, revisions and additions are accomplished more easily and quickly than hand-drawn organizers (Anderson-

Inman & Zeitz, 1993). The Inspiration 6 software allows students to take an active role in their learning by creating graphics that coincide with the information they are learning.

## Rationale

Teachers heavily favor a lecture format of instructional style at the high school level. This overemphasis on a lecture style approach is credited by the teachers as the fastest way to disseminate the amount of information that needs to be taught to the students in a given year. Student surveys, on the other hand, indicate that a schism exists between teaching methods and learning processes. Students indicate that they prefer to be actively engaged in their own learning rather than passively taking in the information that is being presented (Martini, 1986). Research concurs with the students by providing data that indicates students retain and understand information more effectively if placed in an active-learner role (Mitchell, Dunn, Klavas, Lynch, Montgomery, & Murray, 2000–2001).

Students with disabilities especially have difficulty with a lecture type of teacher instruction. They frequently do not process information or apply knowledge efficiently; lack the necessary domain-specific or general problem-solving knowledge and self-regulation processes; and have trouble selecting and deploying task-appropriate strategies (Montague, 1992). These students need an instructional style that is better suited to their style of learning. Active engagement of students with special needs in meaningful and purposeful learning is crucial for them to achieve at high levels.

The research on learning styles and strategies is well articulated in the literature; however, in comparison, relatively little research has focused on effective learning strategies for students at the secondary level. Much of the research on learning strategies focuses on elementary and middle school-aged students (Graham, Harris, MacArthur, & Schwartz, 1991;

Miller & Mercer, 1993). Furthermore, very little is known about how students learn best in content areas, such as social studies, and if the application of cognitive organizers through the use of technology will increase student learning and retention.

A review of the social studies curricular content at the high school level demonstrates a lack of emphasis on the teaching strategies prevalent in a curriculum that includes technology and graphic organizers. By making students actively engaged in their learning process through the use of cognitive organizers and technology, students will hopefully form positive attitudes toward the subject being taught and gain a level of confidence in knowledge and skills. Cognitive organizers also are being used to inspire and motivate students to explore the subject further.

## Purpose

Within the target population, it is evident that the disparity in academic achievement between general education students and those with disabilities increase every year. The targeted population consists of tenth grade social studies students in a middle class high school. The problem of growing disparity was documented by the examination of the students' social studies results according to the final exam scores from second semester world geography.

This study describes an intervention program for increasing social studies achievement of students with learning disabilities by engaging the students in meaningful, learning oriented curriculum activities using cognitive organizers and technology. The focus will be on investigating a learning strategy in which students and teachers can create interactive computer-based resources that take into account different styles of learning. A second focus will be how the teachers and students feel that they have benefited from this type of learning compared to basic teacher lecture format.

The main platform for developing an interactive cognitive organizer will be Inspiration 6 software.

## Research Questions

The following overall research questions will guide this study:

1. Can students comprehend and retain information better if they use a computerized cognitive organizer compared to the traditional textbook and lecture instruction condition?
2. How do students feel about using the computerized cognitive organizer compared to the traditional textbook instruction condition?

# CHAPTER 2

# REVIEW OF THE LITERATURE

## Introduction

### *Shift in the Academic Culture within Schools*

In previous years, schools often neglected to establish meaningful educational goals for students with disabilities and the students were not given the same opportunity to learn as their more advantaged peers (Heubert & Hauser, 1999). Mandates like The No Child Left Behind Act (2000) and the provisions of The Individuals With Disabilities Education Act (2004) focus on access to the general curriculum for all students. This perspective focuses on results-oriented outcomes that hold the schools responsible for all students, including those students with disabilities. The recent paradigm shift to scientifically-based practices and the general call for accountability in education is requiring schools to reexamine their current instructional practices at the secondary level (Carnine, & Granzin, 2001).

Traditional didactic teaching methods are viewed as teachers being responsible for most of the thinking for their students and providing the students with the facts that need to be memorized and regurgitated on paper to be assessed later. Many teachers face the problem of teaching methods that are heavily teacher-centered, lecture-based, and focus on material that is factual-based only (Raglin, 2003). This form of teaching is frequently ineffective and students are unable to comprehend, retain, and generalize the information for important use (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990).

Growing national interest in educational accountability for all students has contributed to the emergence of research for scientifically based practices. For many years, numerous teachers and schools have experimented with lessons and materials that have proven to be ineffective, especially at the expense of students that are already behind their peers academically. No Child Left Behind targets educational programs and teaching methods that demonstrate effectiveness through rigorous scientific research. Programs and practices grounded in scientifically based research are not fads or untested ideas; they have proven track records of success. Teachers and researchers are therefore seeking education programs that are grounded in scientifically based research.

*Difficulties Students with Disabilities Face at the Secondary Level*

Once students with disabilities reach the high school level, they often find a challenge that is more than they can face. At this level, they are confronted with text and lecture-driven teaching methods that often exacerbate their difficulty with reading and adds pressure to meet the expectations placed upon them. Their anxiety increases because of the speed of a fast-paced curriculum that they must be able to keep up with if they want to graduate with a regular education diploma. The students are often hindered by limited organizational skills and are slower than others in completing assignments and assessments. High school is often a frustrating experience for students with disabilities as they face low self-confidence and poor achievement, which sometimes leads to dropping out of school before meeting the graduation requirements.

High school can be a difficult time for students with disabilities because they are more likely to read below grade-level, have difficulties processing information from expository texts, and may not have sufficient compensatory skills (Mastropieri, Scruggs, Spencer, & Fontana, 2003). Unfortunately, 20%-30% of students in the United States will find reading a formidable

challenge once they reach the high school level (Lyon, 1998). Once they reach this educational point, the difficulties compound in every subject area and substantial decreases are noted in the student's self-esteem, self-concept, and motivation to learn to read if they have not been able to master reading skills and keep up with their peers. Reading becomes a chore that is often slow, laborious, and even embarrassing.

Extracting meaning from text, understanding the organizational structure of a text, and identifying main ideas, themes, and corresponding details from textbooks are likely to be difficult for students with mild disabilities (Jitendra, Hoppes, & Xin, 2000). They sometimes neglect to clue in on those important relationships between the main ideas and supporting details while reading. Students with disabilities often read as if everything appearing in text is of equal importance, which makes it difficult to integrate new ideas with existing knowledge or to pick out the information that should be remembered for a test.

Once students reach the high school level, it is important that they have learned the technique of good note-taking strategies while a teacher is lecturing or while the class is having an important discussion. Regrettably, students with mild disabilities frequently have difficulty with this important learning strategy because they are unsure of what to record, and therefore end up trying to write down everything or failing to write down information that is relevant. Many times, if the students do record information, they have a difficult time going back to understand what they wrote and to make sense of what to study for an assessment. Not only will note-taking strategies be important in high school, but it will be a necessity if a student wants to attend a post-secondary school.

When it becomes time to study for an assessment, students with disabilities often have difficulty organizing their time and the materials they need in order to study effectively (Meltzer,

1994). Due to organizational concerns, they do not always write down when tests will occur, which would help them know when and how long in advance they should prepare to study the necessary materials. Even if they are aware of when the assessment will occur, they are not always prepared with useful notes from class. What they typically have is several pages of random facts that make it difficult to determine important relationships, such as cause-and-effect, sequential events, and compare-and-contrast. In turn, this leads to inept study skills that make it difficult for a student with disabilities to reach mastery on content assessments.

*The Challenges of Learning Social Studies*

The curricular demands for a student with mild disabilities in secondary content-area classes are great (Deshler, Schumaker, Lenz, Bulgren, Hock, Knight, & Ehren, 2001). Clearly, accessing the general curriculum and performing at a high level in social studies is difficult for students with disabilities. They usually perform worse than their non-disabled peers after social studies instruction (Donahoe & Zigmond, 1990). Research indicates a rather disturbing pattern of ignorance about history, civics, and geography related to students with disabilities in the area of social studies (National Assessment of Educational Progress, 1990a,b,c).

Unfortunately, the textbook continues to be the primary method that content-area information is conveyed to students in social studies classrooms (Bean, Zigmond, Rogers, Hartman, & Gozdik, 1991; Brophy, 1992; Harniss, Dickson, Kinder, & Hollenbeck, 2001). Research on the study of social studies textbooks has revealed several concerns with student learning (Paxton, 1999). The most discouraging fact for most students with reading difficulties is that the secondary level social studies textbooks are written at reading levels that exceed most students with disabilities (Mastropieri, Scruggs, & Graetz, 2003). Even if student reading levels match that of the text, many students with mild disabilities do not have the background

knowledge skills and/or the strategies to comprehend content-area information (Lederer, 2000). They do not build background knowledge. In particular, social studies textbooks are not constructed to build background knowledge of important concepts and historical events (Beck, McKeown, & Gromoll, 1989). Furthermore, textbooks lack clarity to adequately explain significant events and relationships (Beck & McKeown, 1988), lack conceptual coherence (Beck & McKeown, 1988), fail to provide contextual information, and other conceptual scaffolds that would facilitate comprehension (Dreher & Singer, 1989). Many educational reformers are also concerned about the apparent lack of depth and overwhelming breadth of most social studies textbooks (Woodward, 1987) and the attempt to cover too much information in the allotted pages (Tyson-Bernstein, 1987). Additionally, many of the photographs and illustrations within the textbook do not relate to the material covered, have an instructional purpose, or are often irrelevant and potentially confusing (Tyson-Bernstein & Woodward, 1986).

*Technology in the World of Academics*

With the ever expanding forms of media, technology has infiltrated every aspect of a student's life. They are bombarded with technology through print media, television, movies, and radio. Students now have constant access to handheld computer games, which were once limited to home access or were only available in arcades. Technology has further broadened the ideas of learning with the expanded use of computers and phones. Through these technologies, students can assess and respond to information through the internet and communicating through email and text messaging, which has broadened to express oneself through this form of social communication. Technology is a way of life outside of the academic culture for most students.

In a world that is increasingly dependent upon technology, it is surprisingly difficult to see how insignificant of a role technology plays in academics within schools today. Although

previous technology in schools was commonplace in every classroom, such as overhead projectors and filmstrips, current technology is not often seen in present-day classrooms. The National Survey of Information Technology in U.S. Education reported that getting teachers to incorporate technology into their instruction is one of the most challenging aspects of working with teachers (Charp, 2000). Charp also found that teachers do not feel comfortable, nor prepared to integrate technology as an ongoing component of the curriculum. Why is technology such a popular mode of communicating and learning for students outside of schools, but not customarily used for teaching academics?

It is not suggested that teachers do away with textbooks and completely replace all curriculum materials with computers and other forms of technology. Instead, however, teachers should supplement textbooks with project-based activities that require updated forms of technology. It is these activities that require students to sustain engagement in authentic learning activities, not reading out of a text. Technology is proven to facilitate the goals of content area instruction by providing tools for designing and constructing artifacts (Krajcik, Blumenfeld, Marx, & Soloway, 1994). It is through this method of active learning, that students are able to understand and retain information.

Technology in academics has the ability to enhance and enrich teaching and learning within content areas. No longer are teachers relegated to always being the leader of the classroom while students regurgitate the information presented to them. Technology now allows teachers to become facilitators, supporting students while the students themselves take an active role in their learning. Through creative software and interactive media tools, teachers can develop meaningful lessons that are computer-based and student-driven.

## Related Research

### *Literature Search Procedures*

In this section, the effectiveness of computer-assisted instruction with students with learning disabilities in social studies is reviewed. The following search procedures were employed to retrieve relevant articles. First, a computer-assisted search of six major databases was conducted including *Academic Search Premier , ERIC*, *Psyc*ARTICLES, *Psyc*INFO, *Dissertation Abstracts*, and *Education Abstracts* from 1980-2006. The descriptors used in the search procedure included computer assisted instruction, multimedia instruction, computer uses in education, disabilities, special education, learning disabilities, social studies, history, high school, and teaching methods. Second, a hand search of relevant articles was completed. Third, university professors were contacted to obtain recent publications and manuscripts in press relevant to the review. In addition, Inspiration Corporation was contacted to obtain recent studies employing the use of Inspiration 6 software to enhance learning for students with and without learning disabilities. Finally, a hand search of reference lists and table of contents of relevant journals was conducted. The search procedures revealed 18 studies, which met the criteria for inclusion in this review.

### *Criteria for Inclusion*

The three main criteria for inclusion in this literature review include: (a) articles published between 1980 to 2006; (b) studies that examined the effects of cognitive organizers on student achievement; (c) individuals included in the study are classified as having a mild disability by the authors and meet intelligence quotient (IQ) as defined by the state. For the

purposes of this review, studies were excluded when no clear cognitive organizer instruction intervention was employed or participants were not classified as having a mild disability in the article by the authors and met the intelligence quotients.

*Overall Study Characteristics*

There were 21 studies that ranged in publication date 1980-2006, and appeared in refereed journals such as *British Journal of Educational Technology*, *Learning Disability Quarterly*, *Learning Disabilities*: *A Contemporary Journal*, *Journal of Learning Disabilities*, *Social Education*, *Journal of Special Education Technology*, *Journal of Instructional Psychology*, *Exceptional Children*, *Journal of Computing in Childhood Education*, and *Remedial and Special Education*. A total of 656 participants (range 4 to 87) who had a mean age of 12.5 (range 10.2 to 16.2) and a mean IQ of 92.5, of those reported, participated in these studies. The median number of subjects per study was 32 (range 4 to 87). The majority of studies included in the review employed experimental designs. The typical interventions included five major areas: (a) computerized study guides, (b) project-based learning activities, (c) computerized map tutorials, (d) cognitive organizers, and the use of (d) Inspiration software.

The sample of studies included in this review consisted of six computerized study guides studies (Higgins & Boone, 1990; Higgins & Boone, 1992; Higgins, Boone, & Lovitt, 1996; Horton, Boone, & Lovitt, 1990; Horton & Lovitt, 1994; Horton, Lovitt, Givens, & Nelson, 1989), six project-based learning studies (Edyburn, 1991; Ferretti, MacArthur, & Okolo, 2001; Glaser, Rieth, Kinzer, Colburn, & Peter, 2000; Okolo & Ferretti, 1996a; Okolo & Ferretti, 1996b; Okolo & Ferretti, 1998), two computerized map tutorial studies (Gleason, Carnine, & Vala, 1991; Horton, Lovitt, & Slocum, 1988), three cognitive organizer studies (Boyle, 1996; Boyle & Weishaar, 1997; Gardill & Jitendra, 1999), and four studies using Inspiration 6 software

(Blankenship, Ayres, & Langone, 2005; Boon, Burke, Fore, & Hagan-Burke, 2006; Boon, Burke, Fore, & Spencer, 2006; Boon, Fore, Ayres, & Spencer, 2005). In the ensuing paragraphs, each of these areas will be synthesized and discussed.

*Computerized Study Guides*

Students with disabilities often find studying for an assessment an impossible feat. They frequently do not have the right materials to study, did not take adequate notes during class time, or if they had the materials, could not determine the important facts to study. Studying is hard work and requires a sustained effort over a long period of time, which in turn requires a high level of motivation. Students with disabilities that are already frustrated with the demands and challenges placed upon them by the teachers, curriculum, and their parents will already have a low motivation to study. Since the demands of the curriculum and assessments are only going to continue, teachers need to develop new strategies to assist these students in learning the important concepts to study and the most effective way to study. Using computers to assist students in studying for tests is a powerful tool to engage students in learning the material necessary to pass an assessment and retain information.

Six studies examined the use of computerized study guides to assist students with learning disabilities and remedial students in learning and comprehending social studies content (Table 1). Computerized study guides were used to enhance content area learning, increase recall and comprehension, and support students in mastering content. One study examined the effects of using HyperCard, a software program to increase text comprehension (Horton, Boone, & Lovitt, 1990). Another study compared the use of a computerized study guide versus a note-taking condition to increase textbook comprehension (Horton, Lovitt, Givens, & Nelson, 1989). Three studies evaluated the use of a hypertext computer-assisted study guide to increase

Table 1. Computerized Study Guides

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Horton, Boone, & Lovitt (1990) | *N* = 4<br>*N* = 4 (LD)<br><br>9th & 10th grade<br>Washington State History | Three lessons using hypertext study guides. | This study used a computer-based study guide with hypertext software to increase textbook comprehension. The program provided four levels of instructional cues that matched students to their highest level of independent interaction with a textbook passage based on item-to-item responses to computer-generated questions. | Results indicated a significant gain for students on computer items from pre- to posttest and from pretest to retention test. |
| Horton, Lovitt, Givens, & Nelson (1989) | *N* = 31<br>*N* = 13 (LD)<br>*N* = 18 (Remedial)<br><br>9th grade (HS)<br>World Geography | Using a computer to read a selection, complete a study guide and take a quiz compared to without the aid of a computer. | In the notetaking treatment, the students read a passage for 15 minutes that was on paper, took notes over the passage on their own with no guidance, and then took a quiz. With the computer treatment, the students used a computer to read the passage, complete a study guide, and then were given a quiz. | Results indicated that the computerized study guide produced significantly higher performance than notetaking for both groups of students. There was no difference in the performance of the two groups within treatments. |

Table 1. Computerized Study Guides

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Higgins & Boone (1992) | *N* = 49<br>*N* = 14 (LD)<br>*N* = 13 (Remedial)<br>*N* = 22 (Regular Ed.)<br>9th grade (HS) Canadian History | Three treatment groups in a repeated measures design – lecture only, lecture and hypermedia study guide; and hypermedia study guide only. | The researcher adapted the textbook to hypermedia format and used hypermedia study guides to see if the use of technology would make a difference over a lecture only teaching method. | According to quiz grades, the hypermedia study guide only was more effective than the lecture only and the lecture/hypermedia method. |
| Higgins & Boone (1990) | *N* = 40<br>Study #1:<br>*N* = 10 (LD)<br>*N* = 15 (Remedial)<br>*N* = 15 (Regular Ed.)<br>Study #2:<br>*N* = 2 (LD)<br>*N* = 3 (Remedial)<br>9th grade Washington State History | Three treatment groups – lecture, lecture/computer study guide, and computer study guide. | Each group involved a 30-minute instructional period followed by a quiz. The first group listened to the teacher and took notes. The second group listened to a lecture and took notes for half of the time and then used a highly interactive computer study guide. The third group only used the computer study guide. | Results indicated that the computer study guide group was as effective as the lecture group and the lecture/computer study guide treatment was as effective as lecture, however, posttest scores and retention scores were higher for the computer study group. |

Table 1. Computerized Study Guides

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Higgins, Boone, & Lovitt (1996) | *N* = 25<br>*N* = 13 (LD)<br>*N* = 12 (Remedial)<br><br>9th grade Washington State History | Three groups – students using hypermedia only, students using lecture and worksheets only, and a combination of the two. | Students assigned to the lecture format took notes and listened to the teacher lecture. They then read a passage from the textbook and completed a study guide using a worksheet. The second group listened to the lecture, read the passages and completed the study guide using the computer. The third group completed all activities using hypermedia. | Findings indicate that hypertext support provides adequate reinforcement to move students toward continued, unprompted use of a hypermedia study guide, and that short-term and long-term retention improved for those students using the hypermedia study guides. |
| Horton & Lovitt (1994) | *N* = 72<br>*N* = 13 (LD)<br>*N* = 16 (Remedial)<br>*N* = 43 (Regular Ed)<br>(MS) & (HS) World History & U.S. History | Three groups – one computer based, one paper and pencil based, and the other one was mixed. | Condition 1 – students read the textbook passages, completed a study guide, and took a quiz all presented on a computer. Condition 2 – The same as above occurred except the students used paper and pencil for materials. Condition 3 – A mixture of computer usage and paper and pencil was utilized. | The results of group analysis significantly favored the computer overall on factual questions with individual analysis indicating little difference. There was also no significant difference when looking at group and individual analysis on the interpretative test items. |

achievement and comprehension in social studies (Higgins & Boone, 1990, 1992; Higgins, Boone, & Lovitt, 1996). Finally, another study investigated the diagnostic information gained from two group reading inventories using a computer versus a paper-and-pencil format (Horton & Lovitt, 1994).

Using a pre-post design, Horton, Boone, and Lovitt (1990) examined the effectiveness of a computerized study guide using hypertext software, HyperCard (Atkinson, 1987), on four high school students with learning disabilities in a remedial Washington State history class. Students included ninth and tenth graders, three males and one female, with a mean age of 15.5 (range 14.10–16.8). Three of the four students were Caucasian and one student was Asian. The software program, HyperCard, contained two main features, a reading component and a question component and was presented in the following instructional format: (a) "text", (b) "question", (c) "response", (d) "consequence", and (e) "overall sequence". In addition, the software program included instructional cues, levels one through four, to assist the students in selecting the correct multiple-choice response from the text. Dependent measures included a pre-test, posttest, retention measure, and three individual lesson tests. Results indicated the students significantly improved from pre- to posttest measures on the computer-generated questions compared to the control items in the program and the students were able to maintain these effects for a period of four weeks

In another investigation, Horton, Lovitt, Givens, and Nelson (1989) examined the efficacy of computerized study guides compared to a notetaking condition to increase content learning in two ninth grade world geography classes. Eighteen remedial and thirteen students with learning disabilities were randomly selected to either the experimental (computerized study guide) condition or neutral (notetaking) condition. The computerized study guide was designed

using BASIC C by Microsoft and contained three main features: (a) “a reading passage taken verbatim from the textbook”, (b) “a 15-item study guide containing short-answer questions based on the main ideas from the reading passage”, and (c) “a 15-item multiple-choice test”. While the students in the experimental condition used the computerized study guide, the students in the neutral condition read a passage of text, studied the information and took notes, and completed a multiple-choice test. Results indicated that both students with learning disabilities and remedial students performed higher in the computerized study guide condition, whereas both groups of students performed lower in the note-taking condition.

Using a group design, Higgins and Boone (1992) evaluated the use of a hypermedia computerized study guide within mainstreamed Canadian History classrooms. Forty-nine ninth graders with learning disabilities, remedial students, and regular education students were randomly assigned to three instructional conditions: (a) “lecture only”, (b) “lecture and hypermedia study guide”, and (c) “hypermedia study guide only” (p.155). The hypermedia authoring system, Guide (Owl International, 1986), contained three main functions: (a) “note function”, (b) “replacement function”, and (c) “inquiry function”. The note function, displayed as a “graphic or text”, provided the students access to additional information, not presented in the textbook, while the replacement function provided students the ability to change selected text with a “clarifying segment of text”. The inquiry function enabled the students to complete the multiple-choice items within the instructional lessons. All of the instructional conditions consisted of a 30-minute lesson and a 10-minute multiple-choice test. Results indicated for all three groups, students with learning disabilities, remedial students, and regular education students, the hypermedia study guide only condition, compared to the lecture only and lecture

and hypermedia study guide format, appeared to be the most effective instructional method to teach social studies instruction.

In a similar design, Higgins and Boone (1990) implemented two studies to investigate the use of hypertext computerized study guides with forty ninth-grade students with learning disabilities, remedial students, and regular education students in three mainstreamed Washington State History classrooms for ten days. The design and specific functions of the computerized study guide, designed with Guide (OWL International, 1987), the hypertext authoring system, are identical to the previous study conducted by Higgins and Boone, 1992. For example, the hypertext study guide contained the same basic functions (e.g., note function, replacement, and inquiry function) as discussed previously.

In the first study, students were randomly assigned to one of the following instructional conditions: (a) "lecture", (b) "lecture/computer study guide", and (c) "computer study guide" condition. Procedures in the study included four phases: (a) training of the computer and software, (b) a pilot study, (c) teacher presentation of the instructional lesson, and (d) a multiple-choice test. All students in the instructional conditions received 30-minutes of instruction and completed a 10-minute multiple-choice test. Dependent measures included a pretest, posttest, and retention measure. Results indicated that students in the computerized study guide condition performed higher on daily quiz scores compared to students in the lecture and lecture/computer study guide condition and maintained the information for a period of two weeks. In the second study, using a single-subject A-B-A design, five students with the lowest test scores were selected from the previous study to explore the use of the hypertext computerized study guides as a supplement to traditional instruction. During the instructional lesson, students worked on the computerized study guide lessons and completed a multiple-choice test. Results indicated all five

of the students displayed improvements from pre- to posttest measures. In addition, four of the five students exhibited an improvement from posttest to retention measures.

In another investigation that explored the efficacy of hypertext study guides, Higgins, Boone, and Lovitt (1996) investigated the effects of hypermedia study guides (e.g., pop-up text windows) to increase textbook comprehension for students with learning disabilities and remedial students in a mainstreamed Washington State History classroom for a period of ten days. Twenty-five ninth grade students, thirteen with learning disabilities and twelve remedial students, were randomly assigned to one of the following instructional conditions: (a) "lecture", (b) "lecture/hypermedia study guide", and (c) "hypermedia study guide". The design and procedures of the computerized study guide are identical to previous studies (see Higgins & Boone, 1990, 1992) using the hypermedia authoring system Guide (Owl International, 1987), which included the same functions (e.g., notes, replacements, inquiry) as discussed in the two previous studies. However, in this study, the information from the hypermedia study guide materials was coded as factual information ("information explicitly stated in the reading passage"), inferential information ("information implicitly stated in the reading passage"), or note information ("information accessible in the pop-up text window"). All instructional conditions received 30-minutes of instruction followed by a 10-minute multiple-choice test, as in the previous studies (see Higgins & Boone, 1990, 1992). Dependent measures included a pre-test, posttest, and retention measure. Results indicated a significant effect for the instructional condition and question type (e.g., factual, inferential, or note). Based on the mean retention scores, students responded correctly more frequently to factual questions, accessible in the hypermedia note window, compared to the inferential questions. In addition, the results indicated that students with learning disabilities retained more content information in the

lecture/hypermedia study guide condition, while remedial students performed equivalently in both the hypermedia study guide condition and lecture/hypermedia study guide condition. In general, for both groups of students, students with learning disabilities and remedial students, the lecture instructional format produced the lowest retention test scores.

In the sixth study to examine the use of computerized study guides, Horton and Lovitt (1994) examined the effects of two methods of group reading inventories, computer versus pencil-and-paper formats with six middle and high school science and social studies classes (e.g., two middle school science, two middle school social studies, and two high school social studies classes). Seventy-two students, including thirteen with learning disabilities, sixteen remedial, and forty-three regular education, were randomly assigned to three instructional conditions: (a) teacher-directed, (b) dyadic, and (c) independent. The computer program, designed by the research staff, used Apple II E computers, and included three main features: (a) instructions to navigate the basic functions/features of the program, (b) reading passages from the textbook, and (c) a 15-item multiple-choice test. In the computer assessment condition, students "read a 1,000 word passage displayed on the computer for 10-minutes", "completed a 15-item study guide using pencil-and-paper for 15-minutes", "studied the study guide for 5 minutes", and "answered a 15-item multiple-choice test on the computer", while in the pencil-and-paper assessment condition, students "read a 1,000 word passage from their assigned textbook for 10-minutes", "completed a 15-item study guide using a pencil-and paper for 15-minutes", "studied the study guide for 5 minutes", and "answered a 15-item multiple-choice test with a pencil-and-paper". In both conditions, the study guide consisted of fifteen questions or statements highlighting the main ideas of the reading passage. Dependent measures included nine, 15-item multiple-choice tests, consisting of twelve factual and three inferential test items. Results indicated for both

students with learning disabilities and regular education students, on factual test items, the computer assessment condition was more effective, while on the interpretive test items, students with learning disabilities performed better with the pencil-and-paper format, whereas the regular education students performed better in the computer assessment condition.

Table 1 provides a synthesis of the general areas of intervention research using computerized study guides in social studies instruction for students with learning disabilities, remedial students, and regular education students. The majority of the studies (N = 5) employed an experimental research design, while one study (Higgins & Boone, 1990) used a single-subject A-B-A design. As can been seen in these tables, all of the computerized study guides have been used state history and world geography classes at the secondary level. The duration of the computerized study guides ranged from one 30-minute instructional period to ten consecutive school days. In addition, of the studies reported, retention measures were reported two weeks after completion of the study. Also, it was apparent that the majority of the studies used a similar computerized study guide program Guide (Owl International, 1987) and procedural format (see Higgins & Boone, 1990; Higgins, Boone, & Lovitt, 1996; Horton & Lovitt, 1994). These procedures included the following components: reading a passage of text, completing a computerized study guide, responding to comprehension questions, and completing a multiple-choice test.

*Project-Based Learning*

Project-based learning provides students with the opportunity to learn and complete tasks in a student-centered, exploratory manner. This type of activity allows students with various learning styles to learn in a way that suits their needs. It allows students to make connections between real life applications, which often increases motivation. Five studies examined the

effects of project-based or multimedia instruction on students' acquisition of literal knowledge for students with and without learning disabilities (Table 2). Project-based and multimedia instruction were used to enhance textbook comprehension, increase student motivation, and foster acquisition of literal knowledge in social studies instruction.

Edyburn (1991) investigated the natural retrieval skills of factual information from full-text databases using three types of encyclopedias with thirty students, including fifteen regular education and fifteen students with mild disabilities (e.g., learning disabilities, emotional and/or behavioral disorders, and mental retardation) in grades sixth through eighth in junior high school. Students were randomly assigned to one of three instructional conditions: (a) print encyclopedia (*The World Book Encyclopedia*, 1981), (b) electronic encyclopedia with menus (*Academic American Encyclopedia Online Edition*, 1986), and (c) electronic encyclopedia with commands (*Academic American Encyclopedia Online Edition*, 1986) to obtain and retrieve the specific factual information. The procedures in all three conditions were identical in format and consisted of creating two specific research questions, which were based on a pre-study assessment, and to perform four informational retrieval tasks. For example, students were asked to create a question to be researched about a specific topic, such as "laser technology" and to use four retrieval tasks to locate the factual information to complete a fill-in-the blank statement. These tasks included two types or levels, simple (e.g., "Who wrote the book Winnie the Pooh?") to more complex such as (e.g., "Which was invented first, the camera or the motorcycle?") and students had five minutes to search and complete each task. Results indicated that for both conditions (print and electronic formats) students were able to complete the retrieval tasks to locate and retrieve specific factual information.

Table 2. Project-Based Learning

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Edyburn (1991) | *N* = 30<br>*N* = 15 (LD)<br>*N* = 15 (Regular Ed.)<br><br>Grade 6-8 (MS)<br>Social Studies | Information retrieval skills to use full-text databases using three forms of encyclopedias. | Procedures consisted of creating two specific research questions and conducting four informational retrieval tasks. The four retrieval tasks required students to locate factual information and complete a fill-in-the blank statement. | Results indicated that the percentage of retrieval tasks completed successfully by both groups was equivalent when using print or electronic forms. |
| Ferretti, MacArthur, & Okolo (2001) | *N* = 87<br>*N* = 28 (LD)<br>*N* = 59 (Regular Ed.)<br><br>5th grade (MS)<br>U.S. History | The use of technology to create presentations. All students used the same intervention. | Students analyzed sources with the teacher's assistance to understand the experiences of three emigrant groups. Students then designed a multimedia presentation in teams about the experiences of one emigrant group. | The intervention showed gains in the students' knowledge about the time period studied, a better understanding of historical content and inquiry and improvements in their self-efficacy as learners. Although both groups showed significant gains, the students with learning disabilities did not improve as much as the non-learning disabled students. |

Table 2. Project-Based Learning

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Glaser, Rieth, Kinzer, Colburn, & Peter (2000) | *N* = 19<br>*N* = 9<br>(LD & Mild MR)<br>*N* = 10 (Regular Ed.)<br><br>8th grade (MS)<br>Social Studies | This was a yearlong project that occurred during both semesters. The intervention was a four-part teaching method consisting of students watching a video, exploring the message of the video in small groups, and present the findings. | Phase 1 Anchors - watch video anchors to help students identify and define a problem and explore solutions; Phase 2 Retelling and Segmenting – discuss the video in small groups. Phase 3 Characterization – conduct an analysis on each main character; Phase 4 Student Research – research and create multimedia presentation. | The instruction became more interactive as observational and interview data indicated a twofold increase in the number of daily student/teacher interactions was implemented. The quality of interactions was found to be substantially higher than those occurring during baseline. |
| Okolo & Ferretti (1996a) | *N* = 21<br>*N* = 17 (LD)<br>*N* = 4 (Regular Ed.)<br><br>Grade 6-8 (MS)<br>U.S. History | One group only used word processing tools while the other group used word processing and multimedia presentation tools in developing their projects. | Students in two different conditions developed projects about factors that precipitated the American Revolutionary War. Each student contributed to the construction and presentation of a group report. | Analysis of students' knowledge revealed a substantial improvement in both conditions after the completion of the projects. There was not a difference between the groups. |

Table 2. Project-Based Learning

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Okolo & Ferretti (1996b) | *N* = 65<br>*N* = 21 (LD)<br>N = 1 (SLP)<br>*N* = 43 (Regular Ed.)<br><br>4th grade (ES) World History | The groups were allowed to use a computer with a CD-ROM drive, color scanner, printer, and *HyperAuthor*, a multimedia authoring system. | Students with LD worked cooperatively with non-LD students to develop multimedia projects about the advantages and disadvantages of industrialization. | Students' knowledge and attitudes generally improved as a consequence of multimedia design projects based on a pre and posttest as well as a scale for self-efficacy and motivation. |
| Okolo & Ferretti (1998) | *N* = 33<br>*N* = 11<br>(Mild Disabilities)<br>*N* = 22 (Regular Ed.)<br><br>6th grade (MS) World History | Develop a multimedia presentation using multimedia authoring tools, which enable them to combine text with scanned pictures, digitized video clips, and sounds or music. | Uses project-based learning units to examine controversial topics from the social studies curriculum. Students work in heterogeneous cooperative-learning groups to develop a multimedia presentation that demonstrates what they have learned. | Student knowledge was improved. They also reported interesting shifts in the students' understanding of argumentation and ways to settle disagreements. The discussion was about twice as long as the one those students held a few months earlier. |

Ferretti, MacArthur, and Okolo (2001) examined the effectiveness of a curriculum model, strategy-supported project-based learning (SSPBL), to improve fifth grade students' acquisition of the westward expansion, understanding of historical content and inquiry, and student self-efficacy. This study involved 87 students in an U.S. History class, 28 of the student were diagnosed with having a learning disability. Over eight weeks of 14 lessons, the students were paired into heterogeneous groups to read and interpret evidence to investigate and answer questions relating to the experiences of three emigrant groups, the miners, farmers, and Mormons. The groups then had to ask themselves the following question: "Should these emigrants have gone west? When the students were given the use of technology to create presentations as an intervention, all students showed gains in knowledge about the time period studied, a better understanding of historical content and inquiry and improvements in their self-efficacy as learners.

Glaser, Rieth, Kinzer, Colburn, & Peter (2000) investigated the effects of using a multimedia-based anchored instruction in an 8$^{th}$ grade social studies classroom. A total of 18 students participated in the study, including 10 with mild disabilities. The study consisted of four phases of which all students participated. Phase 1 required the students watching a video anchor as a large group. The students then began Phase 2 by dividing the video into segments to retell and discuss as a group. Phase 3 involved dividing the students into groups in which they would examine one character from the video. Finally, Phase 4 required the students to develop research questions pertaining to the group discussions and create a multimedia presentation using HyperStudio to illustrate their knowledge and acquisition of the subject area. The researchers discovered that using a project-based teaching method improved teacher-to-student learning

interactions and promoted an atmosphere of highly-engaged students that significantly retained the information learned.

Okolo and Ferretti (1996a) investigated the effects of a word processing and multimedia condition to develop projects related to factors that precipitated the American Revolutionary War. The study was conducted with a middle school U.S. History class and the duration was 60 minutes for each session over a 10 day period. Of the 63 participants, 18 students were diagnosed with a learning disability and the remaining 45 students were non-disabled. The researchers analyzed the use of MacWrite II word processing software alone and the word processing software complemented with Media Text multimedia presentation software. Analysis of students' knowledge revealed a substantial improvement in both conditions after the completion of the projects. There was not significant difference between the two groups and this was attributed to both activities involving technology and being similar in nature.

Okolo and Ferretti (1996b) examined the effects of a multimedia project-based learning activity to develop projects concerning the advantages and disadvantages of the industrialization. This study involved two elementary school classrooms. Room A researched the advantages of industrialization and contained a total of 35 students, 10 students diagnosed with a learning disability. Room B researched the disadvantages to industrialization and consisted of 35 students, 11 diagnosed with a learning disability. The 25 sessions were extended out over a two month time span and ranged in duration from 60 to 90 minutes in length. The students were directed to work in cooperative groups using HyperAuthor cards to create a presentation to be presented in front of the other class. The researchers found that project-based learning allowed the students with disabilities to be an equal partner in the contribution of research and design activities. This

further increased the students' motivation and self-efficacy to want to learn and participate in technology-centered activities.

Okolo and Ferretti (1998) conducted a similar study exploring a controversial topic involving Spanish colonization with 33 sixth grade students in an inclusive classroom, 11 of the students have a mild disability. The students worked in cooperative groups to research, design, and present a multimedia project with multimedia authoring tools, which enabled them to combine text with scanned pictures, digitized video clips, and sounds or music. When using project-based learning with technology, the researchers found that the students' revealed a substantial improvement in knowledge of the subject. The students with disabilities also showed an increase in participation in classroom and small group discussion. An unexpected result of the study was that the students learned the appropriate way to have disagreements within a group and to settle the dispute in order to develop and complete a cooperative project.

Table 2 provides a synthesis of the general areas of intervention research using project-based learning in social studies instruction for students with learning disabilities, remedial students, and regular education students. Two of the studies (Okolo and Ferretti, 1996a; Okolo and Ferretti,1996b) employed a group experimental research design, while one study (Glaser, Rieth, Kinzer, Colburn, & Peter, 2000) used a single-subject A-B design. The duration of the project-based learning studies ranged from ten 60-minute instructional periods to a year-long study involving 64 instructional periods lasting from 55 to 75 minutes each.

*Computerized Map Tutorial*

Technology in academics has the ability to enhance and enrich teaching and learning within content areas. No longer are teachers relegated to always being the leader of the classroom while students regurgitate the information presented to them. Technology now allows

teachers to become facilitators, supporting students while the students themselves take an active role in their learning. Through creative software and interactive media tools, teachers can develop meaningful lessons that are computer-based and student-driven. In the subject area of social studies, students often have difficulty memorizing various countries, states, and capitals, which in turn affects their understanding of relationships between historical events and people. Two studies examined the use of computerized map tutorials to teach geographical locations to students with learning disabilities and remedial students enrolled in world geography classes (Table 3). One study compared a computerized map tutorial with a traditional work map activity using an atlas to reference and transcribe 28 major cities in Asia (Horton, Lovitt, & Slocum, 1988). In another investigation, using a pre-post design, Gleason, Carnine, and Vala (1991) compared the effects of two versions (cumulative versus rapid) of an instructional software program to teach students to identify the seven countries of Central America.

Horton, Lovitt, and Slocum (1988) analyzed the effects that using a computer would have on retention of locations compared to only using an atlas. Using a group design, the researchers used two instructional methods for teaching the geographical locations of twenty-one cities in Asia to twelve students with learning disabilities and fifteen remedial students in two ninth grade world geography classroom. One method used a computerized map tutorial to assist students in locating city with the corresponding location and country. On the screen, an arrow would point to a city location and the name of the city would also appear. The arrow would then be removed and a box would appear to the right of the map with the name of the city. The student would be required to recall the location of that city and move the cursor to the city location. If the student was correct, the tutorial would continue with another city. If the student was incorrect, the tutorial would begin again at the presentation of the location and name of that city. This

Table 3. Computerized Map Tutorial

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Horton, Lovitt, & Slocum (1988) | *N* = 27<br>*N* = 15 (Remedial)<br>*N* = 12 (LD)<br><br>9th grade (HS)<br>World Geography | Computerized Map Tutorial<br>vs.<br>Atlas on paper. | Students were compared on the effectiveness of using a computerized map tutorial compared to only using an atlas on paper to help them study for a test. An analysis of one pretest and two posttests between two conditions including one group using only an atlas and the other using a computerized map tutorial. | The mean posttest performance favored the computerized map tutorial over the atlas condition for all students. LS students averaged 85% correct using the computerized map tutorial compared to 19% correct for the atlas. |
| Gleason, Carnine, & Vala (1991) | *N* = 47<br>*N* = 29 (LD)<br>*N* = 3 (Remedial)<br>*N* = 15 (Regular Ed.)<br><br>ES & MS<br>World History/ Geography | Two versions of a Computer-Assisted Instruction Program<br><br>Rapid Introduction Group<br><br>vs.<br><br>Cumulative Introduction Group. | Students were compared on the effectiveness of using a computer-assisted instruction program with students receiving up to seven pieces of information at a time compared to students receiving smaller chunks of information at a time. The study was composed of a pre, post, and maintenance test. | The students in the cumulative group spent 1/3 the time, required fewer responses, showed less frustration, and made fewer errors than the students receiving the information in larger segments. |

intervention was compared to students using a method which involved only a paper atlas. In this method, the students located 14 cities on a map and wrote the names of the cities on the atlas in the correct location. The students were asked to cover up the names on the maps to see if they could recall them as a way to study for a quiz. The study found that students with learning disabilities using the computerized amp tutorial averaged an 85% correct on the test to locate countries and capitals compared to 19% correct for those students only using an atlas on paper to study.

Gleason, Carnine, and Vala (1991) used computerized map tutorials to determine how much information ninety students with mild disabilities could handle being presented to them at one time. The study's goal was to decide which method helped students learn the seven countries of Central America in the most beneficial manner. In this study, one group of students used a rapid-introduction group which presented information in large chunks of seven pieces of information. Questions about each of the seven countries came right after each other even if students were not answering the questions correctly. The students would not return to a country once that country had been introduced. The other group received information in smaller chunks. The students would be introduced to one country at a time and a new country would not be introduced until a student answered a certain amount of questions correct. As a new country would be added and mastered, questions regarding previous countries would be presented as well. Although both groups worked to mastery level, the group receiving the smaller chunks of information spent one-third the time as the other group reaching mastery, showed less frustration, and made fewer errors. All groups involved with the computerized map tutorial were able to master the content compared to those using paper and pen methods. It is interesting to

note that students with mild disabilities require the information to be presented to them in smaller chunks, which enables them to master the information more efficiently.

Table 3 provides an account of the general areas of intervention research using computerized map tutorials in social studies instruction for students with learning disabilities, remedial students, and regular education students. The study by Horton, Lovitt, and Slocum (1988) was a group design study in which two classes were involved using two treatments. Each group was administered pretest and a posttest, one for each treatment. The posttest was the same as the pretest except the four best known cities were deleted. The Gleason, Carnine, and Vala (1991) study included students that were screened and then stratified by sex, age, and grade level. The students were then randomly divided into two different treatment groups. Even though the intervention involved a computer program, all pre-, post- and maintenance tests were administered on paper. The duration of the Horton, Lovitt, and Slocum (1988) study lasted only for one day at an interval of 30 minutes for the intervention and fifteen minutes for the posttest. Information regarding the length of time allowed for the pretest and if it was administered on the same day was not provided. As in the previous study, students participating in the computerized map tutorial designed by Gleason, Carnine, and Vala (1991) was only exposed to the treatment in one session that lasted anywhere from ten to sixty minutes depending on how long it took a student to achieve mastery.

*Cognitive Organizers*

The use of cognitive organizers has been applied across the curriculum in a variety of subject areas. Even though reading is the most widely used subject area to utilize cognitive organizers, there is also a growing body of research in other subject areas such as social studies, science, and math. Cognitive organizers are frequently used to assist with note-taking, comparing

and contrasting concepts, organizing problems and solutions, map cause and effect, and identifying relationships between ideas and concepts. They can be used prior to learning new information as a way to facilitate prior knowledge and introduce a task (Boyle & Weishaar, 1997) or they can be used after the student has learned the information as a way to comprehend and retain information (Boyle & Weishaar, 1997; Gardill & Jitendra, 1999). Three studies examined the effects of using cognitive organizers on students' comprehension and retention of knowledge for students with and without learning disabilities (Boyle, 1996; Boyle & Weishaar, 1997; Gardill & Jitendra, 1999) (Table 4).

The most widely noted impact cognitive organizers have on student learning is increased comprehension. Boyle (1996) assessed the results of using a cognitive organizer on the literal and the inferential reading comprehension of narrative passages by 15 middle school students with mild disabilities and poor reading comprehension skills. These students were taught how to independently create cognitive maps based on given reading passages. Compared to a matched control group, the students using the cognitive organizer strategy increased substantially on posttests on both literal and inferential comprehension measures.

A further study by Boyle and Weishaar (1997) researched whether 39 high school students with mild disabilities and poor reading comprehension skills could independently create effective cognitive maps to assist themselves with independent reading. The study compared the effects of cognitive mapping to expert-generated and no-mapping conditions. The results indicated that those students that used maps performed significantly better on measures of literal comprehension than students who did not. Students who created their own maps performed better on questions involving inferential comprehension as well.

Table 4. Cognitive Organizers

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Boyle (1996) | *N* = 15 (LD) | Student-generated cognitive mapping<br>vs.<br>No-mapping conditions | Students independently created cognitive maps based on given reading passages. The other group was a control group. | The students who learned to use the cognitive mapping strategy increased both their literal and their inferential comprehension. |
| Boyle & Weishaar (1997) | *N* = 39<br>(Mild Disabilities) | Expert-generated cognitive mapping<br>vs.<br>No-mapping conditions | One groups of students used cognitive maps that were created by the teacher. The other group created the maps independently. | The results indicated that students could independently create maps to assist themselves with independent reading activities. Those students that used maps performed significantly better on measures of literal comprehension than students who did not. Students who created their own maps performed better on questions involving inferential comprehension. |

Table 4. Cognitive Organizers

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Gardill & Jitendra (1999) | *N* = 6 (LD)<br><br>Middle School | Direct instruction of an advanced story map procedure on reading comprehension | After the teacher modeled how to complete a story map, the students were grouped in pairs over a 14-20 peek time period to create their own maps based on given stories. | The results from the study indicated a significant increase in story grammar and basal comprehension performance by all six students from baseline to the independent phase condition of the intervention. |

Gardill and Jitendra (1999) worked with six middle school students with learning disabilities to investigate the effectiveness of direct instruction of an advanced story map procedure on reading comprehension. After the teacher modeled how to complete a story map, the students were grouped in pairs over a 14-20 peek time period to create their own maps based on given stories. The results from the study indicated a significant increase in story grammar and basal comprehension performance by all six students from baseline to the independent phase condition of the intervention.

Each of these studies indicates that the use of cognitive organizers is an effective tool for increasing content comprehension. Cognitive organizers are a type of learning strategy that has proven to be effective despite the grade level, content area, or type of student. If coupled with technology, the results of using cognitive organizers may prove to provide another powerful strategy for students with mild disabilities by allowing them to be mainstreamed in the general education curriculum and have the tools necessary to comprehend, retain, and generalize the information learned.

*Inspiration 6 Software*

To make cognitive organizers more effective, companies have begun to develop software that aids students in designing and organizing the graphics with little ease. Inspiration 6 is one example of software that uses cognitive organizers to promote visual learning, strengthen critical thinking, and increase comprehension across the curriculum (Inspiration Software, Inc., 2000). It is used to assist students in building cognitive organizers that represent concepts that they are learning and further their understanding of relationships between ideas.

More recently, a growing body of research has been conducted using Inspiration software to design interventions (Table 5). The software enables the user to design and construct

Table 5. Inspiration Software

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Blankenship, Ayers, & Langone (2005) | *N* = 3<br>*N* = 3 (EBD)<br><br>HS World History | Cognitive Organizer using Inspiration software. | Students developed concept maps using Inspiration to comprehend content area material from independent reading. | The results indicated that all three students performed to criterion on dependent measures of mastery of content material. |
| Boon, Fore, Ayers, & Spencer (2005) | *N* = 10<br>*N* = 8 (LD)<br>*N* = 1 (EBD)<br>*N* = 1 (MR)<br><br>HS World History | Cognitive Organizer using Inspiration software. | Students completed a blank organizer as the teacher completed one on the overhead as she presented the lesson. The students then transferred the organizer to the Inspiration software. | The results indicated that a significant improvement was noted from pretest to posttest for recall and comprehension of social studies facts. |

Table 5. Inspiration Software

| Citation | Participants | Intervention | Procedures | Results |
|---|---|---|---|---|
| Boon, Burke, Fore, & Spencer (2006) | *N* = 49<br>*N* = 12 (LD)<br>*N* = 8 (EBD)<br>*N* = 29 (Regular Ed.)<br>HS World History/ Geography | Cognitive organizer using Inspiration software. | Students were compared on the effects of using a cognitive organizer w/ Inspiration software versus a guided notes instruction format. | The results indicated that the use of cognitive organizers significantly improved content learning for both students with and without disabilities from pre- to posttest measures. |
| Boon, Burke, Fore, & Hagan-Burke (2006) | *N* = 44<br>*N* = 12 (LD)<br>*N* = 6 (EBD)<br>*N* = 26 (Regular Ed.)<br>HS World History/ Geography | Cognitive Organizer using Inspiration software. | (Same as Boon et al., 2006). | (Same as Boon et al., 2006). |

visual displays that can be used to organize content. Moreover, the program allows for the conversion of content material to be integrated with graphics and formatted as an outline. Four studies examined the use of concept mapping using Inspiration software to investigate the effects of electronic technologies to support, foster, and assess student learning (Blankenship, Ayres, & Langone, 2005; Boon, Burke, Fore, & Hagan-Burke, 2006; Boon, Burke, Fore, & Spencer, 2006; Boon, Fore, Ayres, & Spencer, 2005). Inspiration software was used to organize information, elaborate on ideas, study a textbook, outline notes, synthesize materials, and provide individual/group reflections.

Blankenship, Ayres, and Langone (2005) investigated using Inspiration software to increase content-area learning in a world history self-contained class on three students with emotional and behavioral disorders. Using a multiple-probe design across behaviors, the students were required to individually create a cognitive organizer based on a given reading selection using computer software. The study found that each of the students showed an increase in retention and comprehension of the content-area information.

The second study by Boon, Fore, Ayers, and Spencer (2005) evaluated how a teacher-developed cognitive organizer impacted student achievement. The participants included 10 tenth grade students with mild disabilities in a resource setting. The teacher modeled how to complete the organizer on the overhead while the students copied the information onto paper. The students then developed their organizer using Inspiration software in the computer lab. The results from subsequent assessments showed that the students significantly improved and retained the information.

In a recent study, Boon, Burke, Fore, and Spencer (2006) successfully integrated what is known about effective technology-based instruction with findings of effective content

enhancement strategy instruction. Boon et al. (2006) found significant differences and a moderate effect size using cognitive organizers to increase student performance of literal social studies knowledge. In this study they allowed the students to create their own cognitive organizer as the teacher lectured and then transferred that information to the Inspiration software. Again, the results indicated that the students that created cognitive organizers using the Inspiration software outperformed those students in a traditional textbook and worksheet condition.

A replication study was conducted by Boon, Burke, Fore, and Hagan-Burke (2006) to bolster these results by using the control group from the previous study (Boon, Burke, Fore, & Spencer, 2006), as the treatment group in this subsequent study and vice versa. The procedures in this study were the same as the previous study (Boon et al., 2006); however, the chapter in the social studies textbook contained different social studies content-area material. Again, the results demonstrated higher levels of achievement for students in the cognitive organizer with the Inspiration 6 software condition compared to students taught using a guided notes format as part of the traditional instruction. These results further indicate that the use of computerized cognitive organizers, through Inspiration 6 software, is a viable aid for students in acquisition of social studies content-area material, particularly for students with disabilities in inclusive high school social studies classrooms.

The purpose of this current study is to provide a systematic replication of the previous study by Boon, Burke, Fore, and Hagan-Burke (2006) that focused on improving content knowledge for students in inclusive social studies classrooms. In the Boon et al. (2006) study, the primary research question was focused on examining the relationship between cognitive organizers and traditional textbook instruction to facilitate literal social studies knowledge. This

study attempts to strengthen and extend the findings to examine the effects of cognitive organizers and traditional textbook instruction.

# CHAPTER 3

# METHODS OF THE STUDY

## Methods

### *Participants*

*Description*. The purpose of this study was to determine if graphic organizers created based on a teacher's lecture enhance a student's ability to perform on a comprehension quiz compared to a teacher's lecture and independent reading of a passage. In order to participate in this study, the students had to exhibit the need for interventions as evidenced by achievement scores below grade level.

Student participants were selected from classes taught by a special education resource teacher who taught 10$^{th}$ grade technical world history for students in special education. All student participants enrolled in the world history course were expected to follow the general education curriculum set forth by Gwinnett County Public Schools. Enrollment in a resource world history class indicated that the students needed more direct instruction and interventions than the college preparatory full-inclusion classroom could offer. All student participants were working toward earning a general education diploma.

Four students identified with learning disabilities (LD) were invited to participate in the study. These students received special education services for at least three academic classes daily and attended general education classes for the remainder of their school day. Each student participant met the following established criteria to be included in the study: (1) identified with a

learning disability as diagnosed by the school district, (2) an intelligence quotient (IQ) score on the Wechsler Intelligence Scale for Children-Revised (WISC-R) or the Woodcock Johnson III Cognitive (WJIII COG) between 80 and 115, (3) achievement scores at least 2 years below grade level in one or more academic areas, and (4) absence of any other disabling condition. The only other criteria for participation was regular class attendance, parental consent, and student assent.

All IQ assessments were administered by a school psychologist within the past 4 years and were obtained from school records. The WISC-R and/or the WJIII COG were used as measures of intelligence. Achievement scores were based on results from Woodcock-Johnson III Achievement (WJIII ACH) subtest of reading comprehension (RC), letter-word identification (LWI), and writing samples (WS). The standard scores for these subtests have a mean of 10 and a standard deviation of 3. School personnel administered these achievement tests within the past year. A summary of the characteristics for the participants is provided in Table 6.

Table 6. Student Participant Characteristics

| *Student* | Disability | Age | Sex | Race | *IQ*[a] | *WJIII*[b] *RC* | *WJIII*[b] *LWI* | *WJIII*[b] *WS* |
|---|---|---|---|---|---|---|---|---|
| Analy | SLD | 16.8 | F | H | 110 | 65 | 82 | 84 |
| Scott | SLD | 16.5 | M | C | 93 | 89 | 84 | 86 |
| DeAngelo | SLD | 17.4 | M | AA | 80 | 72 | 76 | 72 |
| Gabe | SLD | 15.3 | M | AA | 98 | 67 | 76 | 88 |

[a] Full scale IQ score on the Wechsler Intelligence Scale-Revised or Woodcock-Johnson III COG.
[b] Standard Score for the subtests of the Woodcock-Johnson III ACH for reading comprehension (RC), letter-word identification (LWI), and writing samples (WS).

Of the four participants, one was female and three were male. One participant was Caucasian, one Hispanic, and two African American. The study participants' racial composition was more diverse than the school's demographics; however, there were no students from the Asian ethnic group in the classroom that met the criteria for participant selection. All four participants were in the 10th grade for the first time. The mean chronological age at the time of the study was 16.5 years (range = 15.3 to 17.4). The mean IQ score was 95.3 (range = 80 to 110). The mean standard score on the WJIII ACH subtest of reading comprehension was 73.3 (range = 65 to 89), letter-word identification was 79.5 (range = 76 to 82), and writing samples was 82.5 (range = 72 to 88). For all participants, writing performance was delayed by at least 2 years.

*Prerequisites and exclusions*. Potential participants were excluded from the study if they did not have parental permission to participate or if they themselves chose not to participate. The setting for the study was a world history classroom and the school computer lab. The teacher, researcher, parent, and student had the opportunity at any time during the study to exclude the student from the study if they felt that the time spent on this study could be used for other interventions or programs which were in place within the classroom environment. This issue was not a concern since the study followed the Academic Knowledge and Skills (AKS) as outlined by the Gwinnett County School Board and was material that the students were expected to master. A signed informed consent form detailing all procedures was required from both the parent and student prior to the onset of the study. At any time during the study, parents and/or the student had the choice to be excluded from the study.

Students who exhibited a history of chronic absenteeism from school were excluded from the study. Attendance records for each student were reviewed at the beginning of the semester prior to onset of the study. In order to be considered to participate in the study, the

students had to have been in attendance at least 85% of school days for the second semester of the previous school year.

Each student in the study was required to have a basic understanding of computer use as evidenced by the questionnaire the students completed (Appendix A). Of the four students, three had either completed a word processing class or were taking that course at the time of the study. The remaining student indicated on the questionnaire that they had frequent use of typing skills from either experience at home or in other classroom settings. Although each student appeared to have had competent computer skills, a one day training session occurred to ensure the students were capable of using the Inspiration 6 software. Further instruction was not needed, but planned for by the researcher in case additional training was necessary.

*Teacher participants.* One high school special education teacher who was the regularly assigned teacher for the social studies class participated in this study. The high school teacher was certified in both special education and world history. After teaching world history in the regular education setting for nine years, the teacher added special education certification and was completing his second year teaching in a resource setting. The researcher assisted the classroom teacher with the study. The researcher had taught for six years at the high school in which the study occurred and 10 years total. She held a bachelor's degree in social studies education and a master's degree in special education. The current classroom teacher was responsible for teaching the social studies content material. In the cognitive organizer condition, the researcher monitored the cognitive organizer intervention phase in the computer lab and assessed the students on their knowledge of the topic after each cognitive organizer had been completed.

*Setting*

The study occurred in a large suburban high school located in the Southeastern part of the United States. The school's population of 2,798 students represents a diverse range of races and cultures. Based on the school's accountability report of 2004, the school population consisted of 8% Asian, 9% African American, 7% Hispanic, 2% Multiracial and 73% Caucasian (Accountability Report Issued 2004-05). 10% of the total school population received a free or reduced lunch and 82% of the 528 graduates planned to attend a post-secondary institution. 68% of the teachers at this school had a Master's level of certification or higher. Two hundred fifty-two of the 2,798 students received special education services. Ninety-two of the 252 students were identified as LD, 32 had a mild mental disability, 9 had moderate/severe mental disabilities, 51 exhibited emotional/behavioral disorders, and 68 were identified as having other health impairments. Some of the students were integrated into regular education through an inclusion model for their academic classes. Other students, like the participants in this study, received academic instruction in special education resource programs.

The study was conducted in two locations, the special education resource room and the school's computer lab. The resource room was the teacher's current classroom and was 30 x 40 feet in size. It included four rows of three student desks, a small table for small group instruction, a teacher file cabinet, bookshelf, and two teacher desks. The computer lab was located in the same building and hallway as the classroom. The size of the lab was 60 x 50 and contained 30 lab stations in four rows. The teacher-lecture occurred in the resource classroom and each student was assigned a student desk. The cognitive organizer intervention occurred in the computer lab and again, each student was assigned a specific computer station. The students who remained in baseline for a longer period of time stayed in the resource classroom with the special

education teacher, while the researcher took those students who had begun the intervention phase to the computer lab. If all students were in the intervention stage, both the special education teacher and researcher were in the computer lab.

*Materials*

*Reading selections*. The tenth grade textbook, *World History: The Human Experience* (Glencoe/McGraw-Hill, 1999) was used for this study. This textbook had previously been approved through a textbook adoption committee selection within the past six years as appropriate for this subject area. Approximately 19 reading selections of the world history textbook were used in this study. The baseline phase began on Chapter 1 in the textbook, as that was the chapter in which the students were studying at the time based on the scope and sequence of the world history class and the teacher's lesson plans. The order in which the selections were presented to the students was based on the order in which they occurred in the textbook. All reading selections were works of non-fiction. They averaged in length from three to six pages and varied from 500-750 words in length.

The readability levels of all selections were calculated using the Power-Summer-Kearl Readability Formula. This calculation was based on the average sentence length and the number of syllables in individual words. The readability level of the selections was from a grade level of 5.4 to a 6.4 grade level. Each participant in the study had a reading level that fell above the lowest readability level of a selection as previously mentioned in the participant description section.

*Instructional activities*. The study commenced with the classroom teacher presenting new information in the form of a lecture to the students. This lecture was based on a reading selection

in the world history text. Teacher materials for the lecture included lesson plans for introducing the purpose and objective of the given topic, PowerPoint presentations, handouts, and video clips. Samples of these materials are illustrated in Appendix B.

Student materials consisted of self-generated notes and review activities. The self-generated notes were created based on the teacher's lecture and guidance was provided by the teacher as to important information that should be included. The review activities were obtained from the text and supplemental workbooks that coincided with the lesson for the day. These activities consisted of defining vocabulary highlighted in the chapter, sequencing events and making predictions, and answering critical thinking and comprehension questions.

*Cognitive organizer*. During the intervention phase, the students utilized self-generated notes, their textbook, and a desktop computer to develop a computer cognitive organizer. The computer software Inspiration 6, especially designed for generating computer cognitive organizers, was used by the students.

*Comprehension quiz*. The comprehension quizzes were designed to evaluate the students' understanding of each reading selection in the world history textbook that was used as part of this study (Appendix C). Each quiz consisted of twelve multiple choice questions with four choices from which to choose the correct answer. The quiz was comprised of questions that asked six literal questions about vocabulary, events, famous people, or important cultural aspects of a civilization and six inferential questions which required the students to draw a conclusion or make a logical judgment. All comprehension quizzes were approximately one to two pages long, front-back when typed in 12 point font and double spaced between questions. The students answered the questions using either a pencil or pen.

In order to ensure that each student fully participated in the study, each student's score from the comprehension quizzes was used as a classroom daily grade and was calculated as part of their overall grade for the class.

*Experimental Design and Procedures*

*Overview.* A multiple baseline design across four participants was used in this study (Tawney & Gast, 1984). This type of design allowed the researcher to examine student performance of comprehension skills as the intervention was applied.

*Baseline.* The participants in the class all began in the baseline phase. The independent variable was first applied to the student participant with the most stable baseline after at least three reading selections were covered and comprehension quizzes administered. After a stable intervention effect was demonstrated by the first student, the intervention was applied to another student with a stable baseline. This continued until all students were in the intervention phase of the study.

On the first day of baseline, the students met in the resource classroom and were introduced to the next reading selection in the world history textbook. Lesson plans included a daily review, statement of the purpose, and presentation of information. The teacher lecture lasted for 45 minutes, and students were encouraged to follow along in their texts. As the teacher presented the lesson, the students were provided a piece of blank paper and a pencil/pen for them to take notes independently during the teacher's presentation. During the presentation, with the help of the teacher, the students chose the important points to be added to their notes. Throughout the presentation, the teacher reviewed the content and asked students questions regarding specific attributes of the section to verify that the students understood the information.

On the second day of baseline, the teacher began by reviewing the content material from the previous day for five minutes. After the completion of the review, the students were required to answer questions at the end of the section and define the vocabulary words highlighted in the section. The students had 30 minutes to complete the independent practice. An example of questions at the end of a section can be found in Appendix D.

Upon completion of the independent practice, the students were administered the 12-item quiz. While taking the quiz, the students did not have access to their notes or questions from the section they had just completed. The students had 15 minutes in which to answer the questions on the comprehension quiz. They simply wrote the appropriate letter (A, B, C, or D) on the blank provided, which corresponded to the response they believed to be the correct answer. At the end of the 15 minutes, the researcher collected the quizzes.

*Intervention*. Students met independently in the computer lab to be trained in the various functions of the Inspiration 6 software on the first day of the intervention phase. They were provided a disk containing a template consisting of three major league baseball teams. Using this template, the teacher demonstrated how to insert text into the software and model some of the functions and features on the screen using a LCD projector. Then, after the students independently completed the outline, the teacher demonstrated how to convert the outline into a cognitive organizer by selecting the diagram icon on the menu panel. After the students converted their outline into a cognitive organizer, the teacher demonstrated additional features of the software such as how to highlight text, insert images or graphics, menus to change backgrounds, and other templates available in the software. Finally, the teacher reviewed the cognitive organizer and asked the students to identify specific relationships within the cognitive organizer.

The second day of the intervention phase was the same for those students in the baseline phase who heard the teacher lecture on a reading selection from the world history text. The students who received the intervention met in the resource classroom and followed the same protocol as those students in baseline including taking self-generated notes.

On the third day of the intervention phase, the teacher began by reviewing the content material from the previous day for five minutes. After the completion of the review, the students in this phase relocated to computer lab. They then had 30 minutes to create a cognitive organizer using their self-generated notes from the previous day and the textbook to add any additional information that they found useful. At the end of the 30 minute timeframe, the students were required to print out and view one copy of their cognitive organizer. Examples of the student-produced cognitive organizers can be found in Appendix E-H. Upon completion of the cognitive organizer, the students were administered the 12-item comprehension quiz. While taking the quiz, the students did not have access to their notes, text, or cognitive organizer. The students had 15 minutes in which to answer the questions on the comprehension quiz. They simply wrote the letter on the blank which corresponded with the choice they believed to be the correct answer. At the end of the 15 minutes, the researcher collected the quizzes.

*Maintenance*. Three maintenance probes were administered weekly for three weeks after the intervention phase was completed. Each probe included one day of teacher lecture and note-taking and one day of creating a cognitive organizer.

The goal of cognitive strategy instruction was to not only apply the strategy during class when prompted, but to effectively use it in the future and across settings and subject matter.

After the strategy instruction was taught and mastered, the teacher explained how it could be generalized to other classes.

*Data collection*. The researcher used data collection sheets to note the phase, date, session, and comprehension quiz score for each day of the study (Appendix I). Data was collected using the comprehension quiz as the dependent measure in order to assess the students' attainment of world history facts based from the teacher's lecture and either independent practice or the creation of a cognitive organizer. Data was collected in the same manner for both the baseline and intervention phases. The study consisted of a two-day process, one day for lecture and one day for either independent reading or the intervention. At the end of the second day, each student was required to take the comprehension quiz. A key for each quiz was provided to the teacher and researcher at the onset of the study. Each day the quiz was administered, the researcher recorded the percent correct score of each student on an individual data collection sheet. The researcher also conducted a secondary analysis to chart data to depict how students performed on the inferential versus the literal comprehension questions which were asked on the quiz.

*Reliability*

*Inter-rater agreement*. All data was collected, graphed, and analyzed by the researcher. Measures were awarded points from zero to one for each item. A score of "zero" was represented as no credit, a score of "one" was registered as full credit. The researcher recorded each student's quiz as percent correct on a data sheet provided as a means of collecting the data (Appendix I). While the researcher was responsible for scoring each quiz during the study, the classroom teacher also randomly scored 20% of the quizzes after the researcher as a way to measure the reliability of the dependent variable scoring procedure. These quizzes were scored separately by

the researcher and the teacher. Reliability was calculated by dividing the number of agreements by the sum of agreements plus disagreements. If there had been a discrepancy noted between the researcher and the classroom teacher, the quiz would have been rescored by both in order for 100% agreement to be achieved. The agreed upon score was to be entered as the final score for data collection purposes. The reliability levels were found to be 100 percent accurate; that is a total agreement between teacher and the researcher.

*Validity*

*Internal validity.* The use of a multiple baseline design was intended to reduce the threats to internal validity. First, the selection of the students was carefully determined to ensure the participants were cognitively and academically similar in order for the results to not be skewed by the difference of ability. The students were also similar in age and had never taken a world history course before. Secondly, maturation was not a threat because the students covered the same material at the same time. The study only lasted 19 sessions and was not a significant period in which the students drastically changed or became fatigued with the intervention. Next, testing did not pose a threat to the validity of the study as the students were reinforced by the fact that they were graded on their performance on the quizzes. Last, since the instrument being used to collect data was a multiple choice quiz, experimental bias was not a threat to internal validity.

*Procedural validity*. To ensure the exact replication of instructions for each student, the researcher followed a procedural protocol checklist while training each student on how to correctly use the Inspiration 6 software to create a cognitive organizer on the first day of intervention (Appendix J). As each student entered the intervention phase of the study, the researcher trained the student individually on how to correctly use the Inspiration 6 software to create a cognitive organizer. Each step of the procedure was outlined for the researcher to ensure

the exact replication of instructions for each student. The classroom teacher was instructed in observational procedures to verify the researcher followed the checklist for each student. Procedural reliability was calculated by dividing the occurrence of researcher behaviors by the expected behaviors and multiplying by 100. Procedural reliability was determined to be 100% suggesting that research procedures were followed consistently across participants. The specific breakdown of procedural components with reliability percentages is displayed in Table 7.

*External validity.* The student participants in the study were not chosen by random sampling and could be a limitation to the external validity of the study. The students were chosen, however, based on the availability of the students to the researcher. Since this study is a multiple baseline design, students were not assigned to conditions as they received the same intervention, materials, and teacher direction. All students received instruction in the same instructional setting and received equal time periods of instruction.

*Social validity*. The classroom teacher was asked to complete a questionnaire for each student at the end of the study (Appendix K). The purpose of the questionnaire was to gather additional data on the social validity of the computerized cognitive organizer. The questionnaire consisted of five open-ended questions specifically addressing what the classroom teacher felt the students were able to achieve from the study.

The first two questions asked the classroom teacher if they found using the cognitive organizer was helpful to students and if they noticed an increase in the students' comprehension quiz scores. This question was designed to measure the social importance of the goals of intervention. The following two questions asked the classroom teacher to specify what examples the students liked and disliked about using the cognitive organizer. These questions probed to ascertain the social acceptability of the intervention. The remaining question asked if the

Table 7. Procedural Reliability per Component.

| Procedural Component | Reliability Percentages |
|---|---|
| Instruct the student on where to locate and how to open the Inspiration software when beginning the session | 100% |
| Give the student a disk which contains a template for them to use and instruct on how to open it with the Inspiration software | 100% |
| Give directions on how to complete a cognitive organizer using the outline format | 100% |
| Instruct the student on how to convert the outline format into a visual cognitive organizer | 100% |
| Instruct the student on how to create a visual graphic organizer without using the outline format | 100% |
| Instruct the student on how to use the rapid fire feature | 100% |
| Instruct the student on how to add icons to the text | 100% |
| Instruct the student on how to change the color of text, background and outline of the icon | 100% |
| Give the student 10 minutes of independent practice to create a cognitive organizer using the theme of baseball | 100% |
| Keep the student on task during the session | 100% |

classroom teacher would ever plan to use the cognitive organizer as a future teaching method. This last question investigated the social importance of the results of the study based on the teacher's experiences.

The student participants were also asked to complete a questionnaire to further investigate the social validity of using the computerized cognitive organizer (Appendix L). Similar to the teacher questionnaire, the students were asked questions relating to the social importance of the goals to intervention, the social acceptability of the intervention, and the social importance of the results. The student questionnaire consisted of seven open-ended questions, similar in nature to the teacher questionnaire. The additional two questions investigated the students' perceptions on if they would be able to generalize the cognitive organizer to other subjects.

*Data Analysis Procedures*

*Descriptive statistics*. Data collected was analyzed for mean, median, mode, and range for each phase. Further analysis was conducted to examine significant differences between the computerized cognitive organizer and the baseline phase through the visual inspection of data charts. All data was reported for each individual student and across students. In addition, focus was given to how the students performed to individual questions at the literal and inferential level.

# CHAPTER 4

# RESULTS

## The Context of the Study

The purpose of this study was to address the question of whether students retain information better if they use a computerized cognitive organizer or the traditional textbook and lecture instructional format. It was the intent of the study to determine the effectiveness of using the Inspiration 6 software for increasing the social studies achievement of students with learning disabilities by engaging the students in meaningful, learning-oriented curriculum activities using cognitive organizers and technology. Specifically, the focus was on investigating the educational impact of a learning strategy in which students accessed an interactive computer-based resource that takes into account different styles of learning. The secondary analysis evaluated how effective the computerized cognitive organizer was on specific questions at the literal and inferential level. A follow-up was conducted with both the students and classroom teacher to determine if the students benefited from this type of learning as compared to the traditional textbook and lecture format.

## Primary Analysis

### *Intervention Effectiveness*

Over an eleven-week period, students were administered nineteen comprehension quizzes during the baseline, intervention, and maintenance phases and the data are presented in Figure 1.

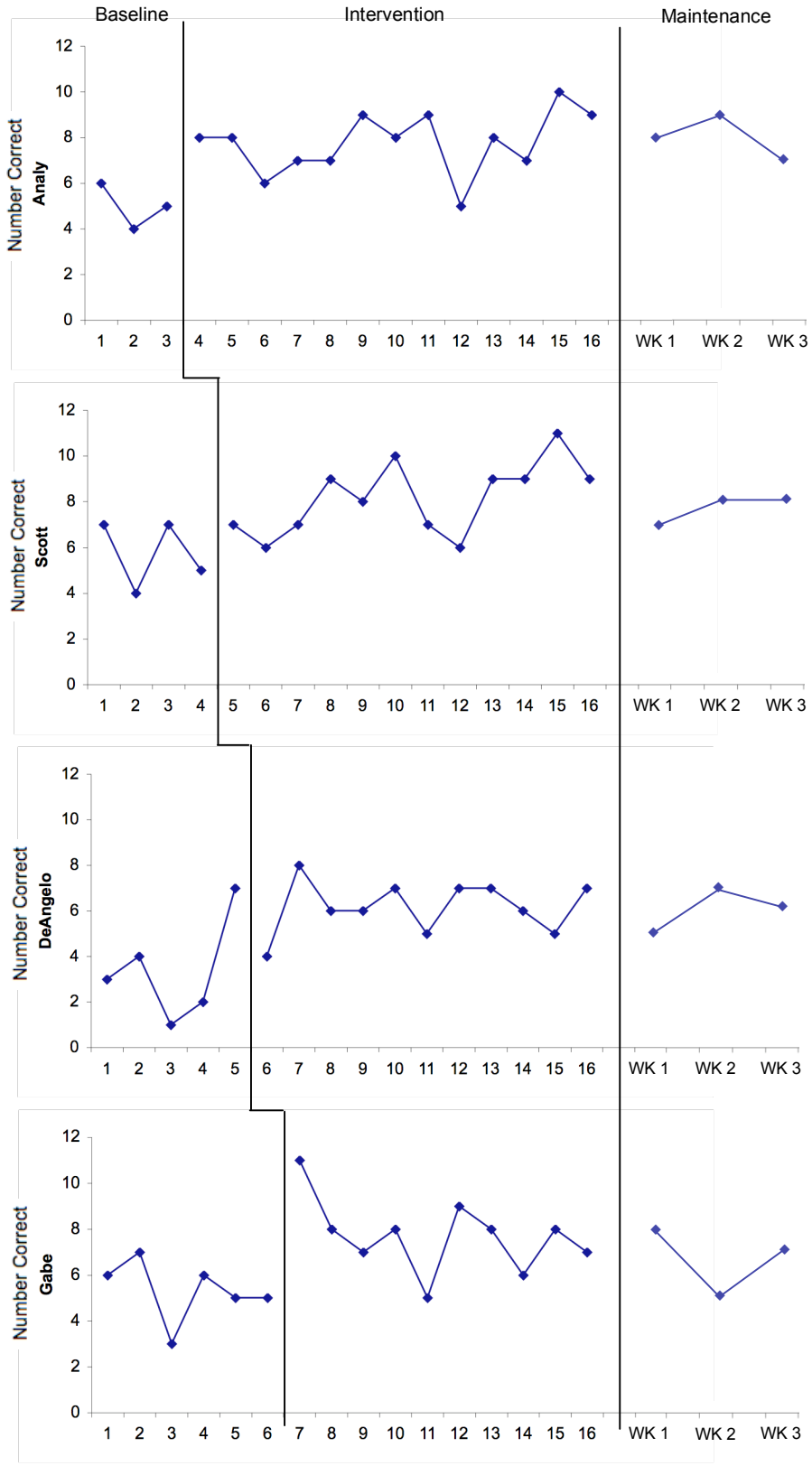


Figure 1: Accuracy Total on Comprehension Quiz

The data indicated that the computerized cognitive organizer was effective for enhancing comprehension quiz scores for every student. The analysis indicated that none of the four students succeeded in the comprehension quizzes during baseline. When all four of the students' scores were averaged, they received a failing grade of 40% accuracy during the baseline phase, as presented in Table 8. This falls 30 points below the passing score expected of students in the technical world history course. The range of accuracy percentages for the students' overall score was from a score of 8% correct to 58% correct, with none of the students' scores reaching a passing level. The classroom teacher confirmed that the students' scores from the baseline phase were consistent with common assessments previously administered at the county level thus verifying that the baseline scores represent an accurate indication of student performance prior to the introduction of the cognitive organizer.

Table 8. Average Percentage of Comprehension Quiz Scores in Each Phase for All Students.

| All Students | Baseline | Intervention | Maintenance |
|---|---|---|---|
| Mean | 40% | 61% | 59% |
| Median | 5 | 7 | 7 |
| Range | 6 | 6 | 4 |

In contrast, intervention scores for all students were demonstrably higher than baseline scores. The mean accuracy percentage improved from 40% correct to 61%, an increase of 21%. The range of accuracy percentages for the students' overall score was from a score of 33% correct to 92% correct, with twelve of the quizzes scoring above a passing grade of 70% correct. Of the

scores that reached a passing level, eight received a grade of "C", two a score of "B", and two received a grade of "A". Therefore, introduction of the cognitive organizer produced a positive change and that further was demonstrated when analyzing all of the students' scores together.

All of the students entered the maintenance phase at the same time and the students were administered three comprehension quizzes over a three week period after the intervention phase had concluded. Similar to the intervention phase, the subsequent maintenance phase was also significant when compared to the baseline phase. During the three week maintenance phase, the students continued to exhibit stable scores nearing the 60% average range. The accuracy of the students' overall score ranged from 41% correct to 75% correct. Compared to the intervention phase, the range of scores began at a higher level by 8 percentage points and was even higher than the average scores during baseline. Although their accuracy level dropped several percentage points from intervention to maintenance, the maintenance data continues to show improvement over baseline. In summary, the use of computerized cognitive organizers proved to be an effective tool in increasing the achievement for students with learning disabilities. Once the cognitive organizer was introduced, an immediate increase was noted across all student participants. The section below presents each student's performance data.

*Analy.* The scores for Analy demonstrated efficacy of the intervention (Figure 1). Analy remained in baseline while the first three quizzes were administered. During the baseline phase, Analy scored an average 41% accuracy on the first three quizzes with a range between 33% and 50% accuracy. All of her scores were well below the score of an acceptable passing grade.

The intervention phase lasted 29 days for Analy. As shown in Figure 1, an increase was noted in accuracy percentages on the comprehension quizzes immediately after the cognitive

organizer was introduced. Analy scored an average of 65% accuracy for the thirteen quizzes she took while in the intervention phase, which was up 24% from the baseline score. The range of accuracy percentages for her overall score was from a low of 42% to a high of 83%. Out of the 13 quizzes administered to Analy during the intervention phase, only two of the scores fell in the same range as the scores during baseline. Four of Analy's quizzes received a grade of 75% or higher, indicating she had mastered the world history concepts.

After 13 sessions in the intervention phase, Analy entered the maintenance phase which consisted of the administration of three comprehensive quizzes over a three week period. Overall, Analy demonstrated a significant increase from baseline to the maintenance phase. She scored an average of 67%, up 26% from the baseline score and two percentage points higher than during intervention. The range of accuracy percentages for her overall score was from a low of 58% to a passing grade of 75%. These results suggest that Analy effectively maintained the skills she had learned during the intervention phase for at least three weeks after the intervention.

*Scott*. Scott's results, as illustrated in Figure 1, demonstrate efficacy of the intervention. Scott remained in baseline while the first four quizzes were administered. During the baseline phase, Scott scored an average 47% accuracy on the first four quizzes with a range between 33% and 58% accuracy. All of his scores were well below the score of an acceptable passing grade.

Scott began the intervention phase for the fifth session and remained in this phase for 26 days. Once the intervention was introduced, Scott experienced a drastic improvement in his comprehension quiz accuracy levels as illustrated in Figure 1. His intervention accuracy mean percentage was calculated to be 68%, a 21 percentage point gain from baseline. The range of accuracy percentages for his overall score was from a low of 50% to a passing grade of 92%. Out

of the twelve quizzes administered to Scott during the intervention phase, only twice did his scores fall below the highest score obtained during baseline. One half of Scott's quizzes during the intervention phase received a grade of 75% accuracy score or higher. He failed to pass any of the five quizzes in the baseline phase.

During maintenance, Scott was able to maintain a higher average of scores compared to baseline; however, the scores were slightly lower than the intervention scores. He scored an average of 64%, up 17% from the baseline score. The range of accuracy percentages for his overall score was from a low of 58% to a high of 66%. Although the scores slightly decreased from intervention, Scott demonstrated a significant increase from baseline to the maintenance phase, confirming that he had effectively maintained the skills he had learned during the intervention phase.

*DeAngelo*. In looking at the results for each independent student scores, the scores for DeAngelo demonstrated efficacy of the intervention (Figure 1). He remained in baseline while the first five quizzes were administered. During the baseline phase, DeAngelo scored an average of 28% accuracy on the first five quizzes with a range between 8% and 58% accuracy. The quiz score of 58% accuracy appears to be an outlier as his next highest score is 33% correct and is more consistent with the other scores. All of his scores were well below the score of an acceptable passing grade.

The intervention phase lasted 23 days for DeAngelo and he was administered 11 comprehension quizzes. Prior to intervention, DeAngelo rarely took notes or studied for quizzes. His comprehension quiz score average was 28% during baseline and was reported by his teacher as a typical score for DeAngelo. As soon as the cognitive organizer was introduced, his

comprehension quiz accuracy percentages increased dramatically. Within several weeks' time, DeAngelo was consistently performing between 50% and 60%. With exception to the outlier score from baseline, all of DeAngelo's scores fall at or above the remaining baseline scores. During the intervention phase, the classroom teacher noted that DeAngelo made an improvement in the quantity of notes he took during the teacher lecture.

After eleven sessions in the intervention phase, DeAngelo entered the maintenance phase for a three week time period. Throughout the maintenance phase, DeAngelo continued to exhibit stable scores within the 50% average range, up 22% from baseline. The range of accuracy percentages for his overall score was from a low of 41% to a high of 58%. Overall, DeAngelo demonstrated a significant increase from baseline to maintenance.

*Gabe*. The results of the dependent measures for Gabe appear in Figure 1 and demonstrate efficacy of the intervention. Gabe remained in baseline while the first six quizzes were administered. During the baseline phase, Gabe scored an average of 44% accuracy on the first six quizzes with a range between 25% and 58% accuracy. All of his scores were well below the score of an acceptable passing grade.

Gabe began the intervention phase for the seventh session and remained in this phase for 20 days. Once the cognitive organizer was introduced, an immediate increase was noted on the seventh comprehension quiz with Gabe scoring 92% correct. Of the ten comprehension quizzes taken during the intervention phase, Gabe scored an average of 64% accuracy, an increase of 20 percentage points from the baseline score. The range of accuracy percentages for his overall score was from a low of 41% to a passing grade of 92%. Out of the 10 quizzes administered to Gabe during the intervention phase, only twice did he make the same score as his highest score in

baseline and twice fall below that level. Two of Gabe's quizzes during the intervention phase received a grade of 75% accuracy score or higher. He failed to make a passing grade on any of the six quizzes in baseline.

During maintenance, Gabe was able to maintain a higher average of scores compared to baseline; however, the scores were slightly lower than the intervention scores. He scored an average of 56%, up 12% from the baseline score. The range of accuracy percentages for his overall score was from a low of 41% to a high of 66%. Although the scores slightly decreased from intervention, Gabe demonstrated a significant increase from baseline to the maintenance phase confirming that he had effectively maintained the skills he had learned during the intervention phase.

*Summary of the Primary Analysis*

The results of the primary analysis demonstrate that using the Inspiration 6 software to create cognitive organizers based on teacher lecture and the world history textbook led to improved comprehension and retention skills for students with learning disabilities at the secondary level. When all four student participants were exposed to the cognitive organizer during the intervention phase, a moderate effect was noted on the researcher-developed comprehension quizzes compared to the baseline measures. Furthermore, Analy and Scott resulted in achieving predominantly passing scores during both the intervention and maintenance phases. In summary, the effectiveness of using the Inspiration 6 software for increasing the social studies achievement of students with learning disabilities was demonstrated to be an effective strategy.

## Secondary Analysis

### *Intervention Effectiveness on Question Types*

While the research questions did not specify a question addressing the effects of Inspiration 6 software on literal or inferential comprehension, it became apparent when designing the comprehension quizzes that an equal number of literal and inferential questions could be included in each quiz. This would allow for a secondary comparison of the effect of Inspiration 6 software on literal and inferential questions. Therefore, the purpose of the secondary analysis was to evaluate the effectiveness of the computerized cognitive organizer on specific types of questions at both the literal and inferential level. Each comprehension quiz was comprised of questions that asked six literal questions and six inferential questions. The literal questions consisted of topics about vocabulary, events, famous people, and important cultural aspects of a civilization. An example of a literal question from one of the comprehensions quizzes was:

> The Greek word for city state is a(n)
>
> A. acropolis
>
> B. polis
>
> C. agora
>
> D. arête

The inferential questions made up the remainder of the quizzes and required the students to draw a conclusion or make a logical judgment. An example of an inferential question from one of the comprehensions quizzes was:

> Which was NOT one of the benefits of a democracy in Athens?
>
> A. The polis was ruled by an assembly of all citizens.

B. Citizens had the right and duty to govern and were responsible for justice.

C. Citizens had equal rights under the law and could claim justice for others.

D. Only 1/5 of the people were citizens.

The study analyzed how the students performed at both the literal and inferential questioning level during the baseline, intervention, and maintenance phase.

Figures 2 and 3 represent the students' performance at the literal and inferential questioning level for all students participating in the study. The analysis illustrated indicates that none of the four students' baseline conditions reached an acceptable level of performance. When all four of the students' scores were averaged, they received a failing grade of 58% accuracy for literal questions, 12 points below the passing score expected of students taking the technical world history course (Table 9). The range of accuracy percentages for the students' overall score was from a score of 0% correct to 83% correct, with only one of the students' scores reaching a passing level. When asked inferential questions during baseline, the scores fared much worse. The four participants averaged only 36% accuracy when responding to this type of questioning, 34 points below a passing grade. The range of accuracy percentages for the students' overall score was from a score of 0% correct to 66% correct, with none of the students' scores reaching a passing level. The classroom teacher reported that these scores were comparable to county-generated common assessments that were administered at the six-week grading period and felt these scores adequately represented typical performance of the student participants when asked questions of this nature.

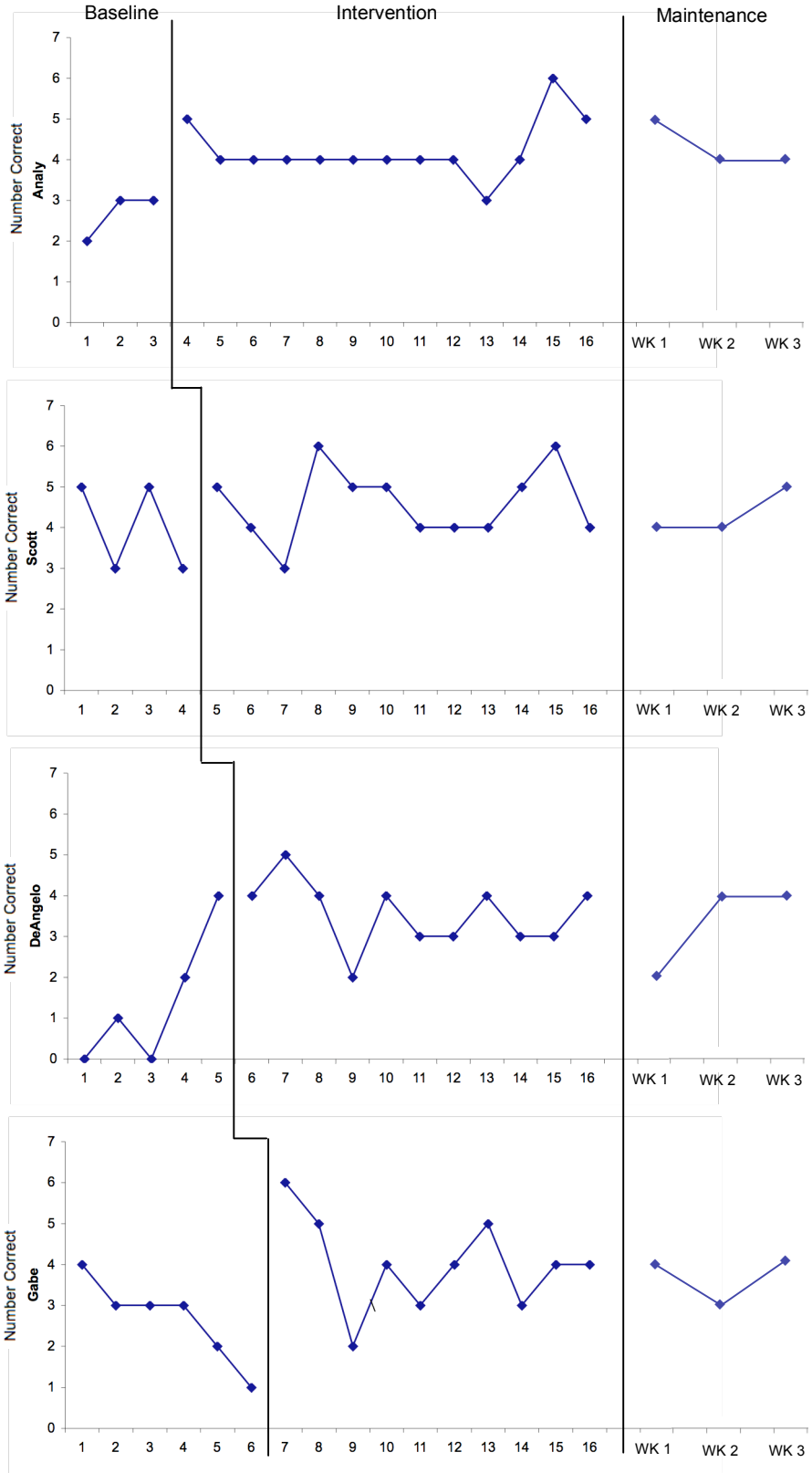


Figure 2. Accuracy When Asked Literal Questions.

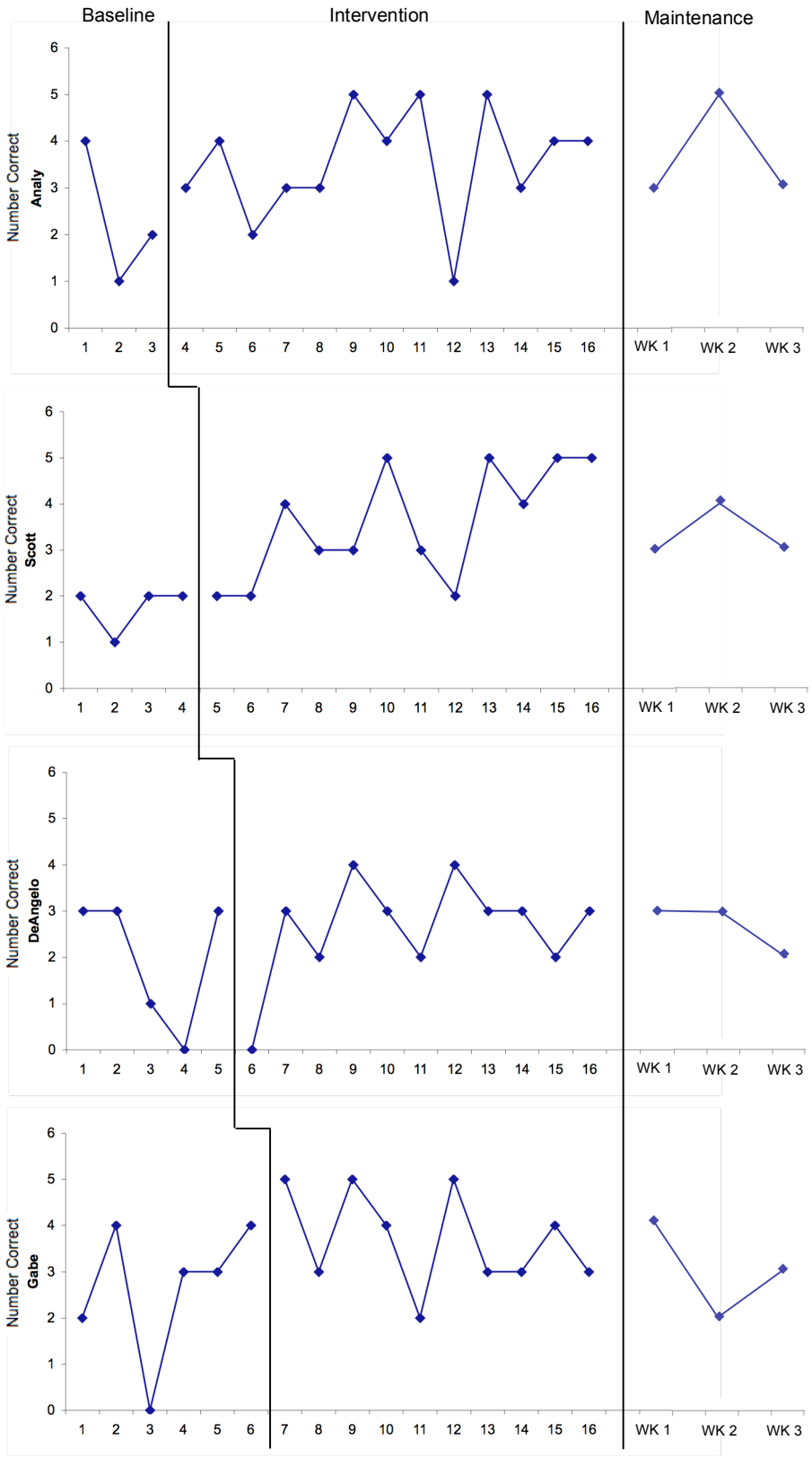


Figure 3: Accuracy When Asked Inferential Questions

Table 9: Average Percentage of Literal and Inferential Scores in Each Phase for All Students

| | Baseline | Intervention | Maintenance |
|---|---|---|---|
| Literal | 58% | 68% | 65% |
| Inferential | 36% | 56% | 53% |

With all of the students' scores combined, there was a significant increase in scores on the comprehension quizzes from baseline to intervention at both the literal and inferential questioning level. The mean accuracy percentage when students where asked literal questions improved from 58% correct to 68%, an increase of 10 percentage points and close to a passing score. The range of accuracy percentages for the students' scores was from 33% correct to 100% correct, with 13 of the quizzes scoring above a passing grade of 70% correct when literal questions were graded in isolation.

Even more notable was the increase in scores when the students answered inferential questions. The students' mean scores improved 20 percentage points, from 36% to 56%. The range of accuracy percentages for the students' overall score was from 0% correct to 83% correct, with 10 of the quizzes scoring above a passing grade of 70% correct when inferential questions were graded in isolation. This is noteworthy since none of the students' scores reached a passing level when asked inferential questions during the baseline phase. Even though the scores on the inferential questions were not as high as those from the literal questions, a drastic improvement was demonstrated from baseline to the intervention phase on inferential questions. This improvement was due to the introduction of the cognitive organizer when analyzing all of the students' scores together.

All of the students entered the maintenance phase at the same time and the students were administered three comprehension quizzes over a three week period after the intervention phase had concluded. Similarly to the intervention phase, the subsequent maintenance phase was also significant when compared to the baseline phase. During the three week maintenance phase, the students continued to exhibit stable scores in the mid 60% and mid 50% range for the literal and inferential questions respectively. The range of accuracy percentages for the students' overall score was from a score of 33% correct to 83% correct for both the literal and inferential questions. Compared to the baseline and intervention phase, no student answered less than two literal or inferential questions correctly on any one of the three quizzes administered during this phase. Although the score accuracy level dropped 3 percentage points for both literal and inferential questioning from intervention to maintenance, a noteworthy increase in scores compared to baseline proves to be significant.

In summary, the use of computerized cognitive organizers proved to be an effective tool for increasing the achievement of students with learning disabilities. Even more specifically, the students demonstrated that the cognitive organizer aided them in answering questions at the literal and, even more noteworthy, at the inferential questioning level. Once the cognitive organizer was introduced, an immediate increase was noted across all student participants. Although the students scored higher when asked literal questions during the intervention and maintenance phases, there were more notable gains in the scores when students were asked inferential questions. These data are discussed for each individual student below.

*Analy.* Data for the dependent measures are presented in Figures 2 and 3. During the baseline phase, Analy scored higher with 43% accuracy when literal questions were posed compared to 38% when asked an inferential question. Analy's accuracy percentages from literal

questions ranged from 33% to 50%. The range of accuracy percentages on inferential questions were from 16% to 66%. All of her scores were well below the score of an acceptable passing grade.

Once the cognitive organizer was introduced, an immediate increase was noted in accuracy percentages for both literal and inferential questions asked on the comprehension quizzes as shown in Figure 1. The inferential question average increased from 38% to 59%, while the most gain was noted from the literal questions, up from 43% to 70% accuracy. Out of the 13 quizzes administered to Analy during the intervention phase, only once did her scores fall in the same range of those scores during baseline when asked a literal question. When isolating the literal and inferential questions, six of Analy's quizzes received a grade of 83% or higher, three based solely on literal questions and three for inferential questions.

Analy further increased the higher average scores throughout the maintenance phase compared to both the baseline and intervention phases. When asked literal questions, her percent accuracy increased two percentage points from 70% in the intervention phase to 72% in maintenance. Furthermore, her percent accuracy when asked inferential questions increased three percentage points from 59% in the intervention phase to 61% in maintenance. The most noted gain was the increase of percentage accuracy when asked literal questions which increased from 43% during baseline to 72% in maintenance, an improvement of 29 percentage points. These results suggest that Analy effectively maintained the skills she had learned during the intervention phase.

*Scott*. Figures 2 and 3 depict Scott's performance on the experimental task across baseline, intervention, and maintenance phases. Scott remained in baseline while the first four

quizzes were administered. During the baseline phase, Scott scored higher with 66% accuracy when literal questions were presented compared to 29% when asked an inferential question. Scott's accuracy percentages from literal questions ranged from 50% to 83%. The range of accuracy percentages on inferential questions were from 16% to 33%. Although Scott had two quizzes where he performed better when asked literal questions, none of the overall quizzes administered during baseline received a passing grade.

Once the intervention was introduced, Scott demonstrated improvement in his comprehension quiz accuracy levels. His intervention accuracy mean percentage was calculated to be 76% when asked literal questions, a 10 percentage point gain from baseline and an average passing grade. More noticeable was an increase in the accuracy when asked inferential questions. During baseline, Scott answered 29% of the questions correctly compared to 59% during the intervention phase. This was an increase of 30 percentage points, which was seen as a notable improvement. Based solely on grading literal questions, Scott received a passing grade on 6 out of 12 of the comprehension quizzes. When grading solely on inferential questions, Scott received a passing grade on 4 of the 12 quizzes. The results for Scott indicated that not only was he making higher scores when asked both literal and inferential questions, but the scores were high enough for him to receive a passing score on many of the quizzes.

During maintenance, Scott was able to maintain a higher average of scores compared to baseline; however, the scores were slightly lower than the intervention scores. Although the scores slightly decreased from intervention, Scott scored an average of 72% accuracy when asked literal questions, indicating a six percentage point increase from baseline. More substantially Scott's scores demonstrated that when asked an inferential question, he improved his score from

29% to 55%, an increase of 26 percentage points. Overall, Scott demonstrated a significant increase from baseline to maintenance when asked both literal and inferential questions on comprehension quizzes.

*DeAngelo*. Figures 2 and 3 represents the comprehension quiz scores produced by DeAngelo in the baseline, intervention, and maintenance phases. During the baseline phase, DeAngelo scored an average of 33% accuracy when inferential questions were posed compared to 23% when asked a literal question. DeAngelo's accuracy percentages from literal questions ranged from 0% to 66%. On two out of five of the quizzes, DeAngelo was unable to answer any of the six literal questions correctly. The range of accuracy percentages on inferential questions were from 0% to 50%. All of his scores were well below the score of an acceptable passing grade. DeAngelo exited the baseline phase after the fifth quiz was administered and was the third student to enter the intervention phase.

Although the results in Figures 2 and 3 illustrate that DeAngelo's score somewhat fluctuated within the intervention phase; the overall scores indicate a positive trend occurred. When asked inferential questions, DeAngelo's scores increased from 33% accuracy to 44%. More notably was an increase in DeAngelo's scores when asked literal questions. He demonstrated an improvement in this area from a low of 23% accuracy to 59% accuracy, a difference of 36 percentage points. During the intervention phase, the classroom teacher noted that DeAngelo made more of an attempt to answer the questions on the quizzes compared to previously when he would rapidly read, guess, and move on to the next question.

Throughout the maintenance phase, DeAngelo continued to exhibit stable scores consistent with those reported during the intervention phase. Although his accuracy level

dropped three percentage points from intervention to maintenance when asked literal questions, he was able to increase the level of accuracy on inferential questions by one percentage point. Overall, DeAngelo demonstrated a significant increase from baseline to maintenance when asked both literal and inferential questions on comprehension quizzes.

*Gabe*. Figure 1 showed that during the baseline phase, Gabe scored an average of 45% accuracy when asked both literal questions and inferential questions. Gabe's accuracy percentages from literal questions ranged from 16% to 66% (figure 2). The range of accuracy percentages on inferential questions were from 0% to 66% (Figure 3). All of his scores were well below the score of an acceptable passing grade.

Once the cognitive organizer was introduced, an immediate and drastic increase was noted on the seventh quiz Gabe was administered as shown in Figured 2 and 3. For this particular quiz, Gabe answered all of the literal questions correctly and only missed one of the inferential questions. When answering inferential questions as a whole, his average increased from 45% to 53%. While gain was noted for inferential questioning, the most significant increase was noted from the literal questioning, up from 45% to 67% accuracy. Out of the 10 quizzes administered to Gabe during the intervention phase, he scored high enough to earn a passing grade when answering literal questions three times. The same can be said for when he answered inferential questions as well. None of Gabe's scores during the baseline phase reached a passing level.

Gabe was able to demonstrate gains in the maintenance phase when asked both literal and inferential questions compared to baseline. Although the scores slightly decreased from the intervention phase, Gabe's scores during the maintenance phase indicate consistently higher accuracy percentage after the intervention was initiated. The most notable increase in scores was

seen when Gabe answered the literal questions. He went from 45% accuracy in baseline to 61% accuracy in maintenance, a 16 percentage point increase. Overall, Gabe demonstrated a significant increase from baseline to maintenance when asked both literal and inferential questions on comprehension quizzes.

*Summary of the Secondary Analysis*

A visual inspection of the data illustrates improvements in performance immediately after beginning the intervention condition and continuous increases in performance throughout the study. As shown in Figures 2 and 3, the students increased their scores when answering questions at both the literal and inferential level. Although the students performed better when asked literal questions, the study demonstrated that the students increased their scores the most when asked inferential questions. Thus, positive changes in the data at both the literal and inferential level were observed between baseline, intervention and maintenance for all four students, which imply consistent and reliable treatment effects within single-subject research (Tawney & Gast, 1984).

## Social Validity

Social validity was measured using a questionnaire completed by both the classroom teacher and students. The questions were designed based on the three types of social validity as described by Wolf (1978). The first question asked if the goals of the study were valuable to the participants. The second area of social validity measured if the method used was socially acceptable for the participants. The third type of social validity questioned if the results were important to the participants.

When asked if the students understood the study and felt that it was beneficial to them, the students responded that they believed the study was useful to them not only in world history, but other classes as well. The survey was followed by a class discussion to review the findings with the students. They were amazed at how well they performed overall compared to their previous scores in baseline. One student reported that he liked using the computer to create the cognitive organizers, but did not realize how much his scores had improved until the researcher presented the graphs.

The second area assessed to ensure social validity was to determine if the students and teacher felt that using the computerized cognitive organizers was socially acceptable for the participants. A question on the survey asked the students "Would you choose to use the Inspiration software in any of your other classes or for studying not associated with this study?". Two of the students indicated they would like to use the software to help them study if they had access to it at home, but currently they do not. The remaining two students commented that they wished that other teachers would arrange times they could go to the computer lab to create the organizers. A student remarked that "I would use it more if they would let me."

The final area of social validity that was measured was whether the results were important to the participants. Since world history is a subject that is assessed on two high stakes tests required for graduation, the students remarked that they needed to do well in the class. Several students commented that they can remember the information when in class, but forget everything once it was time to take the tests. One student commented that "I think I could remember better if I could use this all the time." The teacher commented that he was surprised about the increase in scores for the students and would plan to use the strategy for future lessons.

# CHAPTER 5

# DISCUSSION

## Interpretation of Findings

The present study was a single subject multiple baseline design which evaluated the use of Inspiration 6 software to actively engage students in learning content information at the high school level. The study was conducted to address the following two questions: 1) Can students comprehend and retain information better if they use a computerized cognitive organizer compared to the traditional textbook and lecture instruction condition; and 2) How do students feel about using the computerized cognitive organizer compared to the traditional textbook instruction condition.

Consistent with similar research studies, the results of this study suggested that students comprehend and retain information more effectively if they use a computerized cognitive organizer compared to more traditional methods of learning new material (Blankenship et al., 2005; Boon et al., 2005; Boon et al., 2006). Unlike the other studies, however, this study also analyzed how the students performed when asked specific types of questions. The four student participants demonstrated significant gains when asked both literal and inferential questions on the comprehension quizzes after beginning the intervention. Secondly, the participants concurred that they found the learning strategy useful and would use it again if given the opportunity. Furthermore, the teacher observed the effectiveness of the strategy and agreed to utilize the cognitive organizer for future social studies units.

The first question in the study addressed if students could retain information better if they used a computerized cognitive organizer compared to the traditional textbook and lecture instruction condition. During the baseline condition, none of the students were able to reach a passing grade on the comprehension quizzes. Since the comprehension quizzes in the present study mirrored questions the students were expected to know, the results of this study suggested that without an effective intervention, they would not be successful on future high stakes tests. Prior to the present study, there has not been a published examination using a single subject design conducted to evaluate the effectiveness of using student generated computerized cognitive organizers. However, other studies focusing on non-technological ways to improve the social studies achievement of middle school students with mild disabilities found that during baseline, students scored between 45% and 57% correct, similar to the present findings (Kinder & Bursuck, 1993).

Once the computerized cognitive organizer was introduced to the students, an increase in scores was observed across all participants. Of the four students, Scott was able to achieve the most passing scores on the comprehension quizzes with six, Analy passed four, and Gabe one. Although DeAngelo was unable to increase any of his comprehension scores to a passing level, he showed the most improvement from baseline to intervention of all of the participants. These findings corroborated earlier research implications by Boon et al. (2006) who conducted a group design study and found that students who created cognitive organizers using the Inspiration software outperformed those students in a traditional textbook and worksheet condition. The current study also extended the previous research on the impact of computerized cognitive organizers to improve the academic achievement of students with learning disabilities by using a single subject design rather than using a pretest/posttest treatment control group design.

The maintenance phase confirmed the success of the computerized cognitive organizer as seen during the intervention phase. Overall, the students exhibited a 19% increase in scores on the comprehension quizzes compared to baseline. Although a substantial increase was noted from baseline to maintenance, three out of four of the students experienced a decrease in scores from intervention to maintenance. The student with the most regression from intervention displayed the most erratic scores throughout the study of the student participants. The other two students who experienced a decrease from intervention to maintenance only minimally reduced their scores. The remaining student demonstrated a 2% gain on the comprehension quizzes compared to the scores during the intervention phase. Even though some of the students demonstrated a decline from intervention, the decrease in scores were minimal for most of the students indicating that the students were able to maintain the transfer of skills during the intermittent times between intervention and maintenance.

Few studies have attempted to analyze the impact of computerized cognitive organizers on the various stages of hierarchical learning. Boon et al. (2006) explored the use of Inspiration 6 software to evaluate the relationship between computerized cognitive organizers to facilitate declarative social studies knowledge compared to the traditional textbook and lecture methods. Boyle and Weishaar (1997) compared the use of student-generated to expert-generated cognitive organizers to improve the literal and inferential reading comprehension of students with disabilities. The present study combined aspects of both of these studies as it evaluated the use of computerized cognitive organizers as a supplement to the traditional textbook and lecture methods while specifically identifying student performance at the literal and inferential questioning level. All of the comprehension quizzes were analyzed to evaluate how students comprehended and retained information at various points on the spectrum of hierarchical order

of learning. The data showed that during baseline, the students' scores were over 20% lower when asked an inferential question compared to a literal question. Boyle and Weishaar (1997) found similar results and concluded that students generally were unable to answer correctly as many inferential questions than those questions that merely required recall at the knowledge level. However, students in that study who completed their own cognitive organizer were able to answer more inferential questions correctly than those students who used expert generated cognitive organizers. Thus Boyle and Weishaar's data suggest that students are more successful using higher order thinking skills when allowed to create their own cognitive organizer.

In the present study, although many of the comprehension quizzes did not reach a passing level after the cognitive organizer was introduced, experimental data for the intervention revealed a clear increase for all students at both the literal and inferential questioning level. Further, the students improved their scores at the inferential questioning level by 20%, compared to only 10% at the literal level. Thus, this study suggested that the intervention drastically aided in the comprehension and retention of academic information that requires higher order thinking skills as well as literal comprehension.

When reviewing the students' computerized cognitive organizer, the information included by the students was overwhelmingly text at the literal level. The students were more apt to transfer information from their notes and the book that included definitions, knowledge of dates, events, and places than ideas which were more conceptual. The study suggested that with additional support, the students should include more inferential information in their cognitive organizers in order for them to receive higher scores on comprehension quizzes.

Therefore, one suggestion for future research would be an investigation of how a teacher might practice with the students on how to generate and phrase higher order questions. This

would allow the students to become more familiar with the format of higher order responses. Another suggestion for the students is to create a minimum number of factual and inferential concepts when developing the computer cognitive organizer. This would force the students to consciously think of higher order statements.

Research is also further needed to assess the effects of multiple organizers on specific text structure, thereby differentiating which organizers would be most useful to students given a specific assignment. One study was conducted with non-disabled students and found that once the students were taught how to recognize text structure, their comprehension improved (Richgels, McGee, Lomax, and Sheard, 1987). The two recall measures used for this study were the subjects' recall of main ideas versus details and their recall of normal passages versus scrambled passages. If this could be replicated for students with disabilities, then the knowledge of text structure paired with the appropriate organizer could prove to be a powerful learning strategy. It is possible that with specific guidance, students with disabilities would be able to make a more considerable leap from factual information to inferential when developing computerized cognitive organizers which would in turn increase their testing scores.

This study showed that the students' scores for literal questions appeared to be more stable throughout the intervention and maintenance phases compared to scores from inferential questions (see Figures 2 and 3). The range of scores was much greater on the inferential questions, indicating that the students were not consistent answering inferential questions throughout all of the comprehension quizzes. This is consistent with studies showing that when comparing literal and inferential questions, students with lower reading abilities find answering inferential questions more difficult than answering literal ones compared to their normal

achieving peers (Wilson, 1980). Accordingly, future studies should focus on support techniques to aid students with learning disabilities on answering inferential questions as suggested above.

When reviewing the students' surveys and listening to their comments throughout the study, the student participants overwhelmingly preferred to use the computerized cognitive organizer compared to the traditional textbook teaching method. They enjoyed being actively engaged. Students in similar studies corroborated these findings and responded that the computerized cognitive organizer helped them remember the most important information in the textbook without reading the entire chapter (Boon et al., 2005; Boon et al., 2006). For example, Boon et al. (2005) reported that the students in their study indicated they were more motivated to use the software and enjoyed the novelty of using computers during social studies instruction. These results may be critically important in view of how secondary teachers typically teach.

At the high school level, teachers heavily favor a lecture format approach to teaching as opposed to putting the students in an active-learner role which has been proven to be more effective (Mitchell et al., 2000–2001). Students with learning disabilities especially struggle with a lecture type of instruction due to their difficulties processing information. It is imperative that teachers use concrete teaching strategies that appeal to all students. Active engagement of students with special needs in meaningful and purposeful learning is crucial for them to achieve at high levels, and the current study demonstrated that the use of Inspiration 6 software does result in increased engagement with academic content.

In the present study, allowing the students to complete the organizer independently and providing them with options on how to create the organizer apparently made the students' experience more meaningful and also increased student engagement. Research supports the use of the cognitive organizers when students complete the organizer independent of the teacher. In

the study by Boyle et al. (1997), the researchers examined the effects of expert generated versus student generated cognitive organizers on the reading comprehension of students with learning disabilities. The results indicated that the students who created their own cognitive organizers outperformed those students who had the organizer created for them.

Previous studies conducted using the Inspiration 6 software only allowed the students to complete a teacher generated cognitive organizer using the outline format option (Boon et al., 2005; Boon et al., 2006). The current study, however, allowed the students to design a cognitive organizer independent of the teacher using the creative tools available in the software. The element of adding pictures, color, and altering the font style appealed to the students' creative side. When encouraged to add pictures to the cognitive organizer, the students focused on trying to add the right graphic that would match the text. For example, when using the city "Rome" as a main topic, the students scanned the files for images of the Italian flag and other symbols relating to that country. Other research has indicated that when students can connect information to a contextual image, they are more proficient at comprehending information (Hibbing & Rankin-Erickson, 2003).

Anecdotally, it was observed by the teacher (and indicated by the teacher survey) that the students appeared to spend more time on task during the intervention and maintenance phases when allowed to develop the cognitive organizers than during baseline and asked to work independently. When in the classroom, the teacher frequently had to bring the students back on task because they would appear to daydream, work on another assignment, or disrupt class. While in the computer lab, the students were more focused on creating their cognitive organizer and generally required fewer reprimands to complete the assignment. The students generally appeared enthusiastic about going to the computer lab and on several occasions asked if they

could go everyday. The reduction of off task behaviors and enthusiasm for the intervention reinforced the research of the positive aspects of engaging students and students required to be active learners. It is reasonable to consider that having the students actively engaged reduced the number of behavioral incidents compared to the incidents during baseline. Clearly, this potential outcome of the use of Inspiration 6 software should be researched further.

Several studies have shown that improved student behavior can be a direct result of the students feeling adept about the academic content. For example, Okolo and Ferretti (1998) reported that by using the computer to create multimedia projects, improvements were seen in the students' opinions of their own abilities, attitudes toward learning, and motivation to participate in social studies. Apparently, the use of computers for learning created a risk-free environment for the students. Hasselbring (1997), after conducting a study which used computers to assist students with reading comprehension, reported a student's comment: "The computer corrects me without making me feel ashamed." "Students don't pick on me anymore." These computers can play a valuable role in reducing inappropriate student behaviors, increase time on task, provide a safe environment for students to learn, and increase the motivation of students who are otherwise reluctant to participate.

In the present study, the impact of the intervention on behavior was most noticeably visible with one student, DeAngelo. This student began the study with a defiant attitude and unwillingness to participate in class discussions. He rarely took notes or completed assignments in or outside of the classroom. The researcher and classroom teacher agreed the intervention gave DeAngelo the opportunity to be successful. A remarkable improvement was noted in DeAngelo's attention, note-taking, and participation to the class discussion. Furthermore, this

student took an active role in the intervention and proved to be a positive role model for other students in the class.

Other studies have noted similar improvements in student behavior. Bulgren et al. (1988) reported improvements in the quantity and quality of note-taking when teachers used a concept teaching routine to present concept diagrams to students. Gallego, Duran, and Scanlon (1989) found that while learning and rehearsing a semantic mapping procedure, students with learning disabilities was associated with a significant increase in quantity and quality of in class verbal contributions.

In addition to the positive outcomes noted above, the students were candid about some of the aspects that they saw as a negative aspect to the study. One student commented that he wished they could create their cognitive organizer while the teacher lectured. This particular student found the two day process to be redundant because the students had to listen to the teacher lecture and write down the information on the first day and then transfer their notes to the Inspiration 6 software on the second day. Although the student felt that the study was repetitious, it is important for all students to have frequent exposure to the material to ensure understanding.

Some of the comments from the students revealed ways future research could be enhanced. One student commented that the image selection from the software was limited and requested that the students be trained in how to choose images as well as videos and music clips from the internet and transfer it to their cognitive organizer. Another student added that they wished they could use school laptops in their classrooms rather than using the computer lab. The school does provide teachers with access to laptops; however, they are typically reserved for teachers housed in trailers rather than in the main building. Overall, the students affirmed that the

cognitive organizer was an enjoyable and effective way to help them learn the necessary material.

## Implications for Practitioners

The challenges many students with disabilities face at the secondary level are real and potentially life altering. They often reach this level of academics unprepared for the rigor that is required of them and they are unskilled at creating and generalizing learning strategies that assist them in overcoming their disability. Frustration often occurs when students have difficulty reading high level texts, are unable to take effective notes during class lectures, and are not successful on subsequent assessments. In turn, this sometimes leads to a failure to pursue higher education at the collegiate level or worse, dropping out of school before they complete their high school requirements.

Although most teachers at the high school level provide information to students in a lecture teaching format, it is clear from previous research that students actively engaged in academic learning achieve better results than those in a teacher-centered classroom. Research indicates that it is more beneficial for student success if teachers spend less time preparing lectures and more time preparing students to learn and directing them on how to create learning strategies that can be used in a variety of educational settings.

In addition, more focus should be placed on using technology as a basis for student learning. In this study as well as others, students responded that they enjoyed the novelty of using computers in social studies instruction. In addition, the studies mentioned previously described how extremely successful computer technology can be on student comprehension of factual and inferential information. It also enhanced students' skills in studying and learning through the use of study tutorials and the use of the Inspiration 6 software. With the increasing

demands of accountability for all teachers, Inspiration 6 software can assist teachers in aligning instructional goals/objectives with state standards to ensure they are covering the essential content requirements.

Once students master the strategy of using technology-guided cognitive organizers, it will allow the teacher more time to focus on individual student needs. This in turn will benefit students with disabilities. Although not all students with disabilities have the same needs, and not all are equally motivated to become good students, the research indicated that high levels of access to technology and focused instruction on ways to use the computer as a study tool increased motivation and willingness to learn. The cognitive organizer feature also provided an effective instructional modification for students in inclusive classroom settings.

## Future Research

Several recommendations for future research were discussed previously and several additional recommendations may be made. Much of the published research to date regarding cognitive organizers has focused on elementary and junior high/middle school-aged students in the area of reading comprehension. Given the increased academic demands at the high school level, coupled with current high stakes accountability systems that often rely on ability to understand and retain knowledge to measure student achievement at the secondary level, there is a clear and compelling need for more research on how to improve the social studies skills of high school students. Research needs are particularly pronounced for strategies capable of improving the comprehension and retention skills of secondary students with mild disabilities.

Many of the studies reported have focused using the Inspiration 6 software for students in the world history content setting. One shortcoming of this intervention was that students were not taught to generalize the technique to other academic content areas. Future studies should

replicate and extend the use of Inspiration 6 software in other content areas at the secondary level in resource and inclusive classroom settings across all disabilities.

Additional research is needed to support the findings of the current study in regards to using technology to promote higher order thinking skills when students are asked questions at the inferential level. Future research focusing on higher order thinking is warranted because problem solving and decision making skills is crucial for the success of students with disabilities. Technological resources have made it possible to develop lessons that promote critical, analytic, higher-order thinking skills and real-world problem-solving that are frequently found on assessments today. With the proper resources, such as Inspiration 6 software, teachers have the opportunity to target individual needs and monitor progress as students progress through the demanding curriculum.

## Limitations

This study had several limitations. Most notably, due to the time limitations a thorough examination was not planned for in the study to compare how well the study could be generalized to other subjects. Since world history is a linguistically-based course, a question can be made about how effective computerized cognitive organizers could be in a subject less language-based such as math. Future research in this area could overcome this limitation by extending the research across different subjects.

The study was limited based on the demographics of the student participants. First, the study occurred with 10th grade students only. The results from this study need to be replicated with a broader range of students across grade levels. Secondly, a range of students with disabilities was not included in this study and the small sample size did not allow for a separate analysis. Lastly, despite the growing trend of Asian students attending the school only students

that were Caucasian, Hispanic, and African American were included in the study based on the make-up of the classroom and the requirements chosen by the author. As such, caution must be used in generalizing the results of this study to other populations. Further research on cognitive organizers across a range of cultures and with students whose first language is not English is needed to substantiate its effectiveness for students with mild disabilities.

## Summary

In summary, the results of this study clearly substantiated and strengthened the findings from Boon et al. (2006). As in the previous study, the use of computer-based cognitive organizers increased the social studies comprehension and retention for students. The current study also extended previous research on the impact of cognitive organizers to improve the academic achievement for students with disabilities when answering higher order questions (Boyle, 1996; Boyle & Weishaar, 1997). Despite clear limitations, the present study is promising and hopes to add to a growing body of research supporting cognitive organizers to improve students' academic performance. Future research studies should examine a broader range of students, consider dependent measures that may be more sensitive to growth, and employ stronger designs that would allow stronger conclusions to be drawn. In particular, studies using randomized treatment control group designs with high school-aged students are warranted. Continuing research on helping students with disabilities comprehend and retain academic information will close the achievement gap for those students and their normal-achieving peers.

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Appendix A

Prior Computer Experience Questionnaire

1. I have taken a computer class in school. YES NO
2. When I type, I hunt and peck at the keys. YES NO
3. When I type, I do not have to look at the keys. YES NO
4. I have used a computer to type papers or complete homework. YES NO
5. I have used a computer to make a calendar or organizer. YES NO
6. I have used a computer to create birthday cards, fliers, posters, or some other designed communication. YES NO
7. I have used a computer to create a spreadsheet (i.e. Excel). YES NO
8. I am familiar with how to program software on computers. YES NO
9. I have used a computer to draw and create graphic designs. YES NO
10. I have used a computer to research material for a class. YES NO
11. I have used a computer to research material for pleasure. YES NO
12. I have used a computer to play games. YES NO
13. I have used a computer to email, instant message or talk to others in a chat room. YES NO
14. I currently use a computer _____ hours a week.
15. I consider myself to be very experienced on the Internet. YES NO
16. Of all my computer use, ___% of it is surfing the Internet. (circle the answer that most fits you) 0% 20% 40% 50% 60% 80% 100%
17. I listen to and/or download music on a computer. YES NO
18. I use a computer to load music onto a portable music player (iPod, etc.). YES NO
19. I have used *Inspiration* software at school. YES NO
20. I first used a computer at age ____. (fill in the appropriate age)
21. I have a computer at home. YES NO

Appendix B
Sample Teacher Handouts
Chapter 21 – The Revolutions
Section I – The American, English, and French Revolutions

Name _____ Date _____

**VOCABULARY**—Define the following terms:
1. Glorious Revolution
2. Commonwealth
3. Constitutional monarchy
4. Revolution
5. Bourgeoisie
6. Coup d'etat
7. Nationalism
8. Liberalism
9. Congress of Vienna

**PEOPLE**—Identify the following people:
1. Cavaliers
2. Roundheads
3. Oliver Cromwell
4. Charles II (The Merry Monarch)
5. George III
6. Thomas Paine
7. Thomas Jefferson
8. Louis XVI
9. Robespierre
10. Napoleon Bonaparte

**APPLICATION**—Place the following events in the appropriate category and in the appropriate sequence.

| | ENGLISH REV. | AMERICAN REV. | FRENCH REV. |
|---|---|---|---|
| • 19 Propositions Issued | | | |
| • Bill of Rights created | | | |
| • Boston Massacre | | | |
| • Colonists Taxed Heavily | | | |
| • Congress of Vienna | | | |
| • Constitution of 1791 issued | | | |
| • Declaration of Independence | | | |
| • English Civil War | | | |
| • Glorious Revolution | | | |
| • James, Charles don't like Parliament | | | |

Appendix C
Sample Comprehension Quiz
Chapter 21 – The Revolutions
Section I – The American, English, and French Revolutions

Name _____ Date _____

1. Which of the following statements best describes the reasons for the Revolution in England?
   A. English peasants and middle class members resented having no say in the government
   B. Parliament and the monarchy clashed over issues concerning money, authority, and religion
   C. Heavy taxes and economic crisis placed an unfair burden on the English commoners
   D. Parliament had too much power forcing the king and peasants to fight back

2. James I and Charles I of England were similar because:
   A. both felt that they did not have to answer to Parliament
   B. both felt that Catholicism was destroying England
   C. both felt that Parliament should be strengthened
   D. both felt that war in the American colonies was a bad idea

3. In return for approving additional taxes, Parliament demanded that Charles I sign the
   A. Petition of Right.
   B. National Covenant.
   C. Exclusion Bill.
   D. Bill of Rights.

4. The leader of Parliament's forces during the English Civil War was
   A. William Laud.
   B. Oliver Cromwell.
   C. Sir Robert Walpole.
   D. John Adams.

5. Supporters of Parliament during the English Civil War were called the
   A. Royalists.
   B. Cavaliers.
   C. Roundheads.
   D. Tories.

6. After the defeat of Charles I and his supporters, that type of government did England create?
   A. Constitutional Monarchy (Limited king and elected Parliament)
   B. Absolute Monarchy (King had all power)
   C. Commonwealth (Elected Parliament with no monarch)
   D. Directory (5-man group of leaders)

7. Why did the Restoration occur?
   A. Parliament did not like James II and wanted William and Mary to rule England
   B. People grew tired of the severe, religious rule of Oliver Cromwell
   C. People wanted to abolish the monarchy and set up a commonwealth
   D. The commoners did not get their way during the Estates General

8. The group in English Parliament that tried to prevent James II from becoming king was the
   A. Tories.
   B. Whigs.
   C. Cavaliers.
   D. Roundheads.

9. Which of the following statements best explains the reasons for the American Revolution?
   A. Colonists resented having no say in the government despite being subject to English law
   B. Parliament and the monarchy clashed over issues concerning money, authority, and religion
   C. Heavy taxes and economic crisis placed an unfair burden on the American colonists
   D. The colonists were inspired by the writings of Thomas Hobbes and Voltaire to rebel

10. All of the following are true of the Stamp Act **EXCEPT**:
   A. The British thought the colonists should help pay for the French and Indian War
   B. The colonists were upset because they had no say in government despite the new tax
   C. This was an indirect tax on items such as glass, lead, and tea that actually lowered prices on these goods in the colonies
   D. Merchants began to boycott British goods

11. The American Revolution first began:
   A. at Lexington and Concord
   B. following the Boston Massacre
   C. when colonists invaded England
   D. at Philadelphia and New York

12. Thomas Paine's *Common Sense* was important for all of the following reasons **EXCEPT**:
   A. It urged Americans to declare independence from England and establish a new republic
   B. Persuaded colonists that reconciliation (working things out) with England was impossible
   C. It stated that England and the colonies should work out a better relationship rather than fight
   D. It stated that England was really not concerned with the interests of the colonies

Appendix D
Sample Independent Practice Worksheet
Guided Reading Activity 21-1

*As you read Section 1, complete the sentences below.*

I. Financial Crisis

1. By the end of the 18th Century, France was _____ than it _____.
2. By 1788, _____ of the budget went to pay for the _____ on the national _____. 25% for _____. 6% for king and court _____

II. Meeting of the Estates General

3. 1789--To solve _____, King Louis XVI called for the _____ to meet.
4. Three Estates: _____, _____, _____
5. Estates General voted as separate _____ instead of individual votes, Third Estate broke away and adopted title _____.
6. July 20, 1789 National Assembly swore _____--will not disband until new _____ is written

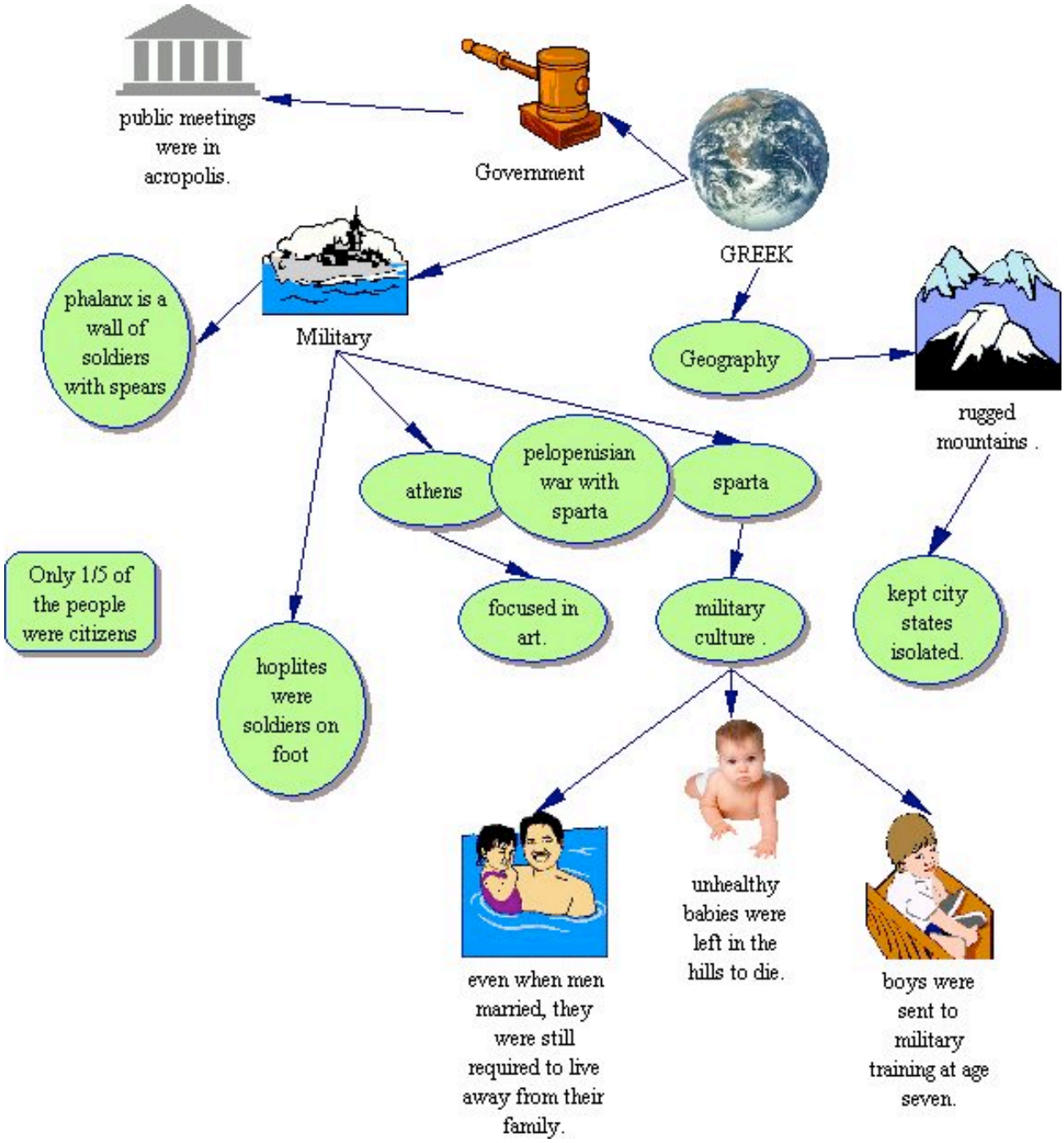
III. National Assembly

7. The National Assembly established _____ which the king accepted in July 1791.
8. The National Assembly had all lawmaking power, but _____ was head of state and could _____ any law.
9. The King vetoed many laws. The National Assembly had _____

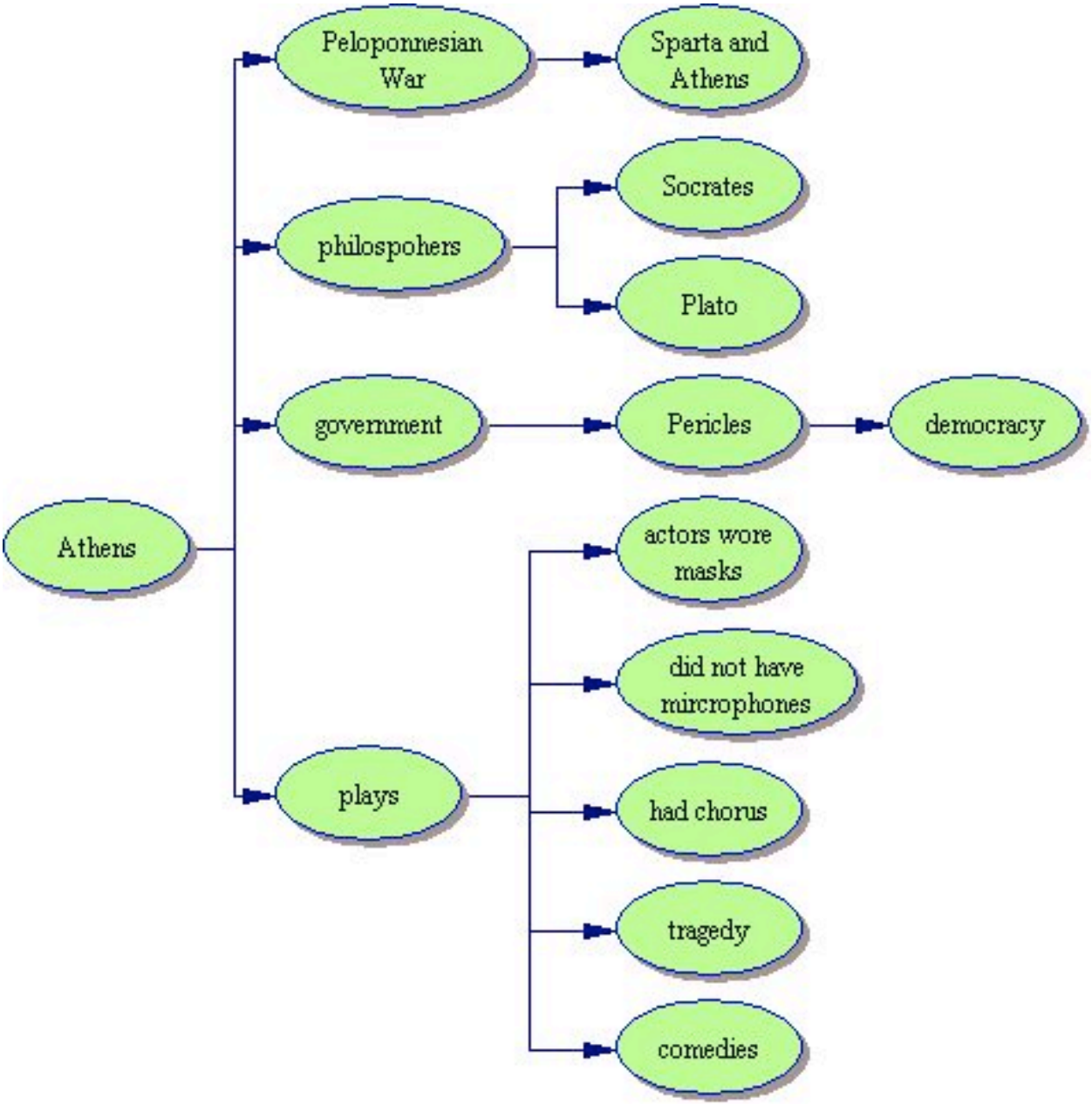
IV. Storming of the Bastille

10. By July 1789, _____ of people were unemployed, _____ prices high, many people without food.
11. July 14, 1789 hundreds marched to the Bastille to find _____.
12. Revolutionary crowds took Bastille. Symbolized beginning of _____ _____

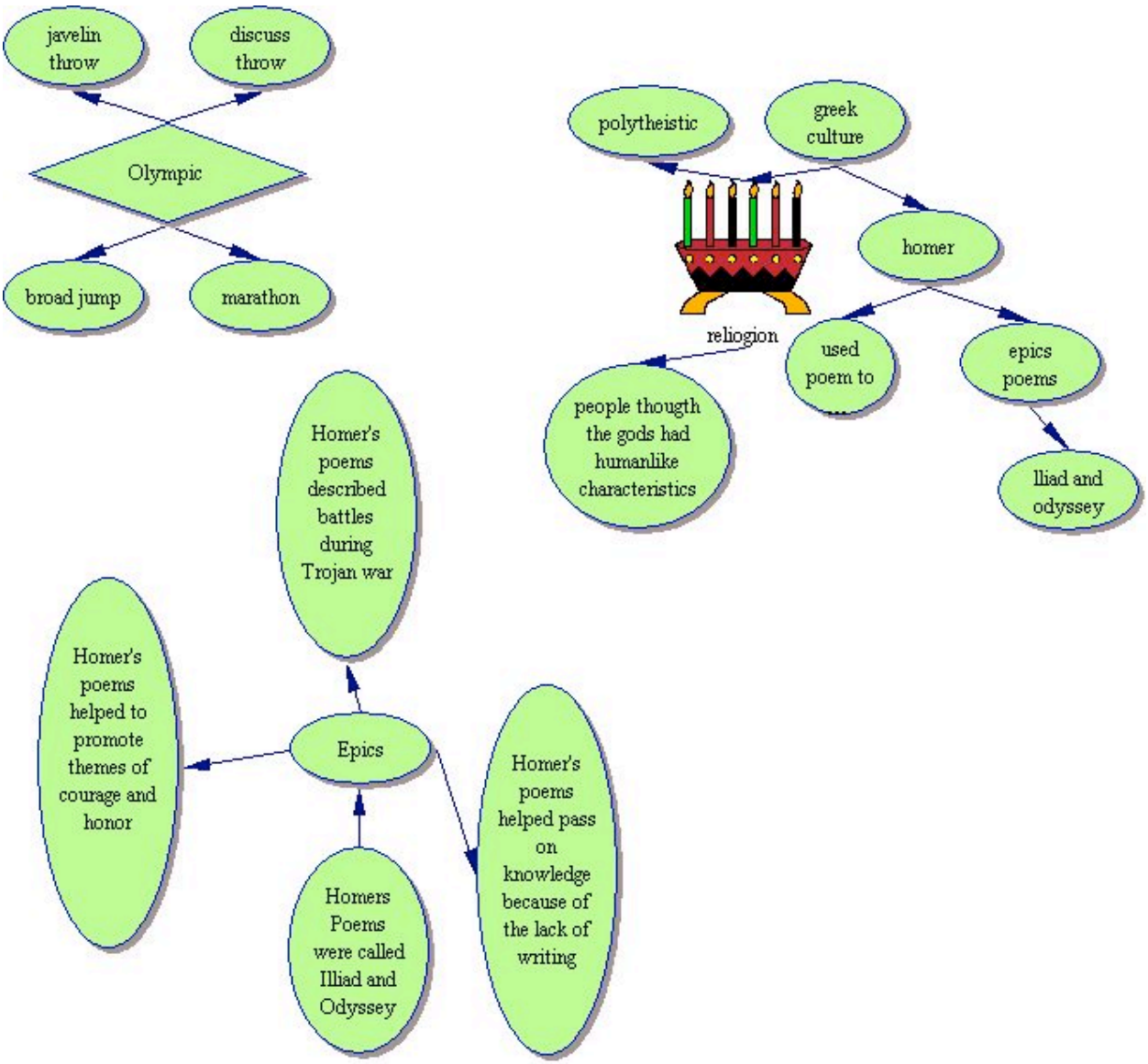
Appendix E
Example of Analy's Cognitive Organizer



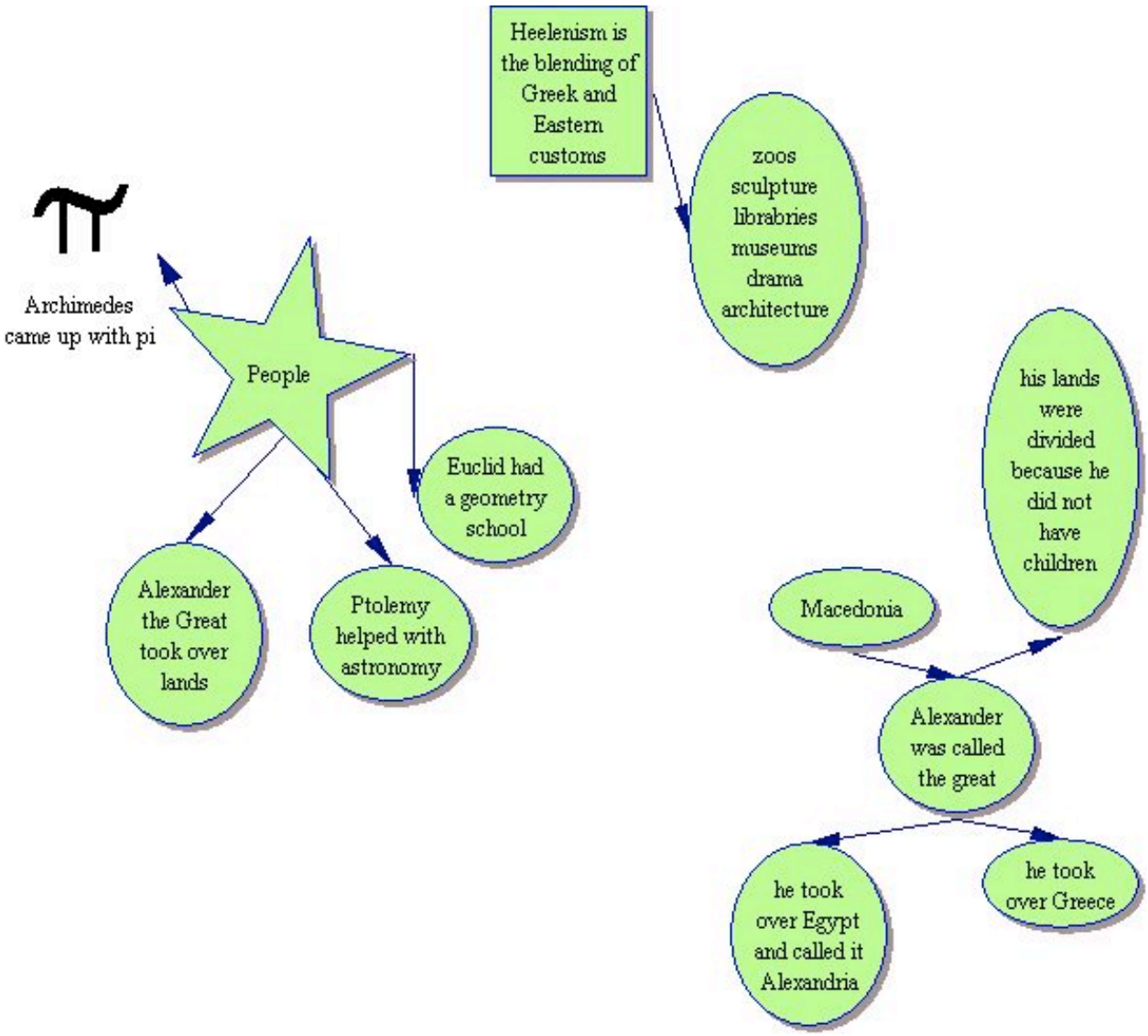
Appendix F
Example of Scott's Cognitive Organizer



Appendix G
Example of DeAngelo's Cognitive Organizer



Appendix H
Example of Gabe's Cognitive Organizer



Appendix I
Data Collection Sheet

Student Name _____ Researcher _____

| Session Number | Date | Phase | Section | Score | F | I |
|---|---|---|---|---|---|---|
| 1 | | | River Valley Systems | | | |
| 2 | | | River Valley Systems | | | |
| 3 | | | River Valley Systems | | | |
| 4 | | | River Valley Systems | | | |
| 5 | | | River Valley Systems | | | |
| 6 | | | Greece | | | |
| 7 | | | Greece | | | |
| 8 | | | Greece | | | |
| 9 | | | Greece | | | |
| 10 | | | Rome | | | |
| 11 | | | Rome | | | |
| 12 | | | Rome | | | |
| 13 | | | Rome | | | |
| 14 | | | Rome | | | |
| 15 | | | Rome | | | |
| 16 | | | Rome | | | |
| 17 | | Maintenance | Byzantine Empire | | | |
| 18 | | Maintenance | Byzantine Empire | | | |
| 19 | | Maintenance | Byzantine Empire | | | |

**Social Validity**
Dates Administered: _____

Appendix J
Procedural Reliability Checklist

Date_____ Student_____

*Please note with a check if each of the following procedures were followed during the session for one student:*

1. Did the researcher instruct the student on where to locate and how to open the Inspiration software when beginning the session?

2. Was the student given a disk which contained a template for them to use and instructed on how to open it with the Inspiration software?

3. Was the student first given directions on how to complete a cognitive organizer using the outline format?

4. Was the student instructed on how to convert the outline format into a visual cognitive organizer?

5. Was the student instructed on how to create a visual graphic organizer without using the outline format?

6. Was the student instructed on how to use the rapid fire feature?

7. Was the student instructed on how to add icons to the text?

8. Was the student instructed on how to change the color of text, background and outline of the icon?

9. Was the student given 10 minutes of independent practice to create a cognitive organizer using the theme of baseball?

10. Was the student kept on task during the session by the researcher as needed?

***Percent of Procedures Followed:***

$$\frac{\text{Number Steps Marked Yes}}{10} \times 100 =$$

Appendix K
Social Validity - Teacher Open-Ended Questionnaire

Teacher _____ Student_____ Date_____

Please answer the following:
1. Did using the cognitive organizers with the Inspiration 6 software help this student? How?

2. Did their quiz grades improve? Yes ___ No ___

3. What did you notice about what they liked about using the Inspiration 6 software?

4. What did you notice about what they disliked about using the Inspiration 6 software?

5. Would you choose to use the Inspiration 6 software in any of your other classes or for teaching future lesson?

Additional Comments:

Appendix L
Social Validity - Student Open-Ended Questionnaire

Student _____ Date _____

Please answer the following:
1. Did using the cognitive organizers with the Inspiration 6 software help you? How?

2. What did you like most about using the Inspiration 6 software?

3. What did you like least about using the Inspiration 6 software?

4. Did your quiz grades improve? Yes ___ No ___

5. Would you choose to use the Inspiration 6 software in any of your other classes or for studying not associated with this study?

6. What subject do you think would be the best to use the Inspiration 6 software? Why?

7. Would you draw out cognitive organizers on your own without the use of Inspiration 6?

Additional Comments: