FIFTH GRADE STUDENTS' SHIFTS

IN KNOWLEDGE OF HYPERTEXT

STRUCTURE

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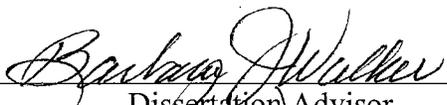
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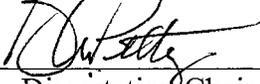
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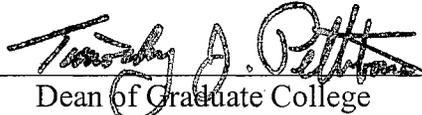
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DEDICATION

To My Husband

and My Thesis Advisor

Who provided skills and encouragement

for me to achieve this

life-long dream.

PREFACE

Much research shows the importance of schema and text structure knowledge in the use of expository text in the typographic field. Very little information is available in the electronic or post-typographic field. This qualitative study was conducted to discover fifth grade students' use and knowledge of post-typographic print in using informational text. Specific objectives were to discover (a) the knowledge the students possessed of post-typographic print, (b) the navigation strategies the students used, and (c) the strategies the students used for evaluation of authorship and content. After the pre-interviews, three sets of topical lessons demonstrating the structure, navigation, and evaluation strategies were shared with the students. Evaluation included analyzing the pre- and post- interviews, field notes, observations, student response journals, and products as well as conducting a correlated-sample t test on the students' comfort level in using post-typographic text.

ACKNOWLEDGMENTS

This study would not have been possible without the support of many people. The decision to begin this degree at this time of my life has been one of the most rewarding decisions of my life. I will always appreciate those who stood by me while making that decision and during the project.

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I would like to give my special appreciation to my husband, Bob, for insightful suggestions to my research, his strong encouragement, love and understanding throughout this whole process. Without him, I know I would not have completed the process.

Finally, I want to give special thanks to my children, brother and sister and their spouses, and my mother for being so understanding about the complexity of the process.

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CHAPTER I

INTRODUCTION

Literacy is the mirror reflecting the soul of a society. It evaluates society's

thinking, learning and culture. Literacy's tools for learning are artifacts which the culture

values to educate and continue the traditions of society. In an oral culture, literacy

focuses on verbal utterances, whereas a written culture literacy looks to written discourse

for meaning. In the twentieth century, another form of literacy emerged to parallel written

literacy. This was the literacy of the mass media or the "second orality" literacy. People

need to be literate in both written and "second orality" literacies to be contributing

citizens of the society.

Then, at the end of the twentieth century, a revolutionary literacy developed. It

was caused by the influx of hypertext and transformed the entire globe. This literacy,

multiliteracy, consisted of a multitude of literacies containing a geometric proportion of

definitions, methodologies, purposes, and functions. There are varying individual,

societal, and global expectations. Traditional versus technological aspects vie for a place

in the literacy world. Yet, each aspect or factor cannot be considered paramount to any

other. No single definition of literacy in this multiliteracy is possible and all literacies are

a part of multiliteracy. Nevertheless, oral, written and "second orality" will continue to

have a significant role in the multiliteracy of the twenty-first century. Each of the

following four sections about oral, written, "second orality" and multiliteracy starts with a challenging or revolutionary quote that shook the prevailing literacy thinking of the day. A short explanation of oral, written, and " second orality" literacies follows each quote. A detailed explanation of multiliteracy follows which focuses on the varying definitions, major concerns, and concepts within the field. Multiliteracy, with its heart in critical literacy or theory, is the "field" from which each reader of hypertext selects the schema and elements of text structure to start the construction of meaning.

<div align="center">

Oral Literacy

</div>

> *The fact is that this invention will produce forgetfulness in the souls of those who have learned it. They will not need to exercise their memories being able to rely on what is written, calling things to mind no longer from within themselves by their own unaided powers, but under the stimulus of external marks that are alien to themselves. So it's not a recipe for memory, but a reminding, that you have discovered.* Socrates concerned about writing's introduction into Egypt (Tyner, 1998, 21).

Over thousands of years, oral literacy was the dominant communication system to share knowledge and experience as well as to measure comprehension and literacy. Then writing was introduced into Egypt. Socrates and others felt a definite apprehension with the change from the oral language and its means of instruction to the world of print. Oral literacy, still found today in a few world cultures and occupations, was characterized by recitation, memorization, and literal thought. Everyone knew what literacy was and who was literate.

> *[Y]ou might say that I have conscientiously translated the New Testament into German to the best of my ability, and that I have not forced anyone to read it. Rather I have left it open, only doing the translation as a service to those who could not do it as well. No one is forbidden to do it better. If someone does not wish to read it, he can let it lie, for I do not ask anyone to read it or praise anyone who does! It is my Testament and my translation-and it shall remain mine. If I have made errors within it (although I am not aware of any and would most certainly be unwilling to intentionally mistranslate a single letter) I will not allow the papists to judge for their ears continue to be too long and their hee-haws too weak for them to be critical of my translating. I know quite well how much skill, hard work, understanding and intelligence is needed for good translation. They know it less than even the miller's donkey for they have never tried it.*
> Martin Luther, Nuremberg, Sept 15, 1530 "An Open Letter on Translating" Translated by Gary Mann, Ph.D. from: "Sendbrief von Dolmetschen" in <u>Dr. Martin Luther's Werke</u>, Weimar: Hermann Boehlaus Nachfolger, 1909), Band 30, Teil II, pp. 632-646.
> http://www.iclnet.org/pub/resources/text/wittenberg/luther/luthertranslate.txt

About 500 years ago, Martin Luther and the development of the printing press helped create a tremendous change in literacy and the spread of knowledge and ideas. Martin Luther promoted the written word to the common man. The invention of the printing press, widely thought of as the origin of mass communication, created the first viable method of distributing ideas and information from a single source to a large and far-ranging audience. The combination of social, religious and technological forces made access to the text possible and created a functional opportunity to comprehend the material. The Renaissance followed and more individuals created meaning even more broadly and inventively. In written literacy, the print text was powerful. "Legibility" (the characteristics of the text, font, stroke, leading, kerns, height and width of an item in relationship to the format, and structure of a page and sentences) was studied for the

appeal value and readability of the written text. Publishing companies found the most

effective legibility for the right content. Illustrations and other pictorial representations

provided a visual supplement to the text. Books were affordable and available for

everyone. Comprehension focused on literal and figurative interpretations. Different

reading theorists (Goodman 1994, Adams 1994, Singer 1994) suggested varying

relationships for the reader, the text, and the teacher. This literacy developed, changed,

and redeveloped into new forms with the onset of radio, telephones, televisions, and other

technological inventions.

Second Orality (Electronic and Oral Literacy)

*It is a source of constant amazement to me that the television set, an inert,
immobile appliance that does not eat, drink or smoke, buy or sell
anything, can't vote, doesn't have a job, can't think, can't turn itself on or
off, and is only used for our option, can be seen as the cause of so much of
society's ills by so many people in education* (Jankowski, 1986).

Electronic communication based on the verbal format influenced and altered what

society thought was literacy. The influence of television, movies, telephones, and radio

media was extensive and powerful. Ong (1982) argued that the culture of the day

presented an age of "secondary orality" similar to an oral culture in the participatory

aspect with an emphasis on the present. Two differences which distinguished this orality

from the primary oral literacy were that television and movie media "appeared" to be a

real oral culture and telephones and other communication devices were not used for "face

to face" communication. The third and most important difference, according to Ong, was

that the presentation of literacy was oral but its foundation of "second orality" was still in writing and print.

The last century saw the technologies of radio, movies, television, and telephone develop quickly and permeate American culture. This literacy, encompassed the comprehension of image, oral and written text, focused on informed and critical understanding of the nature of the mass media, the techniques used by them, and the impact of these techniques. It was participatory in nature and dominant in sound. Hypertext changed the concept by having the shift toward greater orality in the culture at large (Ong, 1982).

Multiliteracy

> *Our country was built on a simple value that we have an obligation to pass better lives and better opportunities on to the next generation. Education is the way we make that promise real. Today, at the dawn of a new century, in the middle of an information and communications revolution, education depends upon computers. If we make an opportunity to every student, a fact in the world of modems and megabytes, we can go a long way toward making the American Dream a reality for every student. Not virtual reality--reality for every student. President Clinton, Getting America's Student Reading for the 21st Century, A report to the Nation on Technology and Education June 29, 1996 http://www.ed.gov/Technology/Plan/NatTechPlan/*

The literacy of the information age is a complex hybrid of oral, written and "second orality" literacies. It is called multiliteracy because of the constantly changing multiple forms of texts, tools, and social contexts of literacy. These multiple literacies combine the rich textual literacy of print, not in the same manner as the traditional alphabetic literacy, but with multilayered electronic and visual literacies. The major tool in this age is the computer with all of its peripheral attachments and presentations and its

focus on communication. Bruce & Levin (1997), Mikulecky & Kirkley (1998), and Drucker (1994) say because of this tool, the work of the world is undergoing a fundamental transformation.

Computers are everywhere—in the kitchen and entertainment systems, money and banking, health and medicine, transportation, commerce, and government. Electronic technology is not only an American phenomenon but a factor within the entire global economy. This technology is going to continue to be a major part of family and society.

Literacy of this information age is not just making and using multimedia. There are many facets of the literacy concept and no agreement in the definition. People develop new schema to communicate and define literacy and they segment the focus into visual literacy, computer literacy, informational literacy or electronic literacy. Others provide multiple definitions of literacy. With each shift in literacy, terms like cultured literacy, layered literacy (Selfe, 1989), social literacy, and multiplicative literacy (Lemke, 1998) are found. Hypertext, the electronic print found on computer screens, is a literacy form of the present.

For Reinking (1995) and Leu (1997), literacy in the electronic information context is being able to make sense of and navigate through several forms of information. It also involves the integration of reading and writing and the ability to navigate through the information. It also is knowing what is important and not important and communicating in a post-typographic world (Reinking 1995, Leu 1997, Flood and Lapp 1995). Leu (2000) states the nature of literacy is changing continually; as new environments and technology develops, so does the form of literacy. He says that electronics will be the context of literacy because it is powerful, complex and continually changing as well as

more dependable and social. Negroponte (1995) and Reinking (1995) believe technology will transcend to new forms of literacy and that learning will constantly be redefined.

Technology is coming to schools, homes, and libraries through governmental and public moneys, policies and directives. Positively, computers can be conceived as a curricular tool for constructing meaning. Sandholtz (1997) believes that technology has many purposes in the curriculum. The child collects information in multiple formats and organizes the information in a unique functional way, and he or she links and visualizes different combinations and discovers relationships among the combinations. The child communicates, and evaluates the information and grows in the depth of understanding within the knowledge domain. Strickland, Feeley and Wepner (1987) add that computers help with individualized instruction and provide immediate feedback as well as present new knowledge in novel ways. Reinking (1998) states that children perceive computers as tools for personal and public goals, storage and repositories of knowledge, business and play purposes and definite communication devices. Many of today's children feel comfortable within the worlds of print and hypertext.

With the rapidly transforming technology and its effect on reading, new schema is developing. A reader reads the different aspects of hypertext and tries to make meaning. A reader finds information and adds that procedure to their schema. As the reader navigates through various sites, they develop new strategies and schema for accessing text. They also evaluate the site as for accuracy of information. Multiliteracy, inherent in technology, changes literacy and learning and thus, a reader's schema.

The Importance of Schema Theory

Schema (Anderson 1994), the learner's organization of the knowledge of the world, helps the reader focus and set out a plan for reading. Schema guides the reader through the multiple levels of meanings. Schema customizes the reader's perspective by helping to analyze the context as well as the characters, and set up meaning. Schema facilitates metacognition (Garner, 1994). The reader knows the vital elements of the declarative, procedural and evaluative aspects of text. In today's world, a well-developed schema of both print and hypertext must be available for the reader to use.

The book or print reader pulls his schema and knowledge of text structure from the perceptions of written literacy and "second orality". In contrast, the reader of hypertext pulls his schema and knowledge of text structure from the worlds of multiliteracy and critical literacy.

Significance of the Study

Teachers need to assess students on their levels of competencies on their states', International Reading Association's (IRA) and National Council of Teachers of English's (NCTE) suggested objectives. For the State of Oklahoma, for example, the teachers use the Priority Academic Student Skills (PASS) (Revised May, 2000) for a minimum proficiency guideline. The state provides suggested activities for reading print and for curriculum planning. There are currently no stated strategies available for teaching hypertext reading skills.

The Purpose of the Study

National, state, and local organizations and educational agencies have standards

and benchmarks which teachers must assure their students have passed. The language arts

sections recommend competencies in both the print and nonprint areas. Oklahoma's

Priority Academic Student Skills (PASS) (Revised May 2000) objectives recommend

fifth graders demonstrate in print and nonprint formats appropriate use of information

sources and understanding of text features. Fifth graders must also know the various ways

to represent meaning and the similarities, differences, and purposes of each media. Fifth

graders must be able to access and understand information from a variety of print and

nonprint materials.

Nowhere are there strategies to instruct these recommended skills and the other

skills which relate to hypertext. Thus, one purpose of this study was to discover what

fifth grade students knew about hypertext and its strategies—its schema, its text structure,

its navigation, and its accuracy. The second purpose of the study was to discover how

these students use hypertext and its strategies in school and for school projects.

The Statement of the Problem

Much research has shown the importance of prior knowledge and text structure in

the print or typographic field. Only a small amount of research had been completed on

the hypertext field. Reading programs showed little or nothing about how a reader used

text structure and prior knowledge to handle hypertext materials. The researcher wanted

to know if good readers naturally transfer their understanding of prior knowledge and text structure of expository print text to the hypertext field.

For this study, print or typographic text is text found on pages or printed documents (Reinking, McKenna, Labbo and Kieffer, 1998, p.xx). It is the same as printed text or print medium. In contrast, hypertext or post-typographic text found on screens or text displayed in digital form electronically on a surface (Reinking, McKenna, Labbo and Kieffer, 1998, p. xxi). This kind of text is also called electronic text. Print and typographic text can be interchanged. Post-typographic, electronic text, and hypertext will be used as synonyms.

This study explored fifth grade students' knowledge and use of hypertext structure in using informational text. Interviews, field observations, reflections and products will demonstrate knowledge and use of hypertext. One aspect of the study asked the students a series of questions about the change, if any, in the knowledge, use and perceived comfort of the hypertext reading task. This part was given a number value by the student about the student's perceived comfort in using and knowing about hypertext. The researcher also states that the three sets of lessons about hypertext strategies will affect the students' comfort levels in using and knowing about hypertext. If the lessons do affect the students:

1. In what ways did the fifth graders shift their knowledge hypertext structure?

2. In what ways did the fifth graders shift in their knowledge of accuracy of hypertext?

3. In what ways did the fifth graders shift in their knowledge of navigation of hypertext?

4. In what ways did the fifth graders shift in their use of hypertext?

Definition of Terms

Declarative Knowledge-factual knowledge available to a person to use (Harris &

Hodges, 1995, p. 55); cognitive units of propositions, strings or spatial images retrieved

from long term memory to aid in production and application of knowledge (Anderson,

1983, pp. 20, 23).

Evaluative Knowledge-the conditions for effectiveness of a product; the

"why/why not," "if/then," or because of an idea. (Researcher's term)

Hierarchical-a ranking of objects one above another.

Hypermedia-electronic hypertexts that require the author to create, and the reader

to follow linked pathways through a whole collection of electronic "texts" presented as

computer windows (Reinking, McKenna, Labbo & Kieffer, 1998, p. 63).

Hypertext-in computer use, a sophisticated branching program that allows the

user to move among and relate text, graphics and sound data in new patterns in any

desired order (Harris & Hodges, 1995, p. 110); also known as post-typographic text and

electronic text.

Internet-a collection of computers, worldwide, connected via a network in which

information or data is broken into discrete packets, transmitted, and then reassembled by

the receiving, or client, computer (Shepherd, 1998, p. 315).

Multiliteracy-multiple literacies which are rooted in literacy traditions of oral/aural, visual, and alphabetic/text modalities; also known as information literacy, visual literacy, media literacy, and technology literacy (Tyner, 1998, p. 60).

Multimedia-the integration of text, sound, full and partial video, or graphics (Harris, 158); having the characteristic of combining materials from different media (Shepherd 1998, p. 121).

Nodes-chunks of hypertext information that are linked to other nodes by reader's needs and previous knowledge.

Post-typographic text-electronic text, text found on screens, hypertext, e-text, electronic media, pixel print; text in digital form displayed electronically on dynamically alterable surface such as a computer screen (Reinking, McKenna, Labbo & Kieffer, 1998, p. xxi).

Procedural Knowledge-knowledge of the "how" conceived as an instructional strategy and expressed in a series of language production rules (Harris & Hodges, 1995, 194); the knowledge about how to do things (Anderson, 1983, p. 215).

Second Orality-the literacy of mass media encompassing the image, oral and written text; the orality of telephones, radio, and television, which depends on writing and print for its existence (Ong, 1982, p. 3).

Text Structure-the various patterns of ideas that are embedded in the organization of text (Harris & Hodges, 1995, p. 230).

Topography-the physical layout of the page or screen page.

Typographic Text-printed text, Gutenberg print, text found on pages, print medium; the technologies of print such as paper, ink, presses, typewriters, laser printer or

fax machine or any other machine that "artificially" produce or simulate printed documents (Reinking, McKenna, Labbo & Kieffer, 1998, p. xx).

Assumptions

There are three assumptions:

1. The participants in the study will be above the thirty-fifth percentile in reading comprehension according to the Iowa Test of Basic Skills.

2. The participants have knowledge of print text structure based on fifth grade benchmarks and standards.

3. The participants have had prior experience using the computer for word processing and Internet research.

Limitations

Knowledge and use of electronic informational text materials for fifth grade students was addressed in one classroom in a midwestern city. The population was generally good readers with no major economic or other needs. Four of these 18 students who participated in the study considered themselves a minority. Four received free or reduced lunches. All of the students were average or above average readers. This study had additional potential limitations. This study was directed at fifth grade students who generally had experience with computers at school and at home. Additionally the 18 students had participated in a comprehensive technology program

within the school's curricular program. Another limitation was the use of laboratory time in a school computer lab for the practice portion of the lessons. Each computer in the school laboratory also had Internet access and more than half of the students had Internet access at home.

Organization of the Study

Chapter I, the introduction, presents a statement of the problem, research questions, significance of the study, definition of terms and limitations of the study. Chapter II contains the review of related literature and research related to the problem being investigated. The methodology and procedures used to gather data for the study are presented in Chapter III. The results of analysis and findings to emerge from the study are contained in Chapter IV. Chapter V contains a summary of the study and findings, conclusions drawn from the findings, a discussion, and recommendations for further study.

CHAPTER II

REVIEW OF RELATED LITERATURE

Much has been written about the reader of print. Rich research in language

processes, social context and culture, literacy development, comprehension, reader

response, and metacognition have created many models of reading and literacy processes

(Goodman, Adams, & Singer, 1994). Schema theory (Reulhardt, 1994) and text structure

(Pearson & Camperell, 1994) were two areas with many studies to create a conclusive

research foundation.

Print and Importance of Schema Theory

The Schema Theory states that the reader's schema provides much of the basis for

comprehending, learning, and remembering the ideas in stories and texts (Anderson,

1994). Multiplicities of graphophemic, morphemic, semantic, syntactic, pragmatic and

interpretative levels are activated. Interactive reading and recall develop. Schema

provides scaffolding for learning, and helps direct selective attention. Knowledge of

schema also helps elaboration, creates a memory system, assists with editing and

summarizing and develops inference. Bower (1976) states that schema helps the reader

understand what is read as well as assists with recall and construction of new stories. He

also states that if any part of the proposed schema is missing or violates what is already perceived, then ideas or concepts are more apt to be forgotten or misinterpreted. Bartlett cited in Clark and Clark (1977) defined schema as "a kind of mental framework based on cultural experience into which new facts are fitted. (pp. 168)"

The following 12 research studies illustrate the basic aspects of the print schema theory. Fifty participants were divided into five groups. Group one only heard the passage and group two saw the context picture before they heard the passage. The other three groups saw the picture after they had heard the passage. Bransford and Johnson (1972) discovered that for prior knowledge to be of maximum use it must be present during the beginning process of comprehension. The three groups which had the picture after the text scored significantly lower than the group that had the picture before the text. The participants stated that without the picture, they searched for understanding to make sense of the text. Bransford and Johnson did a series of four studies and each showed that comprehension was increased when appropriate information was given prior to the reading.

Anderson, Reynolds, Schallert & Goetz (1977) used 30 female students in an educational psychology class designed for a career in music education and 30 male students from two weight-lifting classes. They read two passages. One passage was interpreted as either a prison break or a wrestling experience and the other passage was thought to be either be a card playing or a musical rehearsal event. The results indicated that personal history, knowledge and beliefs influenced the interpretation of the passages. Anderson, Reynolds, Schallert & Goetz (1977) stated that a high-level schemata caused

people to "see" the passages in a particular way and eighty percent of the subjects saw the passage in the most familiar schemata.

Different perspectives on a story were measured by Pichert and Anderson (1977). Sixty-three college undergraduates read one of either a directed or undirected perspective. One third read a story about two boys playing from the perspective of a burglar, one third read it from the perspective of a home buyer and the last third had no given perspective. The group was also given another passage about two gulls frolicking across an island. The perspectives were of an eccentric florist, a shipwrecked person, or no given perspective. One week later, a test was given regarding both stories. The authors stated that the framework provided "slots" for remembering details from the passage.

Anderson, Spiro, and Anderson (1978) studied schemata as scaffolding of information. Seventy-five undergraduates were asked to describe activities which were found in a fine restaurant. Then the subjects were given a passage either about 18 items in a restaurant format or the same 18 items in the same order in a supermarket format. After a 12 minute unrelated activity, the undergraduates were asked to reproduce the entire passage in correct order without leaving anything out. The students with higher verbal skills did better, but that was not significant. The readers of the restaurant format recalled more items, but did not fair better on all subsequent tasks. The authors felt that "ideational scaffolding" for text information may provide support for recalling information at a later date.

The effect of background knowledge on explicit and implicit information was studied by Pearson, Hansen and Gordon (1979). From a pool of four classrooms in St. Paul, Minnesota, a group of individuals with the ten highest reading achievement scores

on the Metropolitan Achievement Test and a group of ten individuals with the lowest scores were selected to participate in the experiment. The students were tested on schemata knowledge about spiders. They were then given a passage about spiders and asked questions. The result showed there was an overall pronounced effect with both groups for prior knowledge because of inference knowledge. The researchers believed students with well-developed schemata on a topic were able to answer more questions about a passage than those with weakly developed schemata.

Spiro and Tirre (1980) used 112 introductory educational psychology students and studied the before mentioned restaurant and supermarket narratives with the same 18 food and beverage items. The order of the items was identical. Individuals with a high score on Embedded Figure Tests scored higher on recall than those who had low EFT scores. Low and high EFT scores recalled the grocery store list equally well. The researchers felt the restaurant had greater schema relevance, so the scores for recall were better.

Sixty-four undergraduate students participated in a study to measure the effect of episode schema in story processing. Haberlandt, Berian, and Sandson (1980) found in two experiments that readers used schema in encoding simple two-episode stories. The readers knew the schema of the story. Around the predicted parts of the schema, more time was used by the readers to understand the parts. For example, at the beginning of a story, more effort and reading time were given to activate comprehension.

Real cops and pretend burglars looked for different things in a story (Goetz, Reynolds, Schallert, and Radin 1983). They said that the readers' schemata were important for comprehension and memory. Sixteen policemen, 20 real estate students,

and 19 introductory psychology students volunteered to read a passage based on the two playing schoolboys in the before mentioned Pichert and Anderson (1977) research study. Again the perspectives were burglar, homebuyer, and no given perspective. These researchers again reported the powerful role that schemata took in recall and comprehension. The subjects in Experiment One rated things that related to their perspective as more important. In Experiment Two, the presentation was on the computer and time was also recorded. The subjects spent more time on the sentences that gave proof to their perspective. Those subjects with no perspectives had little effect in the study.

Alvermann, Smith and Readence (1985) had 56 sixth-grade middle school students write down information on a prompt prior to reading a passage. The study discovered that "prior knowledge may interfere with, rather than facilitate, reading comprehension under certain conditions" (p. 433). Incorrect prior knowledge tended to override the conflicting text information. There was no significant difference in students activating prior knowledge before reading and students not activating prior knowledge in comprehension.

Pritchard (1990) wanted to find out how cultural schemata influenced students' strategies and reading comprehension. Thirty American and 30 Palauan eleventh graders were selected to read two passages-a typical funeral in each of the cultures. As the students read individually, they stopped and explained the happenings, thoughts, and any other details. At the end of the passage, a comprehension test was given. Differences were found between the rate and sequence of connections. American students used a wider range of strategies. Students familiar with the topic produced more details, idea

units and elaborations. When reading unfamiliar information, readers lacked the relevant schemata and thus made more mistakes and were more ambiguous about the topic. Those students who didn't have any familiarity used comprehension-monitoring strategies to get meaning from text.

The importance of subject-matter knowledge and interest in text arranged in a linear and nonlinear fashion was studied by Alexander, Kulikowich and Jetton (1994). Linear fashion is the progression for one thing to another in a single series of stages while nonlinear has multiple or different series of information. Sixty-six studies were analyzed and the importance of learner and environment was stressed. If the student and topic were ill-matched, their interest and comprehension waned. On the other hand, if the student and topic were deemed relevant, then the student handled temporary problems with comprehension or learning. The interrelationship of knowledge, recall and interest factored into comprehension. Topic knowledge consistently produced the highest interest ratings and best recall measures. Knowledgeable students distinguished importance and interest better.

Alexander, Kulikowich and Schulze (1994) gave pretests to 209 college students measuring the familiarity with topic and domain of physics. The subjects then read the passages and rated the interest level of the passage. The result was that knowledge of the topic and domain increased the recall and interest. They stated that the cognitive immature or the less experienced student needed more assistance in the procedures of processing information. Then their interest would rise as well.

Hypertext and the Importance of Schema

Research on schema and the hypertext print is scarce. Reed, Ayersman and Liu (1995) studied the effects of hypertext structure schema. Reed, Ayersman and Liu (1995) wanted to know if prior knowledge about hypermedia from the beginning of the treatment to the end of the treatment affected "more extreme" attitudes toward hypermedia. Fifteen practicing and prospective teachers participated for over 15 weeks in the study. Those individuals with more prior knowledge had markedly the lowest self-based concerns (awareness of program and instruction, management, and informational concerns) and the highest externally based concerns (consequences and refocusing concerns) as well as being the lowest-growth group. The researchers found that those who come into the program with a lot of knowledge were not as concerned with the self-based concerns and in turn wanted more from the externally based aspects. Schema of print and hypertext added to the understanding of text. In addition, print and hypertext were suggested to have fundamentally different characteristics.

Characteristics of Print and Hypertext

There are great differences between print and electronic media. The reader should recognize the elements of text structure. Many readers know the language of the computers as a first discourse language, because they have used it, albeit, without formal instruction for many years. Other readers will have some familiarity and use it similar to second discourse language. Still others will have no experience in the text differences and

treat the computer as a foreign language. The following chart identifies some of the

differences between the two types of text.

Print and Hypertext Characteristics of Print and Electronic Media

	The Print Media	The Electronic Media
Heart of the Media	Found in hard copy on paper; organized into a single hierarchical linear thread; had a definite beginning, middle and end; alphabetic prose; two dimensional; fixed and indelible	Found in pixels on the monitor; multilinear and three dimensional with time as the third dimension; non-static, unstable; unpredictable, and malleable; no guarantee of stability
Layout	Text intensive; sequential format; sentences to paragraphs to pages to book; left to right and top to bottom; earlier context helped build on later context; cumulative knowledge	Non-text intensive; parallel or network format; nodes to another node or links, nodes or fragments of information; association links between nodes; no standard direction; a rhizomatic or fractal network; pictorial or mixed multimedia representation; menu driven; more color and graphic content with a variety of fonts and arrangements
Structure	Bound to logic by syntax; visible words and structure; followed author's predetermined path; permanent; learner control; easy access	Tied together by theme; varied combinations of text, graphics, sound; no center or final version; limitless information; modifiable, enhanceable, linkable; searchable, collapsible and collaborative; novel; medium control; more difficult access
Interpretation	Author's interpretation of an event or phenomena	Multiple and varied views of an event; free access to multiple kinds of evidence and perspectives
Audience	Defined; clear	Unknown; eroded authority of text and author (Bolter, 1991; Landow 1992)
Authoring	Claim to special authoring; editorial board or editors; a long publishing time; "authority" authors	Multiple authors; unknown authors; no board of reviewers; no content policies; no qualifications or editing for authors; anyone can "publish" on the Internet; immediate publishing
Editing	Only in margins for reader's purpose	Invitation to modify; reduce, expand, disappear and move words or ideas for unknown audiences; ease of replication and distribution

Affective	Feel of book or "artifact" (weight, thickness, quality of paper); pace of reading determined by reader's focus and comprehension; guarantor of knowledge	Computer feel; cultural based; value-laded; freedom of choice; encouragement to move fast and non-sequentially; production of text into speech and speech into text; individualized potential; assistance possibilities
Print	Fixed, static; page only contains so many words	No boundaries; expanded, condensed and edited into a new format; less shown information per screen than on page
Reader	Traditional training procedure; passive procedure, abstract	Interactive procedure; decision on scope and sequence; control of topic and purpose; higher level of interactivity; alternative approaches; manipulative
Navigation	Key words, chapter headings; 26 alphabetic keys	Movement controlled digitally; 72 standard keys and with additional combinations can navigate and change more
Text and Graphics	Linked in a controlled pattern; graphics supports text.	Graphics embedded and anchor the links to other pages; graphics were as important as text; screen reading can be more difficult

Reinking (1992, 1994); Duchastel (1988); Anderson-Inman (1998); Birkerts (1994); Selfe (1989); Kerr (1989); Jonassen (1986).

There are also different text structures which a hypertext reader should understand. Nelson (1986) wrote about four different types of hypertext concepts. The basic procedure, almost sequential in nature, provided choices by linking from one link to another. The second type is collateral where information is obtained quickly and easily by looking at parallel structures with differing perspectives. It could be two screens side by side with differing text. The third type of structure is the stretch text where clicking on an icon or word the "text" expands to more details or explanations. This is similar to a trunk of a tree branching to the smallest leaf. The fourth type of structure is the grand hypertext where everything about a subject or position can be found in a single system.

There are also hierarchical arrangements of the text structures. In the first way, information can be node-linked or chunk-linked. It is menu driven and the reader can click on an icon or word and link into another node or chunk. This is almost "linear" in movement. The second way is a structured hypertext where sets of nodes or chunks can be accessed from another set of nodes or chunks. There are usually an introductory block and many choices from which the reader can select and proceed to another set of choices. This has the multiplicity of paths. The last arrangement is the hierarchical hypertext. This is similar to the branching of a tree, where there are endless details and possibilities. These structures and arrangements are common on the Internet and found in many software packages.

The structure and arrangement, as well as differing characteristics of print and hypertext, can affect the reader's perception of the print. The reader should know the intervening elements in order to get the full meaning from the print or hypertext.

Print and the Importance of Text Structure

Text structure is defined by Meyer and Rice (1984) as interrelated ideas conveying a message to the reader. Some ideas can be important to the author's message but others are not. Some can be directly related to readability such as sentence length, vocabulary density or rarity, and idea density. Other ideas are related to the structure and organization of the passage. Some are in the micropropositions (sentences and smaller bits of information, macropropositions (topic or gist importance), and the top-level structure (Kintsch, 1988). Lorch (1989) states that signaling cues as titles, headings and

subheadings, repetition of content, previews or summaries, function indicators, relevance indicators, enumeration devices, and print cues are all important in improving comprehension. A reader's schema of text structure affects the reading level of the reader.

The following 12 studies show the importance of text structure within the print domain. Walker and Meyer (1980) found that relevant facts in memory facilitated integration of content structure. Subjects read various aspects of life in a mythical country. The variables were the "height" of the content structure and the integration during acquisition and retrieval. They found that information high in the structure was more likely to be integrated than information lower in the structure. Inferences found high in the structure were judged more true than those in the low part of the structure and related information presented together was more apt to be remembered than information presented separately.

One hundred two ninth graders in a western junior high school focused on the organizational structure of the text. Meyer, Brandt and Bluth (1980) divided the subjects into good, average, and poor comprehenders on the basis of a standardized test. The subjects read two well-organized expository texts with top-level structures--one with explicitly stated signaling of the structure and the other without any signaling. The results were that those students who used top-level structure strategy recalled much more information than the students who did not use the strategy. Only half of the students used the strategy on at least one of the passages and 22 percent used the strategy on all the passages. The students who used the strategy were more apt to be high in reading

comprehension skills. The researchers felt that the use of the strategy provided the students with a systematic learning and retrieval guide.

The awareness of text structure in good and poor readers in an elementary school was studied by McGee (1982). Sixty third- and fifth-graders from four elementary schools participated in the study. A booklet of two practice passages and two recall passages was given to the subjects and they were asked to read a passage, do a math problem, and recall the passage. Good fifth-grade readers were more aware of text structure and recalled more information than the third-graders. Poor fifth-grade readers had some awareness of text structure and recalled more information than the good third-graders. Good third-grade readers were not aware of the structure of the text and recalled more subordinate facts than superordinate facts. Text structure was an important strategy for recall.

The effect of text structure instruction on 114 seventh-grade students from a suburban junior high school was researched by Taylor and Beach (1984). Instruction on text structure was effective in enhancing students' recall for relatively unfamiliar information. The important awareness of text structure had a positive effect on students' expository writing.

The enhancement of text structure instruction was studied by Fitzgerald and Spiegel (1983). From a pool of poor readers, 19 fourth graders who had the least developed knowledge of story structure were assigned to a treatment group and a control group. The treatment group was given instruction in schematic features of narratives while the other group received instruction primarily in dictionary usage and word study.

This study showed story instruction did improve comprehension and story structure knowledge.

Expository materials were again studied by Englert and Hiebert (1984). Seventy-six third graders and 70 sixth graders in a small southwestern town were the subjects. The students were grouped into high, medium and low ability readers. The four text structures were comparison/contrast, descriptive, enumerative, and sequence. The sixth graders detected differences in the text schemata and incoming information better than third graders. They could pick out the items that did not belong in the paragraph. Better readers did better than the medium and low ability readers. The authors stated that knowledge of the structures facilitated comprehension.

Garner, Slater, Alexander, and Hare (1986) examined children's knowledge of structural properties of expository text. Fifteen average readers in each of the third, fifth, and seventh grades participated in the study. The subjects were tested in three areas: topical relatedness, superordination, and cohesion. The seventh graders explained the structure of a paragraph, excluded irrelevant information and cohesively arranged parts into a meaningful paragraph. All students could identify paragraphs and group parts into short texts. Younger students knew less about structure than older students.

The reaction of intermediate grade children to contextual clues was measured by Rankin and Overholser (1969). Two hundred eight intermediate grade students from a southern elementary school were divided into upper, middle, and lower groups according to a standardized reading test. Reading ability predicted the utilization of the 13 contextual clues and the differences among grade levels can be attributed to the differences in reading ability. The 13 contextual clues (definition, inference, expressions,

mood, clue words, inference, past experiences, synonyms, direct explanation, figures of speech, modifiers, associations, familiar expressions) for intermediate grade children varied greatly in difficulty. The authors felt that sensitivity to these contextual clues made a difference in comprehension.

Richgels, McGee, Lomax and Sheard (1987) tested 56 sixth graders with awareness of the four expository text structures and their recall. Six passages were written in each of the four structures (collection, causation, comparison/contrast, problem/solution). A graphic organizer was also developed for each structure. Written recall, organization in composition, and interviews were used to evaluate the awareness. Comparison/contrast had a high awareness while causation had a low awareness. The important finding was that structure-aware students were more ready to use a structural strategy while reading. The researchers suggested sixth grade students benefited from instruction on how to process information strategically.

Samuels, Tennyson, Sax, Mulcahy, Schermer, and Hajovy (1988) randomly assigned 143 college juniors to either a group receiving information on the organization of a scientific journal article or a control group receiving no information. After the reading, the students wrote down everything they could remember. The result showed a significant positive difference for the students with the knowledge of text structure. The structure aided in storage and recall of information.

Print signals were studied by Golding and Fowler (1992). One hundred eight psychology students were the subjects in the study. The topic was solutions to energy problems. Two versions of the text were constructed-one with a signal version of an overview at the beginning of the chapter and each major section, and the other with no

signal overview. In the two experiments, the first discovery was that the presence of the signal did not lead to better performance on the comprehension test, unless the subject was directed to the signal. The second finding was that the signaled information was recalled better than nonsignaled information.

Text structure with interaction of knowledge could affect learning from a history text. Voss and Silfies (1996) included forty participants, all but two were from a college class. The participants read passages about two different imaginary conflicts (A & B) in the world. Each conflict was written in two ways. One passage, an unexpanded text version, explained only facts about the events leading up to a war. The other was an expanded text which included causal factors relating to the events. The forty participants were divided into groups of ten. Group one read expanded A and unexpanded B. Group two read unexpanded A and expanded B. Group three read expanded B and unexpanded A. Group four read unexpanded B and expanded A. After they completed the reading, the groups were given a comprehension test. The researchers found that reading from an expanded version was more related to reading-comprehension skill and not prior knowledge. Reading from an unexpanded version was a function of prior knowledge. The participants with the expanded versions had more recall and better essays. The participants with unexpanded versions had to use more prior knowledge to correct responses and create a quality essay. The authors state that the more developed the text, the less the reader has to rely on his prior knowledge to make sense out of the text.

Hypertext and Research

Little research has focused on the relationship between technology and reading (Leu, 2000). Most of it has been in the area of adult performances, computer-assisted or mediated instruction, learning outcomes, and learning outside of the classroom (Kamil, 1997). Reinking and Bridwell-Bowles (1991) stated there is little research because it is a relatively new field of inquiry and because of the rapidity of technological changes. They contended the interest was there, but there was no hard evidence either positively or negatively in the use of technology. Leu (2000) discussed historical and social context of changing technologies and literacies. He noted that observations about the use of technologies to support literacies are inadequate because of the rapidity of changes within technologies. Kamil, Intrator, and Kim (2000) concurred there is not a wealth of research in the area, but there is a great potential in the application of technologies to learning.

Six meta-analysis studies looked at the effects of computer-assisted, computer-based instruction, and multimedia. Each of the studies reported positive effects from each type of computerized program. Kulik, Bangert, & Williams (1975) conducted a meta-analysis of 51 evaluations of computer-based teaching at the junior and high school levels. The information for computer-based instruction came from ERIC, Resources Information Center, Comprehensive Dissertation Abstracts and Psychological Abstracts. Almost all of the studies were in the drill and practice areas, tutoring, computer-managed teaching, simulations and programming. The findings also showed both a positive growth in test scores as well as a positive attitude toward computer learning and coursework.

Computer-based education in secondary schools was researched by Bangert-Drowns, Kulik and Kulik (1985). The authors reviewed 42 studies related to Computer Based Education at the secondary level. The findings were that computer-based secondary school teaching was generally positive and attitudes toward computers and instruction improved. The researchers asserted that different types of computer-based teaching have different effects. The computer-assisted or computer-managed instruction was quite effective while enrichment computer activities on student learning were not. The degree of effectiveness was the greatest with disadvantaged or low aptitude students.

Niemiec and Walberg (1987) also reviewed computer-assisted instruction. They reviewed 16 studies in this area and stated that moderate increases in achievement were found when using microcomputer-based studies.

A meta-analysis of computer-assisted instruction by Fletcher-Flinn and Gravatt (1995) showed no learning advantage over traditional forms of instruction. They analyzed 120 studies in computer-assisted instruction. The advantages were in the quality of the program material instruction.

Results from studies comparing the effects of hypermedia and traditional instruction were conflicting. A meta-analysis of 35 studies by Liao (1998) suggested that the effects of using hypermedia instruction, particularly in achievement, were positive when compared to the effects of traditional instructions.

Dillon and Gabbard (1998) in their meta-analysis of 30 on learner comprehension, control and style within the hypermedia context found three strands of research. Strand one was that hypermedia should be used when searching, manipulating, or comparing visual detail or when the overlaying of images was necessary. Comprehension was not

significantly increased. Strand two had to do with control. Students reacted to the control differently; lower ability students had the greatest difficulty. Only the high ability students seemed to be positively affected by the ability to control pace and delivery of information. The high ability students stated the preference was being in control of the learning. Strand three was about learner style. Higher ability students performed better than low ability students in all instruction. The advantages of text-assisted or mediated materials and cuing helped the less-able students do better.

A meta-analysis of interaction with hypertext was conducted by Chen and Rada (1996). They found that among the 23 studies about hypertext the findings from the higher diverse studies were not consistent. Two generalities were described. Users doing open tasks benefited from hypertext. Overall hypertext user performances were more effective than non-hypertext users. The researchers called for interdisciplinary collaboration among computer science, psychology and education to develop quality research products.

Few studies can be found on the relationship between print and post-hypertext materials to measure comprehension. Only a few research studies focused on reading and many of those studies were found in technology journals. Many studies have been also criticized for methodological and conceptual shortcomings. (Reinking, 1991) Most of the research was developed when technology was just coming into the education field. Unfortunately research in the hypertext or post-typographical area of reading is either lacking or inconclusive.

Hypertext and the Importance of Text Structure

Other factors in hypertext structure have to do with topography and other graphic designs that affect the appearance of the text. The differences between text in a book and hypertext on a screen can be significantly different to the eye. Text in a book usually progresses in a linear fashion from one paragraph to another paragraph in a single series of top down steps. Screen hypertext can be in a linear fashion like a book but can also be nonlinear with parallel screens side by side with differing text or branched multiple nodes. Research on learning with and in nonlinear environments is limited. Goldman and Rakstraw (2000) stated that the difference in text structure in print and hypertext structure was the process by which the reader of the hypertext restructured the text. Gillingham (1993) claimed that literature on hypertext was lacking but research on linear text demonstrated that well-organized or well-structured text was easier to read than ill-structured text. Characteristics of well-structured text included topic sentence for the first sentence and additional sentences supporting the main idea. This structured format applied to larger writings as well.

The following five studies focused on hypertext structure. Reinking, Hayes and McEneaney (1988) studied good and poor readers' use of explicitly cued graphic aids. One hundred sixty-seven seventh- and eighth-grade students in a rural high school used their regular English class time to read and study passages as they would their school assignment. Then they were asked questions about what they had read. One set of expository passages had two graphics-one which was redundant and one non-redundant but related to the text. Another passage had no graphic aids. The remainder of the

passages had graphic aids with varying levels of cuing: none, general, specific and combined cuing. The researchers discovered that cuing increased the attention to the graphic aids, and particularly to the redundant graphic. The explicit cuing of graphic aids especially helped poor readers' comprehension.

Guthrie, Britten and Barker (1991) investigated the effect of the role of document structure, cognitive strategy and awareness in searching for information. Twenty-six undergraduate students in an educational psychology class participated in two studies. Study one was to see if the information in table, directory, or prose format on a computer altered the time element. Looking for information in a table or directory format was quicker and more accurate. Students used more time on category selection and less time on extraction. In study two, they wanted to see if the students who were more aware of search processes would be more efficient in search tasks. The researchers hypothesized that students with a highly developed goal orientation system performed quicker and more accurately on the tasks. They discovered that students with erratic strategies showed a lower awareness of the category selection and goal formation than students with efficient strategies.

Gillingham (1993) had 30 adults reading in hypertext about cosmology. He discovered that successful readers only read the important nodes of information and read them for a longer period of time. The strategies used by successful and unsuccessful readers were very different. Reading for depth was discovered to be more successful than reading for breadth. Comprehension failed, or was less successful, with the adults who were unfamiliar with the hypertext format. Gillingham believed that knowing the

hypertext structure, looking for information in depth, and "reinspecting" the answers were strategies which should be taught.

Dee-Lucas and Larkin (1995) investigated the effects of structured and unstructured overviews on learning from electronic text. Forty-five undergraduates, with limited knowledge of physics, studied in one of three treatments-traditional print, electronic print with structured overview, or electronic print with unstructured overview. Either overview was more effective and resulted in greater recall. The structured overview was more effective than the unstructured overview because it was easier for readers to recall and use, and it increased the amount of review. The researchers felt that because the electronic text was already fragmented a systemized organizational aid to help readers structure text was needed.

With a series of four experiments involving hypertext and using 48 to 72 psychology students from an eastern university, Wenger and Payne (1996) discovered reading hypertext required subjects to make sequencing and navigation decisions as well as predictions about the relationships among the various topics. In two experiments, they generally found that reading hypertext was not more demanding than reading linear text. In two more experiments, they stated a reorganization of processing resources must be discovered in order to use hypertext.

Reading and Hypertext

Papert in *Mindstorms: Children, Computers, and Powerful Ideas* (1980) claimed that learners absorb and remember more when they, themselves, figure out the

underlaying principles of the lesson. He stated that multiple viewpoints and discourses, along with debate and dialogue among students, should be included in this style of learning. Knowledge is constructed through the integration of reader's prior experiences with schema and text structure within different and multidimensional forms of hypertext. There are nine studies featuring hypertext.

Reinking and Schreiner (1985) used 364 fifth and sixth grade students from an urban elementary school to evaluate the effects of computer-mediated text on measures of reading comprehension and reading behavior. Six short expository passages were adapted by using vocabulary and comprehension probes. The four experimental conditions were: the different combinations of presentation (the printed page or the computer), the availability of the computer mediations, and student control of the mediations. He found that comprehension of good and poor readers was affected by providing textual mediations. Students who had the choice to mediate text scored significantly higher than students who had no choice. Reinking suggested that students at this level might need the mandatory external control of probes to gain the most from comprehension.

Tobias (1987) found that the mandatory text review group on the computer outperformed three other groups in comprehension. One hundred forty students in an urban high school were randomly assigned to read a passage on a screen in one of four groups. Group one had an adjunct question after each screen. Group two's screen indicated when the adjunct question was incorrect, a mandatory review of the preceding screen material was made and upon the fourth prompt the correct answer was given. Group three's screen was similar to group two but a mandatory review of the easier material text was given. Group four was given no adjunct questions but students could

use any of the previous options. The mandatory-review group outperformed the other groups. The researcher believed that the participants' use of their reported reading strategies was not effective but that external intervention could increase comprehension.

A comparison of reading comprehension using print and microcomputer presentations was studied by Fish and Feldmann (1987). The subjects consisted of 36 advanced doctoral students and 23 masters students ranging in age from 23 to 60 years. The subjects were randomly assigned to microtext or print conditions to read two types of reading material, informational and directional. Microtext proved to be a viable alternative for classroom activities such as reading comprehension, testing, and drill and practice. During a forty-minute period (similar to a high school or junior high school class period) the performances and comprehension did not differ in minimally different presentations of printed and electronic texts.

Thirty-three fifth and sixth-grade boys and girls in an urban elementary school were divided into four groups, read six 140 to 180 word passages and were then given a six item multiple-choice test (Reinking, 1988). Group one read passages on printed pages and no assistance was given. Group two read passages on the computer screen and no assistance was given. Group three read passages displayed on the screen and could choose from options for assistance. This was called the select-options group. Group four read from the screen but were required to view all the options. This group was called the all-option group. Higher comprehension scores, plus greater reading times, were found in the select-options and all-option groups. The four groups did not differ in the preference of the style of reading. The researchers believe that when readers had options for

acquiring information or were able to control their processing of the text, they outperform subjects in either of the read only modes.

In a study entitled: "Effects of the Hypertextual Approach versus the Structured Approach" (Lanza and Roselli, 1991), 60 undergraduate students in an introductory computer course were divided into homogenous groups. The materials were personal computer instructional systems for the Pascal programming language. The mode of difference was the flexibility of control and choice while learning the material. The study program based on a hypertextual mode did not enable students to achieve a better performance than the group exposed to a structured instructional mode. The researchers suggested that the hypertextuality mode could be better suited to students with greater ability, more motivation, or maturity. Answers on a questionnaire found 63 percent of those students with the structured instructional mode found their program boring or unattractive while 76 percent of those with the hypertext found the program stimulating and attractive.

Rice (1994) measured reading comprehension using a paper and computer presentation. One hundred twenty undergraduate and graduate students volunteered to participate in the study. The subjects were divided into four groups: group one-causal passage, print; group two-causal passage, electronic; group three- collection type, print; and group four-collection type, electronic. The results were that collection type passages were better than causal in immediate and delayed recalled situations. The means of presentation were found to be not significant.

In a study by Mioduser & Marin (1995), 86 sixth graders in a computer-based environment in a public school in Costa Rica were in two classrooms. One classroom was

given instruction on building hypertext tree-like representational structures. The control group continued in traditional computer studies. This study indicated that these symbolic structures can be modeled and taught successfully, and the results showed performance at a higher band of cognitive processes in analyzing, organizing, and representing knowledge.

Mandinach and Cline (1996) described positive effects on pre-college students' cognitive and motivational processes in multi-year research. The software system thinking approach contained two elements. One was the study of the behavior of systems, and the other a simulation and modeling of processes. This software system thinking approach was used in a secondary school curriculum to teach content-knowledge and general problem-solving skills. Able and at-risk students were positively affected by the system approach software. This computerized application provided opportunities for students "turned off" by traditional methods to practice instructional activities in real-world experiences. Teachers reported substantial improvement in motivation and self-esteem. The researchers believed that the increased motivation could be due as much to the computer-based medium of instruction as to the systems-based activities. This constructivist learning-centered environment created by the systems thinking project has implications for research and program design.

Twenty-six computer literate third graders and 36 computer literate fifth grade students were assigned randomly to two groups. Group one read a text displayed on a screen and group two read a traditional printed text. No significant difference was found in comprehension but a definite positive attitude was found with the computer participants. The third and fifth grade readers more often liked and enjoyed stories

presented by the computer even though these stories were identical to those presented on printed pages. Gambrell, Bradley and McLaughlin (1997) recommended materials on the screen for children as young as age eight.

Motivation and positive attitudes were outcomes from the above studies (Lanza & Roselli, 1991; Mandinach & Cline, 1996; Gambell, Bradley & McLaughlin, 1987). Salomon (1984) believed that learning was the amount of mental effort invested which was motivated by the learner's perception of learning within a particular instructional medium. If the learner thought it was more difficult, then more mental effort was invested.

Healy (1998) stated that positive outcomes occurred to a group of 125 "at-risk" New York City students when given computers and on-line hookups. These positive outcomes affected withdrawn students conversing on-line, a substitution of Internet research for TV, and higher enrollment in college preparatory courses. Leu (1999) believed that hypertext generated greater interest and motivation and thus comprehension for students. Nicaise (1998), in her work on cognitive research, stated that student motivation, task persistence and learning increases by constructivism. Shabo (1997) added that by integrating constructivism into hypermedia programs, learners were more active and accountable for the learning, and made them construct knowledge in their minds.

In summary, comprehensive research states the importance of schema theory and text structure for reading print. Over 24 studies were cited as to the importance of schema theory and text structure for the print area. Generally, readers had more success in reading when they had the schemata as well as knowledge of text structure prior to

reading. In contrast, research on hypertext or post-typographic print is scant. Only one

study addressed schema theory and five studies were related to hypertext structure. Many

of these studies did not relate to the schema and hypertext structure. Quality and

extensive research in the areas of schema theory and hypertext structure is needed.

CHAPTER III

METHODOLOGY

This chapter describes methodology, setting and participants, procedure, instrumentations, data collection data analysis procedures, and trustworthiness of the study.

The methodology was based on the participant observation form of study where the researcher is accepted as a natural part of the classroom culture in order that observation could be part of the natural part of the classroom day. This decision of methodology was formulated on the characteristics of participants, studied topic and characteristics of the researcher.

The researcher watched, listened, and looked for knowledge, similar constructs, or behaviors among the participants. The researcher, by being the teacher in the process as well as the researcher, interacted with the participants by asking questions and probing for additional self-reflective information. The researcher, through observation of verbal and non-verbal communication, studied the outcome and evaluated the variety of responses from the students in either oral or written formats. The researcher also looked for the meaning of the experience. In addition, the participants engaged in the process by actively interacting with the researcher and the lessons. Participant observation combined with interviewing, field notes, taped reflections, student journaling and a student product

showed an understanding of how fifth grade students handled expository hypertext structure. The research was practical and could be applied easily by teachers in their existing curriculum and within their natural environment, the classroom. The research was relevant to and valued by students (the *informed* active participants) and the teacher (the *participatory* informant). The research was a part of the normal activity and did not take away from the educational goals of the classroom.

The researcher spent more than 33 years in public elementary and middle school education. For more than 20 years, the researcher, a reading specialist, had an interest in the role that prior knowledge and text structure played in the reading process. Within the last four years the researcher developed an interest in the role that hypertext plays within the reading learning process. Because of familiarity with the physical environment, experiences, curriculum, standards and benchmarks, and procedures of the fifth-grade classroom, a fifth-grade classroom was used in the district where she taught for over 20 years.

Instructional/ Research Setting

Finding a population which had at least average reading skills and functional computer literacy was difficult, however, a classroom of 18 students in a large Midwestern city met these two objectives. The students from the prior year's standardized testing were average or above average in the reading areas. The educational practices within this classroom and school district were exemplary. The school district had developed an extensive technology program starting in 1997. The school district had

seen many changes over the last 20 years. The school district currently has a population of 110,259. It consists of one large city of more than 80,000 people, and two other smaller towns. The school district is actually the fifth largest in the state. The school has a 5-3-4 system where the elementary school goes from pre-kindergarten through 5th grade, the middle school is 6th through 8th grade, and senior high from 9th through 12th grade. Approximately 19,872 students are distributed through the 24 elementary schools, five middle schools, one 6th-8th grade charter school academy, four high schools, one high school technology academy, one special education center, three elementary charter schools and one Head Start Child Development center. In addition to the public schools there are 12 parochial elementary schools, two private elementary schools, one parochial middle school and two parochial high schools. The school district also has three higher education centers within its borders. One was an undergraduate college from a major university, another was a private liberal arts college, and the last was a vocational center.

Twenty years ago, the economic base in the district was strong. A major automobile manufacturing center dominated the city and jobs were plentiful and well paid. Unfortunately, in the 1980s, the auto manufacturer decided to close the entire operation in the city. Subsequently related service and supply businesses suddenly closed. The city lost its only sound economic base and the numerous peripheral businesses that went along with it. Since then, however, the city has restructured its economic foundation with more than 150 industries.

The economic needs of the students have also changed. When the school was built, the autoworkers and other parents whose children attended the school had good jobs and there were almost no reduced or free lunches. During the last year students on

reduced lunches composed 23 percent and students on free lunches composed 15 percent. Fifteen percent of the population identified themselves as a minority. Twelve percent are Afro-Americans and three percent are American Indian. On the state assessment, the percentage of fourth graders performing at or above average on the standardized tests are 97.8% reading, 100% language, 100% mathematics, and 100% science. The attendance rate is around 95.7 percent for the 411 enrolled students. The school, built in 1962, is laid out on one level with four sections of the building forming a square enclosing an open area. Inside the open area is where the PTA planted trees and flowers for a garden. On the north side of the square are the principal office, the gym, and what was once the all-purpose room. The primary wing of the school is on the east accompanied by the computer lab. On the south side are the library and the kindergarten rooms. The upper level classrooms are located on the west. The music and reading teachers go to the classrooms for their lessons. The all-purpose room is now two rooms separated by a portable divider--an art teacher has one half and a classroom teacher has the other half. The physical education teacher shares the gym with the lunchroom shifts. Every closet and space within the school is used for offices, classrooms, and learning/study areas.

The school has also two other active programs within its walls. It has a full-inclusion school for 20 students who have been identified as having special educational needs including autism, mental disability or some type of learning disability. It has a school within a school of about 100 "enrichment" students in grades two, three, four, and five. The majority of these two additional "schools within a school" are bussed to this site from the northern half of the district. The school's staff is made up 29 teachers, four educational assistants, two and a half custodians, one principal and one secretary.

Participants

The classroom where the research was conducted consist of 18 fifth-grade students. The teacher and principal volunteered this classroom for the study. The parents and students signed permission forms for participation. Most of the ten girls and the eight boys attended this school since second grade. The ethnic diversity and the economic needs of this classroom are very similar to the school as a whole. Fifteen percent of the classroom population identify themselves as belonging to diverse ethnic groups including one Afro-American, two Asians, and one American Indian. The classroom has four children receiving free or reduced lunches which consists of about one-fifth of this classroom population.

The computer experience for the students of this school was similar to the computer experiences across the district. Each classroom was allotted one hour per week in the computer lab for classroom teacher guided computer experience. Additional minutes from the "open" times could be checked out by the classroom teacher or by individual students. This particular lab contained 29 iMacs, all with Internet access. At the primary levels the computer practices were usually drill and practice. A six-week keyboarding course was offered in both third and fourth grades. This elementary school purchased a set of AlphaSmarts which the teacher can roll into their classroom for additional "computer" time. Four computers with Internet access were located in the library/media center. Each classroom had an allotment of two computers. First and second grades pooled their computers for a mini-lab where a parent, when available, monitored the students using the computers. The rest of the classes had their computers

on a cart in the classroom and occasionally these computers were "borrowed" by another classroom teacher for additional computer time. Only four classrooms in the intermediate wing had Internet access at the time of the study.

The students in the research classroom were good readers and met the assigned district benchmarks. The school district recorded competency on language arts and information benchmarks starting in the fourth grade. The fourth grade students met several reading benchmarks about expository text. They identified main points and details in expository text as well as understood the basic expository text patterns: definition, chronology, and comparison/contrast. These students used the arrangement of text and graphics to gain meaning as well as the features of books to gain information. They accessed prior knowledge to understand the reading selection. They used print and electronic resources as reference tools. In the language arts area the fourth grade students organized expository writing to include introduction, body and conclusion and wrote a report that develops a topic using subtopics, details, and examples. They used reference materials and technology as tools to develop writing.

In fifth grade, besides the continued development of the fourth grade benchmarks, the students applied knowledge of basic elements and patterns of nonfiction to understand expository text: main topics, subtopics, details, listing pattern, sequential pattern, and compare/contrast pattern. The students understood the basic characteristics of various types of literature including fiction, personal narrative (biography and autobiography), essays, and factual articles. In the language arts area, the students continued the fourth grade benchmarks and, in addition, wrote a biographical piece, a multiple paragraph

persuasive piece, and an extensive report using subtopics, details, examples, and explanations (cause/effect).

The fourth and fifth graders in information literacy knew how to use and locate sources of information. The students selected relevant information, organized and interpreted the selected information, and communicated and evaluated the results of the inquiry. The school district assigned an expository research project as the main means to meet these benchmarks. All of these benchmarks related directly to print (nonfiction or information books and resources), yet no benchmarks extended into the hypertext media. The classroom teacher's checklists on the school district's standards and benchmarks for language arts and technology indicate the students had been exposed to or had mastered the fourth and fifth grade competencies.

The knowledge and use of print and hypertext structures were based primarily on the district's comprehensive goals and benchmarks for reading and technology. The students were provided a strong base of schema to allow them to succeed in reading and technology through the district's and school's language arts and technology programs. But the students were different. They had different abilities and different opportunities.

The differences among the students were accentuated by both the financial background of the parents and the number of parents in the home. In addition, the access of students to a computer outside of school varied. Ed (pseudonym), a member of a single parent household, did not have a computer at home, but he went to the library to use one, and used his father's during visits at his home. The children whose parents were dentists, lawyers, and business owners always had computers in their home. Gabriella (pseudonym) said her family had a computer ever since she was born. Ty (pseudonym)

said he had had a computer "forever" and had just gotten a new one. S.S. (pseudonym) stated that her father was a "computer whiz" so they got a new computer every year or so. She said they have about five computers because her father works on them, but that only two work. All of the other students have had a computer at home for about two or three years, with the exception of one student who has only had a home computer for one year.

All but four of the students with computers at home have Internet access. This seemed to be wholly related to the financial ability of the parent or parents. The children of the more well-to-do parents only had not the Internet access, but other specialized software and CD's.

Three students stated in the pre-interviews that they use their home computers for schoolwork as much as three hours each week. Three stated they didn't use the computers at all for schoolwork. They indicated they use the computer for assigned project research and to type lengthy reports. Only about a third of the students use their computer's word processor to type daily homework.

The students were also influenced by other family members' use of the computer, particularly their siblings' use. It was clear that older brothers and sisters were most influential in instructing their younger siblings not only on the operation and nuances of the family computer, but in locating chat rooms and the location of other information sources. About a third of the children were fortunate to have parents who use computers in their work, and who were particularly knowledgeable about computer usage. The students whose family members did not know about computers learned either from friends or, most often, from the classroom instruction they received.

Procedure

The researcher obtained parental and student permission, took field notes in observations, conducted pre-interviews, taught lessons using computers, conducted post-interviews, and reviewed taped reflections, student journals and products.

The research was completed in the fall semester of 2001-2002. First an introductory letter and permission form (Appendix A: Parent Letter) were sent home to introduce the researcher and describe the purpose of the study and its procedures. The researcher met with any parent who requested additional information. Telephone calls or personal meetings were held as needed.

After parent and student permissions had been received, a pre-interview was held with the student. The interview was audio taped. At the introductory interview, the researcher asked about the student's use of print and hypertext. The interview consisted of three main parts: the student's computer usage in the home and at school, the student's assessment and use of print expository text, and the student's assessment and use of hypertext expository text. (Appendix B: Interview Form).

Observations were conducted during computer classes, reading classes, research periods, reading for content areas, and library usage times to see how the students used their schema of text structure in print and hypertext formats. The students agreed to reflect about the declarative, procedural, and evaluative portions of using print and hypertext structures in their journals and during taped reflections.

The research was conducted in a way that did not disturb the normal routine of the classroom. This instruction was held within one of the two classrooms made from the all-

purpose room of the school. It was unique in that on the north end of the room was a full stage with curtains and stage lights. On the south wall was a small chalkboard and two bulletin boards. Sixteen student desks were arranged in a large horseshoe with three desks in the center lined up along side the teacher worktable. The teacher's desk was along the west wall and the two computers were on the east wall. There was no telephone jack and the room had only four electrical outlets. The classroom had books, science equipment, and displays on tables and along the front of the stage. Student work and student displays were taped or stapled on the walls.

The laboratory consisted of 19 iMacs arranged around the outside wall and ten in back to back rows down the center of the room. Each iMac was connected to the Internet. The researcher worked around the computer lab time for the research. One hour a week was the scheduled computer classroom time for the class. Additional times were arranged during the computer laboratory assistant's lunch and break times when no classes were scheduled regularly.

A unit plan was developed which included content standards and benchmarks, complex reasoning activities, lifelong learning standards, key questions or assessment methods, strategies for addressing attitudes, differentiation of curriculum, performance assessment, instructional materials and supplies and support personnel (Appendix C: Unit Plan). The daily planner stated that the teaching part of the unit was ten forty-five-minute periods. The performance objective was that each child, either as a zoologist or biologist, must select the fifth living object that best represents the uniqueness of Earth life to include in NASA's 2004 probe to Jupiter's moon, Europa. The assessment was the creative project that showed this life form and its uniqueness. Any project, print or

electronic, could be created. (Appendix H: Product List.). The students as a class and individually developed the evaluation matrix. (Appendix G). The researcher selected the first four living forms to use in the teaching unit.

Daily Schedule

This series of lessons emphasized the aspects of hypertext structure. Six of the 12 sessions of 45 minutes were discussions and applications which provided the background information about electronic text and in particular, the Internet. Discussions and practices about declarative aspects of hypertext continued for the first two days. The students gained information about the physical aspects of a screen page-the layout and the role of pictures and varying fonts. The next two days included the procedural aspects of a screen page-the flowchart of the hypertext and the reading clues that guide the reader. The last two of the six instructional days covered the evaluative aspects of hypertext. The students evaluated the author and editing process, the copyright date, and the permanency of hypertext.

The sessions took 12 days. Day One described the introduction to the study and unit. On Day Two, the students studied details of text structure in print and hypertext layouts. Characteristics and a layout of a webpage were also analyzed. On Day Three, the students went to the laboratory and used the iMacs and they applied their knowledge to a HyperStudio stack on the blue whale.

Then the procedural aspects of the webpage were studied. On Day Four, navigation aids were discussed. The layout of a website was discovered to be linear,

branched, or a combination of both. Flowcharts were illustrated. Students looked at a

variety of introductory pages of websites and deduced if the layout was linear or

branching. On Day Five, the students went into the laboratory and used a HyperStudio

stack on tubeworms to decide the stack's structure and draw its flowchart.

The last two instructional days covered the evaluative aspects of hypertext. On

Day Six, the students in small groups discussed the aspects of a good website. They used

printouts of four different sites about coyotes and evaluated the sites as to writer,

audience, layout, graphics, publishing date, and extras. The sites used were

http://www.nationaltrappers.com/Coyote, html,

http://animals.about.com/science/animals/library,

http://www.bright.net/~swopejak/coyote.htm, and

http://www.geocities.com/TimesSquare/9560/thecoyote.html.

The first site, http://www.nationaltrappers.com/Coyote, html, written by the National

Trapper Association and Furbearers Unlimited, contained no advertisements other than a

book from which the graphics of tracks and range were taken. The presentation was

divided into sections of Introduction, Description, Reproduction, Habits, General, and

Other. Each section had four to nine paragraphs about coyotes. Three graphics on range,

tracks and coyote were also included.

The second site, http://animals.about.com/science/animals/library, was similar to

an encyclopedia article with a colored graphic and colored text, but it was only about a

printed page in length. This four paragraph article was enclosed by numerous

advertisements. One set of links at the beginning of the article consisted of a list of

additional animal paragraphs which the sponsor, About.com, featured. The links at the

end of the article were sponsored by additional companies or individuals and indicated the cost of advertising per click. The readability was about a fourth or fifth grade reading level.

The third site, http://www.bright.net/~swopejak/coyote.htm, was a website written by an individual named swopejak. The article was about one and a half printed pages and contained no graphics or links. The hypertext included information about location, parenting, and appearance. The readability was around seventh grade. This article included an e-mail address of the author.

The last site, http://www.geocities.com/TimesSquare/9560/thecoyote.html, was sponsored by geocities. Its 18 paragraphs were divided into history of species, survival, description of coyote, role of parents, man as predator. The combination of second and third person expository and practical examples made the article interesting and easy to read. It had a black and white graphic of the coyote which was used twice at the beginning of the article.

Day Seven focused on Uniform Resource Locator (URL) addresses and the clues the URL address can provide. Students were told to think of the URL as going shopping at the Mall of America. The first part of the address described the name of the mall (www) where they would find the information. The next part until the period told the name of the department store. The part of net., com. and edu. indicated the type of store. After the first slash came more information which indicates the floor of the store, the department of the store, and finally the counter within the store. Finally, the students went to the laboratory and used a Hyper Studio stack on Venus flytrap to practice the information gained about URL addresses.

Day Eight was a summary day where the students used the information from the prior lessons on a HyperStudio stack about seastars. In the laboratory, the students evaluated the layout, made a flowchart about the physical layout, and filled in an evaluation matrix about the stacks, layout, author, audience, information, date, pictures, and other extra things. Day Nine set out the challenge of the end product and the students created an evaluation matrix for the project. Day Ten and Eleven provided computer time in the laboratory to do research. Day Twelve was presentation day.

Data Collection

A variety of sources--interviews, field notes, taped reflections, student journals and a student research product–were used to obtain data for the study.

The Interviews

The first set of data was the pre- and post- interviews and extended conversations with the individual students. For the first interview, the physical make-up consisted of a table and two chairs in the backroom of a nearby teacher's room. The audio tape recorder was placed near to the interviewee and researcher to enhance the quality of the recording. Beyond the tape recorder near the back of the table was a pile of information books including an encyclopedia, a science textbook, a field guide, an almanac and a factual picture book. On the right of this stack was a stack of hypertext informational sources as

Encarta Encyclopedia, Tour of the San Diego Zoo, and *Almanac 2000.* Both stacks were beyond reach of the interviewee.

The first part of the interview discussed the format of the interview and developed rapport. The researcher explained the questions in the interview which focused on the amount of computer expertise, the current knowledge of expository (informational) text structure in books, and current knowledge of hypertext structure using the screen. The questions were open-ended questions and the interviewee had the freedom to pause and think and go back to prior questions at any time. The students were told to turn on the recorder when they were ready to start. The researcher stated that field notes will be jotted down to allow the researcher opportunity to clarify ideas in the interview at a later date. Then a suggested pseudonym was elicited from the interviewee for use in the dissertation. The first part of the interview determined the students' knowledge and use of computers. Questions explored the history and types of computer used in both school and home environments. The primary part of the interview included the declarative, procedural and evaluative aspects of print and hypertext informational reading. The declarative aspects consisted of the factual knowledge the reader had about the expected layout of the expository text in a book and on a screen, role of pictures and graphics on the page, directional format of the book and screen and reading strategies which were needed to understand the text. It was the "what" of a topic.

Procedural knowledge was the knowledge of "how" to do a task. The procedural aspects were the reading clues that guided the reader through expository print and electronic texts, the flowchart of hypertext, and the physical aspects of book and screen that lead the reader through text.

Evaluative knowledge looked for the effectiveness of a product. It was the "why" or "why not." The evaluation aspects focused on the author and editing process, the copyright or publishing date, the availability and distribution of hypertext, the accuracy of information and the advantages and disadvantages of the different forms of text.

The interview started with a statement about the expository (informational) text and the importance of knowing how to read the text. The researcher stated that in grades four and five students were instructed on clues and procedures to read informational text. The researcher needed to gain knowledge what students knew about the task. The format of the questions was semi-structured because the subjects were fifth graders. The 14 lead questions and possible stimulus questions focused on the research and were:

1. Tell me about your computer experiences. *Do you have a home computer? Tell me about when you started using the computer and what you did. What do you do at home with the computer? Word process? Research on the Internet? Create multimedia? Chat rooms? E-Mail? Anything else? What did you learn to do at school within the computer lab? When did you start your experiences? What computer experiences do you do in the classroom or the library? What are your opinions about computer as an educational tool?*

2. What types of informational books, do you have at home to use? *Dictionary? Encyclopedia? Almanac? Atlas? Thesaurus?*

3. When you read an informational book (the researcher taps on the pile of informational books) what do you know about how to read these books? *You were taught how to read a book, but you have your own special way to read a page. What can be found on an information text page? Tell me what your eyes*

see on a page that tells you how to read the material. How do your eyes go on the page? Where do your eyes go? Why do your eyes go there?

4. The author includes things on a page to help direct a reader. *What are some of the clues that the author includes to tell the reader how to read a page? In a textbook, the editors really direct a reader's eyes across the page. What are some of the clues that the editors place in a textbook? Do you know of any other directional aids on how to read a page?*

5. In an informational book, accuracy and truth are two important traits. *How do you know if an informational text is real or factual? How do you evaluate the truthfulness in a book? Are there any other ways to judge the correctness of the information in a book?*

6. You were taught about informational text structure, particularly in fourth and fifth grade. *How does knowing about the page organization help you as a reader? What other information about these books are important for a reader to know?*

7. What kinds of electronic informational text materials do you have access to use? *Encyclopedia? Thesaurus? Dictionary? Atlas? Almanac?*

8. When you read information on the screen (the researcher taps on the pile of hypertext resource materials) what do you know about these forms of information? *Tell me what your eyes see on a screen that tells you how to read the material. How do your eyes go on the screen? Where do your eyes go? Why do your eyes go there? Were you taught what to read on a screen page? Who taught you and what did they say?*

9. How do you read through these materials? *What are some of the clues that helps the reader read from a screen? Do you know of any other directional aids? How is reading a computer screen the same or different from a book?*

10. How do you know if the information on the screen is true or a good source of information? *How do you know if the information on the screen is real or factual? How do you evaluate the truthfulness? Are there any other ways to judge the correctness of the information?*

11. How does knowing about screen organization help you as a reader? *How does knowing about the page organization help you as a reader? What other information about hypertext is important for a reader to know?*

12. How did you learn how to read hypertext? What do you know about reading from a screen?

13. Which form of reading do you prefer and why? *What are the benefits from reading from a book? What are the benefits from reading from a screen? What are some of the problems in each media?*

14. Anything else you want to add about reading informational text either from the printed format or a screen format?

The last part of the interview asked the interviewee if he or she had any questions for the researcher. The researcher thanked the interviewee and told him or her that when the interview was typed he or she could read over the notes and see if there was any clarification that was needed. The interview was repeated after the lesson about hypertext text structure. In the post-interviews, questions eight through 14 were used.

Comfort Zone Questions

Additional questions were proposed about the students' feelings of comfort while using hypertext before and after the lessons. These questions were used to evaluate the researcher's hypothesis that students' knowledge and use of hypertext would be affected by the series of lessons. A Likert scale of one to ten, with ten being the most comfortable with the knowledge and use of the hypertext, was used.

1. On a scale of one to ten with ten being the highest, what was your comfort zone in using hypertext before the lessons?

2. What are your reasons for stating that number?

3. On a scale of one to ten with ten being the highest, what is your comfort zone in using hypertext after the lessons?

4. Why the difference? State particularly what you know now that you didn't know before.

5. If the score was not a 10, what areas do you think you should learn more about? Explain.

These questions were developed and refined in a small pilot study conducted by the researcher in which four students participated. The individuals were asked the questions and the questions were evaluated as to clarity, quality of possible information, and purpose of question.

Student Response Journals

The second set of data included the responses the students wrote at the end of each instruction day. These reflections told about what they learned during the day and why hypertext structure or content was learned. (Appendix C: Unit Plan) Over half of the days consisted of a reflective journal about the topic, procedure or task. Three days were constructing an expository paragraph on a teacher assigned topic. Two of the days were summaries of a topic or lesson. And for two days, a stimulus question started the student response.

Taped Reflections

The third set of data came from taped reflections. The students taped themselves individually or in pairs and reflected upon the procedure, thoughts and experiences they had while using the HyperStudio stacks, researching their topics, or working in small groups. Partners had a tape recorder to share for approximately 15 minutes while they worked through the three HyperStudio stacks. They recorded what they saw, how they proceeded through the stack, and their feelings about the physical layout, procedure, and evaluation of the stack. Individuals doing research also had the tape recorder for about 15 minutes to reflect their thoughts as they proceeded through the research process. When the students were in small groups in the classroom setting, each group recorded their comments as they worked through the group tasks. All taped comments were typed and evaluated by the researcher.

The Field Notes

The fourth set of student information was the researcher's field notes collected from direct observations of activities, informal conversations, and nonverbal actions. The students agreed to explain their thinking as they proceeded in research and activities using hypertext. The researcher's daily journal of other events, happenings or impressions augmented the field notes from the classroom.

The Student Project

The last set of data included the project at the end of the research project. The project was selected from a list of suggested formats for a presentation. Individually or in pairs, the students selected a living object to represent on a NASA probe to Europa now scheduled for 2004. The students researched the living object using the Internet and other electronic resources and created a product to share with the class and with NASA. The researcher observed the process of gathering information as well as the transformation of the information into a project.

Data Analysis Procedures

The constant comparative method, Krathwahl, 1991) was used as the basis for analysis. The first step was the researcher's complete reading of all transcripts of the interviews, reflections, student journals, observations, and student products. The bits of

information were subsequently physically cut apart and coded as to student, date, and

data source. The concrete descriptions of the student's actions and thinking were

organized, categorized, evaluated, and synthesized into meaningful categories and sub-

categories. The researcher observed for explicit and detailed examples of theme,

inferences, procedures, evaluative ideas, and knowledge of the topic. The last step

clarified the meanings and explored the relationship with the other categories in order to

revise themes and sub-themes while allowing the researcher to study similarities and

differences. Mutual and structural relationships were considered. All aspects of the study

were examined in detail for clarity, purpose and trustworthiness. Donna Merten's book on

Research Methods in Education and Psychology: Integrating Diversity with Quantitative

and Qualitative Approaches (1998) was used as the basis for trustworthiness.

Trustworthiness

Five aspects of trustworthiness were examined. The five aspects included

dependability, credibility, transferability, confirmability, and authenticity. Dependability,

the first aspect, was possible because the study can be replicated if the resources,

personnel, and the timetable were the same. All resources were available to the classroom

teacher. The timetable was possible in any classroom. The results should be similar with

any group of good readers with similar computer experience.

Triangulation was the main aspect of credibility. The information from the field

notes, the taped reflections, the interviews, student journals, and observation was

compiled into readable scripts. All data from the multiple perspectives was checked and

rechecked for support or non-support of the research questions. The researcher wanted assurance that a study like this could be transferred to any other classroom without a problem. The population was well described, procedure was detailed, and plan focused. The limitation of transferability would be in the availability of computers with Internet access.

Confirmability reflected on the researcher's skill as a researcher. The researcher was a reading specialist of 20 years and spent more than 15 years teaching students of this age and type. The researcher had knowledge of hypertext structure. Extensive field notes in formal instruction, during interviews, and during informal discussions added richness to the experience. The researcher was confident all voices in the classroom had opportunities to share their thoughts and feelings. Scaffolding was provided in new instructional areas. Reaffirming the value of prior knowledge (print text structure) and linking to new knowledge (hypertext structure) was a natural pathway to learn. Working within the educational structure of the school district and classroom provided an acceptable environment. All procedures outlined in the study were followed as much to the letter as possible. Parents, as well as students, had the opportunity to read any data that directly related to the particular student.

CHAPTER IV

FINDINGS

The students' knowledge and use of hypertext shifted after the three sets of

lessons. The students were asked to rate their initial comfort zone, on a scale of one to

ten, about their knowledge and use of hypertext before any topical lessons occurred. The

students also explained their skills in the areas of knowledge and use of hypertext. The

scale ranged from a rating of ten as the most comfortable to one as the least comfortable.

Bob (pseudonym) gave the lowest number and said he was between one and two. Ed said

he was a three. Eight students chose either four or five. Another said she was only

halfway comfortable. Four students put their comfort level at a seven, and two chose

eight. The highest indicated she would be a nine or a ten. These answers to the questions

conveyed a wide range of hypertext skills. The mean for knowledge and use of hypertext

prior to the lessons was a 5.42. The median was 4.75 and the mode was 4.0. The range of

responses was eight points. The students in the class ranged from (extremely not

comfortable) level one in knowledge and use of hypertext to a (mostly comfortable) level

nine. No class members seemed extremely comfortable with the knowledge and use of

hypertext. Most of the students appeared to be in the middle range of comfort.

After the lessons the students were again asked about their comfort zones in use

and knowledge of hypertext. After the lessons, t he outcomes had changed. The mean

was 8.89 and the median was 9.25, a rise of four and one half points. The mode was a ten, with seven students stating their comfort zones were within the ten range. Almost half of the students indicted they were extremely comfortable using hypertext. The range of students narrowed greatly with the majority of the students clustered around the "mostly" or "extremely comfortable" levels (Levels nine and ten). The change in medians and modes indicate the lessons made a difference in the students' comfort levels, and knowledge and use of hypertext.

During and after the study, all data from the interviews, the students' journals, observations, taped reflections, and projects were analyzed according to the constant comparative method. All data was coded, sorted, resorted, compared, contrasted, and reclassified. The data was checked and rechecked for support or non-support of research questions and the data was represented by all 18 students. Each student had a student journal, taped reflections, observation, interviews and a project; the research questions were addressed in multiple formats.

Five shifts emerged from the data. The first was the knowledge of the hypertext structure. The second evaluated the accuracy of the material and the third reflected on the knowledge of navigation. The fourth reflected on the use of hypertext and the last theme focused on the variety of product responses.

Theme One: The Shift in Knowledge of Hypertext Structure

Students shifted in their knowledge of hypertext structure. Students knew print text structure, but they did not have hypertext strategies in order to read hypertext. By

participating in a few lessons, the students acquired knowledge of hypertext structure and improved their awareness of hypertext.

Before the Lessons

Students stated in their pre-interviews that their approach to reading was the same for reading a book and a screen article. They attempted to apply a known reading strategies onto the hypertext format. A popular strategy was to look for a dictionary or encyclopedia organization. The students indicated informational books were generally arranged in alphabetical order with guidewords along the top to help the reader locate information. Jeff (pseudonym) said that in an encyclopedia the information would be, "...in rows and it would have pictures. And if it was like a big topic, say cars, it would have big letters and a couple of pages after it. Sometimes it will be in paragraphs." S.S. used the table of contents in a book to get information. Link (pseudonym) stated he liked the textbook headings of paragraphs, the pictures and the glossary or index. Gabriella noted the use of italics for a phrase or word which indicated something important or different. Lillie explained that she expected to see on a screen, "...a scroll of things in alphabetical order. And then you would click on one subject, it would show a picture of it and then give the noun and part of speech. It would give the definition or a report about it. If it was an animal, it would tell what size it was and the height."

Another strategy was looking for familiar layouts and pictures. Angelina (pseudonym) preferred textbooks to encyclopedias because textbooks editors "...put in better words that I can understand better." Ty also noted he preferred textbooks because

the information seemed to be more general and divided into sections. He said when he had to read the columns top to bottom on the same page, he had to take his time. He said, "I don't want to skim through pretty fast-like when my class is talking about it and what is this thing, and I will want to look at it again." He said he varied his reading based on the information and his need to learn.

About one fourth of the students especially looked for pictures or photographs. Tia (pseudonym) stated if you were looking at historical things the screen would show, "...different pictures of different people in our history. And then it would show like the name of the program, like World Book, and there would be more menu items on the top buttons." T.W. (pseudonym) looked for different icons to click to different spots. Most of the students remarked that they just "read the text" because it was automatic and the reader just did it with no different procedure than reading a book.

In summary, the students affirmed during the pre-interviews that they mainly used strategies they had found successful in reading print informational texts. They indicated they generally looked for alphabetical order, italics or bold letters, and sections in the layout. The students did not recognize that missing or incorrect electronic reading strategies could affect the comprehension of hypertext. They stated the reading of both kinds of texts as similar and no additional or different strategies would be needed to read the hypertext.

After the Lessons

The students learned there were many differences in reading hypertext. The students wrote in journals, talked about the differences, and observed that hypertext structure was different than print text structure. One area of difference was the layout and available devices to help the reader understand and navigate the page. Another was the actual need to know the hypertext structure so that the reader could read the page strategically. Lastly, the availability and permanence of hypertext were considerations.

Hannah (pseudonym) stated this theme in this way, "Mostly computer and book pages are very different. You have a vast array of options with computer pages. With books, all that is available is what is on the singular printed page. For instance, you have an index with a book, but with a web page you have links and a menu bar. On the web, information can be current. In books, information may be out-dated." Gabriella in a post-interview said her reading had changed a lot. "Now I look for different kinds of print, punctuation, things that you can click into, bullets, if it is written in a different color and sometimes the size of the pictures, if it is small you can enlarge them and if you hold on, you can go to different sites." She also particularly noted the scroll bar, menu bars, captions, and the identity of the author. Ed commented that on a web site there were important things such as ". . .information and extra things to help you read and find more things." T.W. indicated in her conversations with the researcher that she stopped and looked at the screen set up. She added in a taped reflection, "I never would have realized anything interesting on a computer if I didn't get this study. I can look at a computer in a completely different way now than I ever did before."

Students conveyed that the procedure of reading hypertext was different. Sarah in a post-interview commented, "One thing you don't have to do is turn pages. You just have to use a scroll bar. Also you can change anything with a great click of a mouse." Link noted, "All electronic pages are in pieces and are all stuck together to form a page. Then it pops up. A book page you turn or flip to." Harry (pseudonym) wrote in his journal, "Electronic information has menus and links to bring to other places. It's like a smashed book. They both have pictures but in electronic information they are called graphics." Owen (pseudonym) noted in her journal, "Layouts on a web page vary from page to page. They are targeted at different audiences." She also added that most books were in a 12 to 14 font, while the Internet fonts could be much bigger or smaller.

Students commented that permanence was a consideration. Owen and Bob were both concerned about the continued availability of hypertext. Owen wrote in her journal, "Print on the Internet is easily changed as information changes; in books, it's there forever. Many science books are incorrect, while the Internet pages are often updated. While books take years to produce, Internet sites take only weeks or even days." Bob wrote that an Internet author fixes his pages whenever and however he needs, and can update them but with books the material always stays the same. He added that computer pages can be deleted but in "regular books they stay." But, he said with a giggle that, "It is kind of hard to be able to lose a computer, but it's easy to lose a book." Jennie noted a similar concern. She said books were permanent and the print on the Internet was not permanent. "One day the page could be on the Internet and the next day it could be expired," she wrote.

Consequently, the students emphasized the difference in reading print text and hypertext. In their journals and in field observations they used varied and different strategies for the reading. They actively searched for clues to help them read the material. The perception of the reading task had shifted from applying strategies from a print text to using new strategies designed for hypertext.

Theme Two: Shift in the Evaluating the Accuracy of Information

The students before the lessons did not think about the accuracy of the print information. They attributed the accuracy to the complex editing process found in publication of books. They extended this feeling to include the area of hypertext. They stated information published in any form was more likely to be factual. After the lessons, the students shifted their thinking about accuracy to believing that it was one of the most important aspects of hypertext. They also started evaluating print material as well.

Before the Lessons

The students stated in their pre-interviews that the information on the Internet was correct because the hypertext was similar to book text. Since the layout was similar to dictionary and encyclopedia formats, the accuracy had also to be similar. The students stated in the pre-interviews that the dictionary and encyclopedia had to be true whether it was in book or electronic form. Hannah said that, "...basically you have to trust that the encyclopedia will be true. You know that some things must be true."

In a book, the second most frequent response about its accuracy concerned the bibliography and the copyright date. Tia remarked, "So, if it was in 1870 or 2000, you can tell maybe the information can be old and not with more technology, it might have changed." Jennie looked at how recently it was published. She said, "Say it was 1887, I probably wouldn't take anything from it."

T.W. mentioned accuracy might depend on the classification of the book. "Some books say that they are fiction or non-fiction. You have to hope that they are non-fictional." Hannah took something from the title of the book. She said, "If you have a book like *Porpoise Goes to School* or *Porpoises*, you would know which one is more factual."

In the electronic field, Ty said in his pre-interview, "I don't know that stuff is correct. I am pretty sure that it is true because they wouldn't put something up there unless it is true." Jeff stated he knew that some of the information on the Internet was wrong because he tried to get some codes from it once and the codes were wrong.

The students indicated they would use a variety of ways to check the truthfulness of the information from the Internet source. Eight of the students said they would cross-reference the information in a book or electronic source with their own prior knowledge. Lillie and Ed said they would check the information and see from where it came. Four others said they would look it up in a book to see if it was accurate.

A majority of the students wanted the information to be correct. Bob mentioned in a conversation, "Because if they told the wrong things, people could get bad grades or in trouble or stuff like doing the wrong things." Jeff wanted correct information so he would

not ". . . get it wrong on a test or something." All the students wanted the information to be correct.

After the Lessons

After the lessons, all students thought knowing if the web site was accurate was one of the most important factors in determining the site's quality. They wrote in their journals and demonstrated through field observations several methods to determine the accuracy of a site.

The students studied four websites about coyotes and then formulated a plan for a good web site. Sarah said in a class discussion that good information, nice pictures and a nice layout, checked by a web editor for grammar and accuracy, were important. Nick (pseudonym) added good information, color, and graphics in the layout, and he wanted his web sites written for a student in grades four through eight. Owen thought the layout, pictures and links were significant, but that the identity of the author and the accuracy of the information were important. Jeff didn't want any advertising in his ideal web sites. Link wanted the date of publication and the date of any updates in the sites he considered ideal. T.W. thought links to other information were important. The students set up a schema for evaluating websites.

Another method to establish the accuracy of information was evaluating the address. Bob wrote in his journal from reading the URL (universal resource locator) address, the reader could tell if it was a little or big site and if it was made by a company or a school. Crystal (pseudonym) looked for an author. S.S. wrote in her journal that,

"Names like National Science something or other could be more true." Lillie (pseudonym) noted in a taped reflection whether the URL address was written by an organization, government, business or person. Owen explained the importance in her journal. Owen wrote, "You can tell if a website is going to be reliable or not just by the address. For example, you could not rely on http://www.aqua.net/~stevie738/conesnail because it would be a private web page and who knows if 'stevie738' tells the truth."

Nine students focused on the author. Link said in a discussion, "It depends who wrote it you know. If it was written by Microsoft about computers, probably it would be factual. But if it is from some person who just popped up on the Internet, you must be careful." Owen in a post-interview wanted to know the author because, "You don't want [information] like heart medicine from like a dog doctor." She noted that authors and editors' names were harder to find than in a textbook, but the reader needed to know who they were and what their qualifications were. Jeff looked at the website address and stated in the post-interview, "If an author wrote something on a scientific thing then you might know that might not be true. You would want a scientist to write it. A governmental organization might write on the same topic and it could be true."

Sara wrote in her journal authors were known in books, and the reader knew the source was credible and this was not true with pages on the Internet. Gabriella wanted to be assured that the author was knowledgeable about the topic and warned that authors could write false information and this information was not be edited by an outside book or electronic source. Angelina and Ed both added that scientific web sites should be written by scientists who are studying "that kind of stuff" and the reader must be careful

about what they believe. T.W. warned that books have multiple authors and editors, but web sites frequently had one author who edited the piece himself.

Jennie (pseudonym) indicated in a journal entry that books were written for a particular audience, but web sites were written without the age of the audience in mind. Bob thought it was important to find a website that matched his interest and reading level and then evaluate the importance of the information.

Nick wrote in his journal that if there was a question of accuracy he would check it against other pages, and eventually a bibliography. Tia also wrote she would check other sources if she thought the author was not an authority. She said, "Like if a scientist that studies rocks wrote something about how to cook a cake or something than you might want to check other sources because you wouldn't expect a scientist to be writing about that. You would expect a chef to."

Ty (pseudonym) commented in a conversation that his websites had to be updated before he would decide if the information was accurate. He felt updated web sites were more apt to be truthful than those sites put up years ago. If he found conflicting information he said he would look in other sources to find the right information because he didn't want to put false information in a report for school. Sara was afraid of old sites. She said a lot of information has been discovered in the last five years or so. She added that multiple sites with the same information were most apt to be accurate. Jennie said she would try to check the information in other sources and would use her own knowledge about the topic to see if it was accurate.

Tia stated in a conversation that out of the millions and millions of web sites, some web pages are questionable. She said the reader had to check the information and then still might not be sure.

The majority of the students questioned the print materials as to accuracy. They commented in their journals that books could also be incorrect especially if the copyright date was old. They questioned factual information in their science textbooks. Angelina wrote in her journal that books could also be wrong and that the reader needs to check the information using multiple sources.

Overall, the students checked the accuracy of information when doing research by assessing the layout, extras, address, update and author. Hannah wrote in her journal, "I have learned about the authors and editors of web sites, and even what a web address means. I have learned why books are how they are and why the layouts of the web sites matter so much. Overall my brain is enriched." The students used their evaluative skills to judge the accuracy of a website. The students adapted the evaluation process into the print as well.

Theme Three: Shift in the Knowledge of Navigation of Print

Before the lessons, about half of the students had rudimentary knowledge of the navigation within hypertext. The other half had surface knowledge of the workings of navigation but did not use the devices effectively. After the lessons, all students had shifted in their knowledge of navigation of print. Those with little experience and those with experience learned to navigate the sites efficiently and with ease.

Before the Lessons

The next theme was the navigation of the reading task. Before the lessons, students said in their pre-interviews that the navigation of the hypertext was similar to print reading task. They used prior navigational skills to read the material.

The first procedure was the direction of reading an electronic article. Almost all of the 18 students indicated in the pre-interviews that after they located the information, they would read from the left side of the page from the top to the bottom. Gabriella suggested that the reader, "...start at the beginning of the information and you look at the top. Sometimes it will have a little arrow and sometimes there is a page. You can always try a few things. You also look down at the bottom and there will be a next page or something which tells you about this page or the next page." Owen said in a taped reflection the screen page, "...looks the same as a book. Instead of turning pages, you scroll down."

The students used a few of the icon clues to help locate information. Tia looked for more menu items at the top and buttons, which she said the authors wanted you to do besides reading. The students used the scroll bar, the mouse and clicking on words to obtain their objective. They would frequently try something to see what could be accomplished by doing it. Harry said, "You click on something and it might tell you how to do it." Most of the students clicked on the underlined words to learn about them. The students stated less than seven icons to aid in the reading process.

The knowledge of the organization of the reading material was stressed by many students to assist in meaning making. The students used known organizational patterns in

their attempt to read hypertext and "not get lost" or confused. Jeff said by knowing the organization you "can find things easier." Link commented further the need for organization by saying in the pre-interview what was needed to look up a word. "Well, if you are going to look up a word like rhododendron, that is a plant. And it is scattered around, you would have a heck of a time trying to find it and have to go through the entire book with the small print. If you didn't have the organization, you never could find the word. You must know the alphabetical order or another order." Crystal said that knowing the organization helped her to be less confused and not have to say every few seconds, "Hey, what is happening?" Owen worried about being lost on an electronic site and getting in somewhere she should not be. Looking for organization similar to encyclopedias and dictionaries was used by most students.

In summary, the students indicated during the pre-interviews they used several methods to navigate their reading task. The majority of the students presumed an alphabetical order and stated the alphabetical order helped them proceed through the electronic process. Almost all used primarily the mouse and underlined words to proceed through the material.

After the Lessons

The students shifted to knowing that navigating a website was very different than the organization of a book. Once the students understood the organization of hypertext, the students felt more comfortable with their task. In the journal entries, taped reflections, conversation and field notes, they saw reading in print as a different procedure than

reading hypertext. Link wrote it, "Reading is a procedure, so is baking cookies. It's just a really weird way of reading on a computer." Owen continued by describing the process in her journal, "Procedural knowledge was how you did something. It could be described as the steps you have to do and the directions you could move in it." S.S. described it by stating, "Learning about the Internet is similar to finding a book, learning to ride a bike, and learning how to take steps. There were steps to the end that a reader must take." Angelina added in her journal that this part helped a reader understand where the reader could go and where the reader could not go.

Navigation of the reading process focused on the need to recognize the electronic layout. The electronic layout could be either lineal or branched like a tree and its roots/branches. The students studied the layouts and created flowcharts to see directional flow. Owen said in a conversation, "You have like branches off of that and you can tell what directions you can go from there." She felt she could navigate through webpages and know what she was doing and she wouldn't have to restart anything. Harry wrote in his journal the electronic information was like a tree and you could jump from branch to branch. Crystal said in a conversation that she learned to "branch off" and go to different places but she can still get back. Tia wrote it was easy to read on a computer. "I first start with the home page. Then you can jump around to wherever you want to go. The computer is like a big tree. You start at the top, then branch out the way to lead to just about anything and that is the root."

Ty wrote in his journal that knowing the flow of a site helped him not to get, ". . .jumbled up in my mind and wonder where to go next or whatever." He said he could read and then press the buttons and not get lost. Angelina wrote that she had never

thought of the format of the site, but the flowcharts helped her navigate the sites and made the task easier and faster.

Bob added in a conversation that learning flowcharts taught him what order the parts are in and whether ". . . they are going back and forth or in another way. It sort of goes down ways or side ways in what order you want to do it. Then it has branches and you do it off of the branch." Sara delineated the steps for making a flowchart in a post-interview. "We made these little boxes with numbers [representing each electronic page] on them. When we read five boxes and wanted to go back to the third box, you could just go back. You would know, okay, this box is there and you knew where you were." She added that sometimes these boxes, or links, were in a row and sometimes they were in another arrangement. Tia commented flowcharts showed her how to navigate where she was without getting lost.

The students learned the string and concept of URL addresses. An analogy of a large shopping mall, like the Mall of America, was used to construct meaning. As the students read through each part of the URL address, the students visualized the web address location. For example, the "www" was the name of the mall. The next word was the floor of the mall, and the ".com" or ".edu" was the type of store on that floor. Then as each word was typed in, the address became more and more narrow and particular. Jennie in a conversation felt this analogy made her understand what was happening as she navigated the electronic address. Tia wrote in her journal the shopping mall was a fun way to remember the procedure for reading an electronic information. She said by thinking of each site as a mall and each category a store in the mall, she could always press the home button and get back. She said, "You could just retrace your steps."

The students were pleased to learn the procedure of reading a web address. Bob wrote in his journal, "I also learned how to actually read a web address. I had no clue what "http://" meant. I didn't really care how to read the address. I just used the information. I now know I compare the addresses to each other and figure out which one carries more factual information." Harry said that he liked learning addresses could possibly tell the author as well as the country of origin. Tia learned that addresses had to be accurate or the reader could end up in something totally different than what was wanted.

In summary almost all students emphasized that the actual navigation of hypertext was different for hypertext because the procedure was different. T.W. and Jennie said in the post-interviews that reading a book was generally left to right and down, but reading on an electronic site was jumping around. Ed said the reader had to chose a path to read an article. The students recognized the layout of hypertext as linear or branched. They knew if the layout was branched that they could retrace their steps and get back home. They felt that the comfort of knowing the layout helped them to avoid being lost and frustrated.

Theme Four: Shift in Use of Hypertext

The 18 students were widely divergent in the knowledge and use of hypertext before the lessons. A third of the students were non-users. The other students were using the Internet, but with no understanding or effectiveness. One student said that she knew all about using the Internet but neither she nor the others were fully competent.

The knowledge of the devices that aided the reader to navigate through the material and the layout of hypertext structure were two points that the class used in their search for new information on the Internet. Using newly discovered clues to get to other links and information, they enthusiastically searched for relevant information. Then they applied their knowledge of layout of a site and web addresses to navigate effectively. Lastly they evaluated the information as to authorship, audience, and accuracy. The students had become critical readers of hypertext.

Three vignettes describe the shifts in three individuals. These vignettes, written by the researcher from the collected research data, exemplified the growth in the knowledge and use of hypertext. The first vignette's subject was a non-user and the lessons affected his subsequent use of hypertext. The second vignette tells about the overcoming of inappropriate reading strategies to read hypertext. The last vignette's subject was a fearless risk-taker who used the Internet for research and fun but did not use the hypertext strategically.

Bob

Bob particularly changed in his use and understanding of hypertext. He changed in two ways: his knowledge of the devices and text structure that are represented in hypertext and his willingness to use this media for personal and family uses.

Bob progressed the most in his knowledge and use of hypertext. He stated in the pre-interview that he chose not to use the computer for any research. He liked to go to the library because the library contained a variety of books that could be used for his

research. He didn't even use the computer much for games. He just didn't like it. He had older siblings who used the computer for schoolwork and games; his apprehension had to do with getting into sites which were inappropriate.

Bob listened and followed directions carefully. He did not initially participate in the classroom discussions. When he began to take a risk and use the Internet, he would first stay on one page and then stop and go back to the start again. He did not use any of the clues or links to proceed further into the site. He had trouble finding information initially on his topic about the viperfish. He started using the school's suggested search engine and located multiple sites. He still didn't take many chances and branch into the sites very much. But by the time Bob had finished the sessions, he was foraging deeply into sites and branching off into new ones. He said that he felt competent that he could go anywhere and be able to get back without any trouble. His paper showed that he had gone to multiple sites to get varied information.

Bob loved the graphics part of the sites. He found out that he could click on a graphic with a red or blue box around it and enlarge it to study the details.

Bob made a great shift in using hypertext. In his final interview, he spoke with confidence and knowledge. He felt what he knew now was "is kind of cool. I know how to search on the web and get actual facts about subjects for reports and things." He commented that now he could look up things for his dad and he knew what to do to get good information. He also started using the word processing program to type the reflections and other papers. He had made great strides in risk taking, but he added he needed more practice and time to understand the use and procedures of the computer and

Internet to get better and better at it. He was thankful that "his mind and knowledge were gradually expanding every day."

Hannah

Like Bob, Hannah initially hesitated to engage in Internet activities. Hannah wanted to learn how to handle hypertext so that she could improve her study skills. Hannah was an extremely proficient reader. She loved the comfort that she found in books. She loved to read and handle the books. She was very proficient at researching and writing an excellent paper. She was a perfectionist with her work and thus always had A's in all of her assignments. When she found out that she had to use the Internet as the sole source of information for this project, she was distressed. She asked if any books could be used, and what if the information could not be found on the Internet. She felt that books were still her best source of information and that the Internet would not give her the information that she wanted. Learning about using the Internet as a research source meant that not only she had to handle the technology related to the computer, she had to learn a completely new set of procedures. She knew that her old reading strategies were not effective in this new medium. She said that it was just easier to read the books then look things up on the computer and "besides, I understand it better in books." She knew that in order to do her assignment she had to learn the navigation devices and text structure of this electronic source. Her desire to learn took her through apprehension and soon she was using the technology effectively. Her fears dissolved first into slight smiles and then changed to confidence.

As she was studying the organization of the class website, she began to forge ahead and only wanted confirmation that she was proceeding correctly. She used all her time in class and in the laboratory productively, and when her partner was not on task, she chastised him that they had work to complete.

She chose the tuatara for her project, and she was amazed at the information that was on the Internet. She started reading and evaluating the materials. She bogged down several times and mentioned on taped reflections to the researcher that there must be an "overload of declarative, procedural and evaluative information" and giggled. She gushed over unusual facts as the skull length of a giant tuatara. She used the pronunciation key to pronounce new words. When she found a chart, she stated that it would be cool to duplicate for her project. She commented on tape that the map on one site was incorrect and that another site had a fabulous map. She made notes on the quality of the sites as she wrote down the addresses –"great map," "excellent info," "wrong facts." She was excited that she could right click and get a graphic for her paper. She enthusiastically located graphics for each section of her paper.

She stated on tape that looking for information was a headache when there was technical error and the machine shut down. She just reopened the computer and entered the address of the last site that she had written down. She continued to write down sites so that she could continue her research at her home. Because she was so interested in the topic, the electronic glitches affected her only temporarily. Her final product, a report on the tuatara, was a professional job with complete informative text and colorful graphics. She was very proud that she could locate quality information with ease and that she could

make her paper more professional looking with the addition of color, various sizes of font, and graphics.

Ty

In contrast, Ty fearlessly took all of the risks which were possible when exploring the Internet. His older siblings had taught him many tricks. He looked for unusual places to locate different information but he also made sure that he would not jeopardized his computer time so he didn't visit inappropriate sites.

He used the customary search engines, and when he learned about dogpile.com in class, he was excited. He couldn't believe that one search engine could contain all of the search engines that he had used before. He thought this convenience helped him with his research.

Ty spent hours on the computer, particularly using e-mail, instant messenger or chat rooms. He had his favorite games. He would use word processing for reports. When he announced how many words that he had in a paragraph, the other class members wanted to know how he did that. He taught the class edit, authoring, and word count. He wanted to learn big words and "do great things" so that people would think that he was older.

Ty knew most of the navigation devices, but he didn't use them effectively. He could easily get to a spot and backtrack to get to the beginning. He didn't notice hypertext structure or the organization of the text. Because he was not applying text structure strategies to his reading, Ty started off as a surface reader. He just looked at the

graphics and the layout to see what was on the site. He especially liked the "extra stuff" that a site had to make it more interesting. If the site didn't appear good, then he went to another site. He read the material only at the surface level and if the answer to his question was not obvious then he left the site to look for another site with the answer plainly stated in the first few links. He also did not use the links in the site to locate other information or other links. He did not evaluate the information as to accuracy or effectiveness. He wanted only the bare quick facts.

When the class was studying flowcharts, he figured out the layout quickly and helped others see through the procedure. Because of his experience on the Internet, he knew instantly if the layout was branched or linear. He predicted the complexity of the site. He benefited from learning about the evaluative aspect of the lessons. He started reading URL addresses with meaning. He looked for authors, copyright dates, and other information to judge authenticity. He judged the quality of the information.

Ty, at the end of the project, was one of the most effective researchers. He had the technology skills to click to many sites. He had no fear and thus would go far and beyond looking for the last interesting fact to include in his script and video. He would comment on taped reflections that one bit of information was great and the next bit was not accurate and ponder where the author got that information. He learned to use the Internet as a research tool for his benefit.

Each of these vignettes illustrated three approaches to the hypertext reading task. Bob represented the group which had no knowledge of hypertext structure and navigation devices and did not use the technology. Hannah had little knowledge of the medium and knew that hypertext was a different reading source. She knew that she needed different

strategies to read hypertext. Before the lessons, she was extremely uncomfortable because the strategies that she knew did not match the new reading task. Once she was given hypertext reading strategies she only needed affirmation once in a while that she was using the strategies appropriately. Finally, Ty represented the group with knowledge of the navigation devices but did not have the necessary reading strategies to use the medium effectively. He perceived the print reading strategies as appropriate for the reading. Two more vignettes are found in Appendix I. Link illustrates a person with an incomplete schema of boolerian search and hypertext structure and Tia shows an individual with apprehension about the procedure.

Theme Five: Variation in Product Responses

In their search of information for their product, students discovered multiple formats of information. They learned to open video, play sound tracks, enlarge graphics and read many structures of hypertext. In turn, the students created their products with these multiliteracies in mind.

The 18 students did projects ranging from reports to other creative projects. The directive was the students should use only information from the Internet and the information could be represented in any form. A list of possible projects was given to the students and no other discussion occurred. This research source and directive was a shift from prior reports when the students generally used books as the major research source and the chosen format was a written report. Not one continued using the report form as the primary information giver. All modified the traditional report form in one or more

ways. Two students wrote poetry. Three constructed 3-D models of the animals. Seven did posters, charts and pictures. Three did dramatic presentations. The fact file format was popular with three students. The students added more creativity to their projects. All but one student combined two or more products into a final project.

For example, Owen used multiple products to describe her animal, the cone snail. She wrote several paragraphs, made a bar graph comparing the toxicity of the poison, copied several graphics and overlaid text upon the graphic, replicated the animal in clay, and drew pictures. She placed all of this information attractively on a tri-board for display. She felt that the information found on the Internet was exceptionally informative and the graphics and other materials supported her topic.

Link, in contrast, studied the graphics on the Internet and copied them with black ink on the top of lined paper. Under each of his six drawings was a paragraph of three or four sentences describing each characteristic. This photo essay told the important information about the swallow-tail kite. He also made an Ivory soap sculpture of the bird.

The students using a format most like a report were Lillie, Hannah, and Gabriella but each enriched their topic with either graphics or other objects. No one used only the traditional report form. An itemized list of students and their projects is found in Appendix J.

Even the students who didn't communicate the information well in written form, enthusiastically contributed to the question and answer period which followed the individual presentation. All students had detailed and interesting information for each of the researched animals. Through their comments and writings, the students stated that

they found more information than was put into their projects. The students shared that they would have had more details if they had been provided additional research time.

During the field observations, taped reflections and informal conversations, the researcher noted that the students were fascinated by the number of different formats in which the information was presented. Jennie, for example, turned to her partner Sara Ann (pseudonym), and commented on the sound, graphics or type of information. Hannah commented in the taped reflections that she loved the maps and the different sources of information. Lillie loved the amount of information. Link was amazed that kites were toys, birds and other things. About half of the students saw videos of their animals or listened to someone tell about the animal. Tia said on the tape that she loved the zoo sites and the information in fact file form. Owen loved the graphics. Information presented in multiple formats encouraged students to present their own information in multiple formats as well. Very few students only had one medium for their presentation. Most of the students used two formats and many students used three or more formats. Because they saw the Internet presenting information in many different ways and formats, the students wanted to relay information in as many different ways.

In conclusion, the major themes which emerged from the students' journals, observations, interviews, taped reflections, field observations, and conversations were the students' shifts of the knowledge of hypertext structure, accuracy of information, navigation, use of hypertext and the variety of products will be explored. The change from a mean of 5.42 to 8.89 and the mode from four to ten was evident in the application of the lessons to the research for the project. The reading task had been enriched by adapting or adding a set of reading strategies to enable the reader to read the material

more effectively. The navigation of the hypertext source was stronger. The students

indicated that they knew where they were and they were able to navigate to a place where

they wanted to go. The students actively evaluated author, address, and information as

being appropriate for the assigned task. They enjoyed the variety of formats which

presented the information. The students effortlessly used hypertext to meet the need of

finding the best information for their project. The students' attitude about the use of

hypertext was extremely positive.

CHAPTER V

DISCUSSION

This study explored students' knowledge and use of hypertext structure in their investigation of informational topics. The research looked at what fifth graders knew about hypertext and how they used it. Prior to the study, all of these fifth graders had a good background of technical knowledge and product production because of their participation in a district-wide comprehensive technology program. They knew word processing and could produce a variety of products. These students had many hours of experience using school and home computers. The students' knowledge of the computer, its possible products, and potential use was extensive. But, the students generally did not know the characteristics of an Internet page or how to use the information on it.

The students in this study participated in a series of lessons on the aspects of expository hypertext. The students focused on the devices that signal the aspects and procedure for reading hypertext material. Then the students learned the layout of the hypertext material and ways to navigate through the material. Lastly, the students evaluated the material as to its appropriateness for the reading task.

The researcher used pre-interviews, post-interviews, taped reflections, student journals, field notes, observations, and student products to evaluate the knowledge and use of hypertext in using informational material.

Conclusions

Students need to have appropriate schema and hypertext strategies in order to strategically read this new type of text. After the instruction, readers focused on the structure of the site, new navigation devices, and other multimedia elements as sound, graphics and movements. Students selected the order in which they received information by deciding whether to follow or ignore different paths. The students evaluated links and underlined words and decided whether to "click" or not. Because hypertext is constantly changing into new formats, students should have knowledge to effectively use and adapt to the emerging and changing hypertext.

Four main areas emerged from the research. The first was that the students knew hypertext was different and print reading strategies were not always effective. The second area was that students benefited significantly by learning about navigation devices. The third area illustrated that creativity was heightened by using multimedia. And the last area was the students' engagement. The engagement was improved with knowledge and use of hypertext skills and strategies.

A Need for New Strategies

In the first area, the students knew reading hypertext was different from reading narrative or other expository print text. They knew from prior experience that in order to comprehend a passage, schema of the textual organization helped in selecting a strategy

for interpretation and understanding. They searched for devices and strategies to cue

them for structure and to aid in understanding.

Students knew the print strategies were not helping to read hypertext. Since the

schema for providing a scaffolding to read the material was missing and the

comprehension was ineffective, the students attempted reading the material, but said they

were frustrated. Many of the students mentioned they were "lost" or "confused." The

students didn't find effective ways to navigate themselves through the material. They

knew the words but the cohesiveness among sentences was missing. The passage

structures and the devices that signal passage structures were different. The relationship

between what the reader knew about reading and what was on the page was different. The

strategies the students used from their prior reading experiences made the task of reading

hypertext uncomfortable as well as ineffective. The students knew that their approach to

computer reading was not appropriate.

The majority of the students applied the same steps they used to read a dictionary.

First they looked for alphabetical order and pictures to help find meaning. They looked

for guidewords and linear arrangement. A few students tried to read the hypertext as they

would read an encyclopedia article. These students looked for alphabetical order as well,

but also looked for sections or paragraphs to help the reader go through the article. They

read the material in a linear fashion.

This feeling of confusion was probably not different from the first time that the

students read a dictionary. The students recognized that the words were familiar, but

everything else about reading a dictionary was different. They learned the procedure of

using guidewords to get efficiently to the correct page. They discovered that each entry

had a specialized part and each part had a specialized purpose. They knew that dictionary passages were presumed correct, but that the reader had to select the meaning that was closest to the reader's purpose. Reading this new form of information text took many exposures before it became comfortable.

The same uncertainty was present when the students started reading hypertext. The words were familiar, but everything else about the reading was different. The passage structures and the devices that signal passage structures had to be taught. The hypertext structures were no longer only linear like in the print medium. Sometimes they branched, parallel, or other times even more complicated. The students in the study initially started learning the devices which would enable them to navigate through the passages. The students learned the role of icons, underlining and bold-faced functions, linear and branched layouts, and graphics. Then the students learned clues that would enable them to judge if the website was a good website for their purpose. They started by learning to read the URL addresses and look to see if an organization, business, company, or education sponsored the site. Then by studying the individual parts of the URL address, the students could even possibly judge the point of origin and authorship. They then went to the sites and looked for additional clues as to copyright date, authenticity of author, and appropriateness of content. The students enriched their old strategies or learned new strategies to read hypertext material. Because hypertext structure could be different from previously known reading strategies, additional strategies should be taught. The students were not previously familiar with hypertext structure despite substantial computer usage.

The students' actions affirmed the schema studies by Bransford and Johnson (1972), Anderson, Reynolds, Schallert & Goetz (1977), and Goetz, Reynolds, Schallert, and Radin (1983). Without appropriate scaffolding for the reading task, the readers were confused and unable to comprehend the materials effectively. It was clear the readers' background information of text structure and procedure was vital for interpretation and meaningfulness of passages. Schema, to have the most effect, must be at the beginning of comprehension to help with recall. These students did not have the appropriate schema for successful hypertext reading.

As in the text structure studies of Richgels, McGee, Lomax and Sheard (1987), Taylor and Beach (1984), Gillingham (1993), Wenger and Payne (1996), and Gillingham (1993), these students profited by knowing the quality of the organization. Because the students knew the structure of the website and were able to navigate the site, their final project demonstrated clear understanding of the topic. Finally Wenger and Payne (1996) suggested reading hypertext needed a reorganization of processing resources. These students assessed their prior strategies and modified or created new strategies which enabled them to read the materials with comfort and ease.

This study validated that hypertext strategies are needed and can be taught to students just like dictionary strategies are taught to students. The dictionary's physical aspects and procedure in reading them is part of an elementary child's standards and benchmarks. Reading hypertext is a unique reading task like reading a dictionary. Hypertext structure, procedure devices, and evaluative strategies should be taught when the students are beginning to use the Internet for reading or research.

Benefits of New Navigation Knowledge

The students were primarily divided into two groups—one group which was new to the navigation and the other group which thought they knew about navigation. Through the lessons, both groups learned effective navigation practices and became more engaged with the hypertext reading task.

Part of their new learning was to review the devices or icons to help them know the procedure and efficiency of the task. The students learned how to get in, read the material, and get out. They learned shortcuts. A few students learned how to save graphics; others learned how to play audio and video. They learned to recognize if the site was linear, branched, or in another arrangement, and they learned to use the layout to their advantage. Students recognized the multiplicity of navigation devices.

Another step in new knowledge for both groups was their ability to use URL addresses to save time in navigation. After the students learned to read the URL address, the students were able to make an evaluation as to authorship before even entering the site. They started to skip over sites because they were published by an inappropriate organization or business. When they were researching for a report on animals, the students selected sites by choosing organizations such as PBS or zoos as their first choices. They no longer clicked and clicked, but made selective choices for their clicking and knew where they were. Then if they liked the site, they went in and used other evaluative measures to see if the material was appropriate. This refined their procedure through the reading task and enabled them to make better site selections.

Another navigation device which saved time was the use of a multiple-source search engine instead of the single search engine. With the use of multiple-source search engine, the students located a variety of sites from many search engines to elicit the needed information for their project. Both the experienced user and the nonuser learned equally about the ease and function of the Internet research.

Finally, navigation must be efficient through this form of reading. The unbelievable volume of information is overwhelming and the information is increasing geometrically. Students must be able to locate and evaluate the quality and relevance of a site.

This study confirmed the statements by Reinking (1995) and Leu (1997), that hypertext literacy is being able to navigate through information and make sense of it. Reinking (1995), Leu (1997), and Flood and Lapp (1995) added that students must also know what is important or not important in navigating this hypertext or post-typographic world.

Navigation of a hypertext site is unique. Students need to be taught multiple strategies for using the hypertext material in an effective way in order to improve their comprehension. Strategies as to physical layout and navigation devices are two areas to address. Another two are hypertext structure and how to evaluate accuracy of information. Both the educational technology or the literacy programs could divide the strategies. Physical layout and some navigation could be taught as part of the computer classes. The reading program could teach hypertext structure and evaluation possibilities. Students who are expected to use the Internet as part of their research for their classes should have strategies to use the Internet site effectively and successfully. Through

multiple exposures to varying formats, students would gain experience and be able to select the appropriate strategy for the specific format.

Products with Multiple Formats

The third area showed that when the students were exposed to a variety of informational and multimedia sites, their products had more creativity and consisted of multiple formats. Very few sites were only in a narrative form. When the students saw movies, graphics, maps, and pen and ink drawings were all parts of the "report format," the students incorporated these aspects into their final projects. Not one of the 18 students compiled their project only in report form. All students added a graphic, an art project, decoration or combinations of them with the written text. Because the students saw the range of layouts on the Internet as only a beginning of possible options, they created new enriched projects instead of simple typed reports. Their products were represented in a multiplicity of formats.

This study affirmed the study of Taylor and Beach that the knowledge of the print text structure had a positive effect on the student's expository writing. Knowledge of hypertext structure and exposure to multimedia formats helped the students to create multiple formats of students' products. Sandholtz (1997) stated that students collect information in multiple formats and evaluate and reconstruct information within their knowledge domain. The researcher of this study added that not only do the students collect information in multiple formats, but also represented their products in multiple

formats as well. Multiple exposures to differing formats help the student construct more creative products.

Engagement

The fourth area was the students' engagement with the use of hypertext. The students enjoyed the research time. Two students had to have more direct instruction in the search process, but all were on task and taking risks in locating new and interesting information. Fourteen of the students were extremely comfortable with the use of the technology. The other four said they were very comfortable, but that they needed additional instructional time and experience. The instruction was well used, and within a short time all of the students had a reasonable amount of information for their project. The students enjoyed the research time and were actively taking notes and recording URL addresses for their additional research. Although the research study did not focus on the attitudes of reading from a screen, the students stated in their final interviews that they would prefer to start their research on the Internet because it was fun, easy to get the materials, and fast. The motivation and positive attitude validated the studies of Gambrell, Bradley and McLaughlin (1987) and others who stated that no definite difference was found in comprehension, but a definite positive attitude occurred. The students enjoyed their experience in learning about hypertext and how to use it effectively. They were engaged in the lessons.

The students' new knowledge and their recent instruction in using the Internet for research helped them appreciate the new tool and to get themselves into new areas for

research. The result of the scaffolding and experience was evident. The students benefited

from having a few lessons on the aspects and use of hypertext in order to become a

strategic reader in this form of communication.

Knowledge and use of hypertext structure in using informational text improved

the students' efficiency of task, creativeness of products, and comfort levels. Through

just a few lessons, the students researched the chosen area with ease and created an

appropriate product. In their presentation of the product, they knew their topic well. They

enjoyed the task and showed their interest in the quality of the product. The students'

knowledge and use of hypertext improved their literacy.

Implications for Teachers

This study adds to the growing body of knowledge that students need to have

schema related to hypertext. Students should have experiences to understand the new

language, syntax, vocabulary and procedure of the hypertext world. Research in the print

reading field proved the importance of having schema and text structure strategies for

effective comprehension. The same is true for hypertext reading. Since the students are

unable to adapt print strategies into a unique hypertext format, students should be

provided instruction in this area. The students should be taught effective schema and

navigation and hypertext structure strategies to be effective readers of hypertext. This

schema included the devices that signal the passage structure as well as the procedural

aspects for reading the passage. Teaching should include ways to make cohesiveness

among sentences, passages, and sites.

This study also indicates students must learn the hypertext structure of the website so that they can navigate and understand it. Without such knowledge, the trip through the website can be nondirectional and nonproductive. Knowledge of print text structure helped in storage and recall of information. The same is true for hypertext structure. The students can recognize if the structure is similar or not similar to known print text structures. If the text structure is not similar, then the students can construct the structure of hypertext and be able to navigate through the hypertext. The intent is to have the students understand as much as possible and enjoy the experience. The students should receive lessons in the various hypertext structures.

This study also illustrates that a few lessons on hypertext sites assisted the students to read hypertext. If the objectives for the school district state that students will use multiple print and electronic resources to obtain research for report writing, then lessons in hypertext and the use of the Internet should also be provided. If a student is not taught the steps for dictionary study, the student will be ineffective using this tool. Similarly, if a student is not taught the aspects and steps for reading hypertext, the student will be equally ineffective with that tool.

Most standards and benchmarks for the intermediate language arts program at the intermediate elementary grade levels indicate a need to use both print and non-print materials for research. At this point, lessons on reading hypertext should start. Fifth grade would be an ideal grade level to initiate non-print standards in their reading program. The lessons on schema and hypertext structure should be divided between the technology and language arts programs. The technology aspect can focus on the declarative and procedural aspects of hypertext. This part can include navigation devices, role of icons

and graphics, and reading an URL address. The hypertext structure and evaluative aspects could be part of the language arts program. This would include the physical layout, the different ways of reading a site, and evaluation of a website.

Students profited from their exposure to multiliteracies. They represented their knowledge in multiple formats and showed pride in their products. The students whose strengths were in the verbal areas created "reports" enriched with graphics, charts, and other forms of print. Students who preferred the visual arts created their paintings and drawings and enriched them with words. Students in the oral field presented radio and television shows and showed their knowledge orally. Students had a venue to relate information and they used their exposure to the multiliteracies on the Internet to create their own products. In addition, the audience enjoyed the variance in products and were engaged in listening, asking questions, and evaluating the products. The audience highly supported the presentation of the individual student's products and gave positive encouragement. The students' presentation time was a positive experience.

As for implications for literacy theory and research, hypertext reading is new and evolving. A relationship among hypertext and reader is different than in the print world. The reader might apply problem solving skills in order to figure out the hypertext structure of a site. The reader looks at the format of the information and decides the type of reading strategy to apply to the reading. Sometimes the reader will need to skim or scan to locate information and other times the reader will find a key word with the find option and look for meaning. Sometimes the reader will know that the information is in list form and can click to the information readily. Other times the information is imbedded in the branching of information. Sometimes the information will be linked to

other nodes and other times the information is found on an additional web site named in the search engine list. Strategies for the reading of hypertext are changeable and involve strategic decisions.

In conclusion, in order to effectively navigate an Internet website, lessons in schema and structure of hypertext need to be given to elementary students at the point they are beginning to use the Internet for research. These lessons can be incorporated in both the technology and literacy aspects of the curriculum. Then through varying exposures to multiple formats and contexts, the students may produce products reflecting today's multiliteracies. The students will possibly not give information only in the report form. They will enrich or vary the product in order to make their product more interesting and engaging. The students will enjoy this hypertext reading experience.

Recommendations for Further Research

Additional research is needed in many areas. These students had a basic understanding of the technology and the products which could be produced through word processing. This district's standards and benchmarks were already exemplary, and the objectives were applied within the classrooms. Other school districts do not have the technology, and some of the students do not have wide experience with computers and word processing. These students would benefit from similar instruction on knowledge and use of hypertext, but they could need additional experiences. A research project could try these lessons and see if the results are similar. Another research project could learn what students in other grades know and how they use

hypertext material. This research could particularly focus on the middle school level student and his knowledge and use of hypertext. Another research project using a widely diverse reading ability population could be completed. This study had participants who were in the average and above-average range. Also there were no participants who had a specific individualized educational plan (IEP). Another classroom could have students who had special needs with a wide range of reading abilities. This classroom could be studied.

This study also illustrated a need to construct and validate an instrument which can evaluate the knowledge and use of hypertext in order to research in the experimental design format. At this point, no standardized or valid instrument exists for use in an elementary classroom situation. A quantitative research project should be completed.

This study sets forth new information for students in hypertext or post-typographical field. Research has not been done for the classroom teacher and their knowledge of hypertext schema and structure. It should be done so that teachers can learn new techniques to help readers use hypertext strategically.

This field of hypertext is relatively new and emerging. The need for extensive research to help the classroom teacher and the students is needed. The need for strategies for teachers to use in the classroom is critical to create readers who read all types of texts strategically. Using Internet as an access to a wide variety of information and services is becoming increasingly important in the academic and personal lives of students. Therefore, it is the finding of this study, that instruction in the declarative,

procedural and evaluative aspects of hypertext is important when conducting research

and report writing using the Internet.

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APPENDIX A

LETTER TO PARENTS
PARENT PARTICIPATION FORM
STUDENT PARTICIPATION FORM

Mary Swanson
Oklahoma State University
Stillwater, Oklahoma
(Home Phone-918-368-2285)

September 1, 2001

Dear Parents of Students in Room 209,

During the fall semester, your child's class is participating in a study on the knowledge and use of electronic text structure. If you and your child give consent, I will be observing your child as he/she learns and uses electronic text structure. The entire study will be embedded within a science lesson on the uniqueness of life forms and the elements to keep the life forms continuing. The concepts will be presented through *HyperStudio,* a multimedia program. The only parts, which are not in a normal classroom activity, are pre- and post- interviews on the student's knowledge of the organization and use of informational print and hypertext. Your child will be identified by a pseudonym and no names of school, town or classroom will be used. Audio tapes and transcripts will be destroyed upon completion of analysis of information. The school district and principal have agreed to the study.

For more than 18 years, I have been a teacher and advocate for the program in your school district. I only recently retired to pursue another passion, my doctorate in educational technology. Now, I am back this fall semester to see if my beliefs about reading and educational technology are correct.

If you feel that you don't want your child to participate or if you have additional questions, please contact my home number or your homeroom teacher. If you have additional questions or concerns, call Sharon Bacher, Oklahoma State University IRB, 1-405-744-5700.

Sincerely,

(Mrs.) Mary Swanson

Parental Participation Form:

Room 209 is participating in a study on the knowledge and use of electronic text structure from a screen. The study will be presented within science lessons for about three weeks.

- I understand that the participation in the study is voluntary and that withdrawal from the study at any time is possible without penalty.

- I understand that the name of the participant, the city and state, and the school district will not be used in the study. All information will be held in confidence.

- I understand that the only official record which will be shared with the researcher is the Spring 2001 reading and study skills percentages from the Iowa Test of Basic Skills.

- I understand that the student will be interviewed twice--once before the study and once after the study. I also understand that the student will be observed during his classroom work and will be asked to reflect about what he or she sees or what he or she does when the student is reading from a book or a screen. The researcher will be taking notes during these procedures.

- I understand that my child and I can read the typed transcript from my child's file at an agreed upon time. Audio tapes will be erased immediately after conversion to a transcript. All transcripts are identified by a pseudonym.

- I understand that Mrs. Swanson will be available for phone calls and meetings at mutually agreed times.

I give permission for _____ to be interviewed about his or her skills in reading informational material either in books or on the screen. I give permission for Mrs. Swanson to have my child's Spring, 2001 Reading and Study Skills scores.

_____

Parent's Signature

_____(Date)

Student's Assent Form

September 9, 2001

To: Mary Swanson

Room 209 is participating in a study to determine how students acquire and use knowledge about electronic text structure. The study will be presented within science lessons for about three weeks.

- I understand that my participation in the study is voluntary.
- I will not be penalized if I decide to not participate.
- I also understand that I am free to withdraw and end my participation in this project at any time without penalty after I notify the project director.
- I will use a pseudonym for the study and at no time will my name, school, or city be used in the study.
- I know that I will be interviewed twice—once before the study and once after the study. I will also share my thinking as I am reading or working on a computer.
- I understand that all audio tapes and transcripts will be destroyed after analysis.

_____

Student's Signature

_____

Date

APPENDIX B

INTERVIEW FORM

Pre/Post Interview Form

Alias_____   Date:_____

General Information:	Other Observations:
1. Tell me about your computer experiences. *Do you have a home computer? Tell me about when you started using the computer and what you did. What do you do at home with the computer? Word process? Research on the Internet? Create multimedia? Chat rooms? E-Mail? Anything else? What did you learn to do at school within the computer lab? When did you start your experiences? What computer experiences do you do in the classroom or the library? What are your opinions about computer as an educational tool?*	
2. What types of informational books, do you have at home to use? *Dictionary? Encyclopedia? Almanac? Atlas?*	
3. When you read an informational book (the researcher taps on the pile of informational books) what do you know about how to read these books? *You were taught how to read a book, but you have your own special way to read a page. What can be found on an information text page? Tell me what your eyes see on a page that tells you how to read the material. How do your eyes go on the page? Where do your eyes go? Why do your eyes go there?*	
4. The author includes things on the page to help direct a reader. *What are some of the clues that the author includes to tell the reader how to read a page? In a textbook, the editors really direct a reader's eyes across the page. What are some of the clues that the editors place in a textbook? Do you know of any other directional aids on how to read a page?*	
5. In an informational book, accuracy and truth are two important traits. *How do you know if an informational text is real or factual? How do you evaluate the truthfulness in a book? Are there any other ways to judge the correctness of the information in a book?*	
6. You were taught about informational text structure, particularly in fourth and fifth grade. *How does knowing about the page organization help you as a reader? What other information about these books are important for a reader to know?*	

7. What kinds of electronic informational text materials do you have access to use? *Encyclopedia? Thesaurus? Dictionary? Atlas? Almanac?*	
8. When you read information on the screen (the researcher taps on the pile of hypertext resource materials) what do you know about these forms of information? *Tell me what your eyes see on a screen that tells you how to read the material. How do your eyes go on the screen? Where do your eyes go? Why do your eyes go there? Were you taught what to read on a screen page? Who taught you and what did they say?*	
9. How do you read through these materials? *What are some of the clues that helps the reader read from a screen? Do you know of any other directional aids? How is reading a computer screen the same or different from a book?*	
10. How do you know if the information on the screen is true or a good source of information? *How do you know if the information on the screen is real or factual? How do you evaluate the truthfulness? Are there any other ways to judge the correctness of the information?*	
11. How does knowing about screen organization help you as a reader? *How does knowing about the page organization help you as a reader? What other information about hypertext is important for a reader to know?*	
12. How did you learn how to read hypertext? What do you know about reading from a screen?	
13. Which form of reading do you prefer and why? *What are the benefits from reading from a book? What are the benefits from reading from a screen? What are some of the problems in each media?*	
14. Anything else you want to add about reading informational text either from the printed format or a screen format?	

Comfort Zone Questions:

1. On a scale of one to ten with ten being the highest, what was your comfort zone in using hypertext before the lessons?

2. What are your reasons for stating that number?

3. On a scale of one to ten with ten being the highest, what is your comfort zone in using hypertext after the lessons?

4. Why the difference? State particularly what you now know that you didn't know before.

5. If the score was not a 10, what areas do you think you should learn more about? Explain.

APPENDIX C

UNIT PLAN

Subject: Science Unit
Unit Title: Life Processes
Grade: Grade 5
Suggested Time Frame: Thirteen Teaching Days, 45 minutes to an hour each day.

Prior Information

In 2004 National Aeronautics and Space Administration is sending a probe to a Jovian moon, Europa. This moon is suggested to have an ice-capped ocean and possible life forms. Ed Weiler, the agency's chief of space science, announced that NASA is open to any viable options to study this Jupiter's moon and the planet Pluto. Maybe an option could be suggestions of life forms from Earth that should be shared with the life on Europa.

Thumbnail Sketch of Unit:

In order for life to exist, there are six aspects that must be considered. The six aspects are that each living thing must have a balance of liquid within its system, a gas for metabolism, nutrients for subsistence, an energy source, a reproduction cycle, and a means for dispersal. These six aspects vary widely from life on land to life deep within the trenches of the Gulf of Mexico. The students will learn how these aspects are related especially to the blue whale, Venus fly traps and carnivorous plants, tube worms and starfish. The student will select a fifth living thing to complete the set of unique Earth life forms which will be included in a 2003 NASA probe to Europa.

Content Standards and Benchmarks Assessed:

Standard 4: Understands that unity and diversity characterize life
- Understands that plants and animals have a life cycle which includes reproduction, growth and development, and death.

Standard 7: Understands the interrelationship of species and their environment.
- Understands that living things are found almost everywhere in the world: different types of plants and animals live in different places.
- Knows that an organism's patterns of behavior are related to the nature of that organism's living and nonliving environment
- Understands that when an environment changes, some species survive and reproduce and others die or move to new location.

Standard 9: Understands the basic concepts of the evolution of species.
- Knows that organisms of the same species vary and sometimes the differences give individuals an important advantage in surviving and reproducing.

English/Language Arts Standards and Benchmarks.

Standard 1: Applies reading strategies to gain information and understanding
- Identifies main points and details in expository text
- Selects and uses appropriate reference tool to gain information (e.g., thesaurus, encyclopedia, dictionary, almanac, encyclopedia, atlas
- Uses strategies for accessing prior knowledge to understand the reading selection
- Uses the arrangement of text and graphics to gain meaning (e.g., titles, headings, captions, directions, paragraphing

Standard 2: Reads, interprets, and analyzing a variety of literature
- Applies knowledge of basic elements and patterns of non-fiction to understand expository text: main topics, subtopics, details, listing pattern, sequential pattern, and compare/contrast pattern.
- Understands the basic characteristics of various types of literature including historical fiction, personal narrative, fantasy, essays, factual articles

Standard 5: Applies writing strategies to communicate with different audiences for a variety of purposes
- Organizes expository writing to include introduction, body, and conclusion
- Writes a biographical piece, a multiple paragraph persuasive piece and a report (with subtopics, details, examples, and explanations).

Complex Reasoning Activities

_x_Comparing, Day 2, 3, 4, 6 (Similarities and differences of bodies of information by concentrating on specific attributes)

___Classifying

_x_Inductive Reasoning, Day 1, 2, 4 (Inferences of principles through observation and discussion)

___Deductive Reasoning

_x_Abstracting, Day 4 (Identification of underlying general patterns)

_x_Constructing Support, Day 6 (Development of support for an idea and product.)

_x_Analyzing Perspectives, Day 1, 6 (Different perspectives on an issue)

___Problem Solving

_x_Decision Making, Day 1, 2, 6, 7, 8, 9 (Making decisions as to identification of goals and matrix evaluation items, self-assessment of performance, selection of theme of product.

___Experimental Inquiry

___Invention

_x_System Analysis, Day 1 (Evaluation of relationships among the attributes and effects of a missing or changed attribute.)

_x_Investigation (Historical, Projective, or Definitional), Day 10,11,12 (Identification and investigation of a topic and product.)

Lifelong Learning Standards

Knowledgeable Person:
- Understands and uses knowledge as stated in the standards for each subject.

Complex Thinker:
- Applies reasoning, makes decisions, and solves problems.

Effective Communicator:
- Accesses information, evaluates accuracy, uses information and communicates clearly.

Self-directed Learner:
- Sets and achieves goals, directs change, evaluates self, sustains effort, and seeks new ideas.

Quality Producer:
- Creates quality, appreciates excellence, and uses appropriate tools.

Contributing Citizen:
- Connects family/school/work, works in groups, manages conflict, and respects diversity.

Information Literacy

Standard 2: Knows how to use a formal information seeing process.
- Identifies possible sources of information including print, non-print, electronic or human resource.
- Selects more than one resource when appropriate
- Identifies keywords or phrases
- Recognizes different ways to organize information

Standard 3: Knows how to locate sources and find information within those sources.
- Uses the elements of a book to locate information
- Uses print and electronic sources.

Instructional Technology

Standard 1: Demonstrates knowledge of basic instructional technology concepts and operations.
- Demonstrates proficient management skills.
- Uses instructional hardware and software for class use.

Standard 4: Knows how to use technology to plan, produce and present a product
- Inserts, ejects and plays a CD-ROM

Standard 5: Knows how to use technology to access and transmit information
- Uses basic terms related to the Internet
- Accesses information from the Internet using a Web browser

Assessment:

Purpose for Assessment:
The assessment will be the fifth living object which the student selects which should be included in the NASA probe to Europa, a Jovian moon. This selection must represent the uniqueness of an Earth life form. The student must then "package" his selection in an appropriate product based on his goals and objectives.

Audience for Assessment:
The product will be presented to the classmates and other interested classrooms within the school.

Framework of Assessment Approaches and Methods:
Self-made evaluation matrix based on originality, organization, mechanics, growth, productivity, and a personal goal will be used to evaluate the product.

Evaluation and Communication Methods:
The class will decide as a group the means and evaluation for the presentation to the other classroom and school.

Positive Attitudes and Perceptions

Self-selection of topic and evaluation adds to positive attitude toward learning. Active reading and thinking strategies will complement small group, large group and individual activities. The importance of relating the information to real life and real audiences are worked within the lesson plan.
.

Strategies for Addressing Needs of Different Learners

Differentiation: The science content meets the standards and benchmarks suggested for the grade levels. The information is challenging enough to meet the highest level of students but scaffolded to assist the students who need it to have success.

Modification: Pairs of students will use the same book or computer and the adult will be available to assist in declarative or procedural areas. More assistance can be provided to the non- or challenged reader.

Daily Planner

Day One

Activities: On the first day, the students will have introductory lesson introducing the topic, the goals and objectives, and the procedure of the unit. The topic is Life Cycles. The task is that each child, as either a zoologist or biologist, must select the fifth animal or plant that best represents the uniqueness of Earth life to include in a NASA probe to Europa in 2003. The researcher has selected the first four forms. The assessment is the creative product that shows this life form and its uniqueness. Any product, print or electronic, can be created. Day One also describes the six basic elements for life.

Assessment: The Think, Write and Share cooperative strategy will introduce, "What essential elements must be available for continued life? The questions, "Is there life forms somewhere else? Is so, what should they know about Earth's life forms?, will continue the discussions. Goals and expectations will be formulated

Homework/Reflection: A blank matrix will be handed out for the student to fill in the evaluation part of the unit to prepare for self assessment of performance assessment objective. (See Appendix C: Unit Plan- Day One). A reflection journal will conclude the day. The first part of the reflection is what the student learned today and the second part is the feelings about learning. The third part is to predict what life forms the researcher chose to include in the study.

Day Two

Activities: The declarative aspects of print and hypertext structure will be shared. With partners, the students will study a social studies book and make a list of characteristics of the page. As a whole group, the information is formulated on a KWL chart. (See Appendix E: Unit Plan- Day Two). The students then studied several screen pages about Europa focusing first on address and then on layout. Then in groups of three, the students match what they know about the characteristics of a screen page.

Assessment: The students will contribute in small and large group discussions about the topic:
The students will be active participants in the learning process.

Homework/Reflection: In the reflective journals the students write a comparison/contrast expository paragraph about the likenesses and differences between a book page and an electronic page. A graphic organizer will be provided, if needed.

Day Three

Activities: Day three will focus on the electronic representation of the first animal which the researcher chose to represent the uniqueness of life. The first part is the introductory activity of 21 Questions to discover the name of the animal and the purpose for choosing the animal. The procedures and goals of the day are explained. The researcher will model "self-talk" strategies by using the first page of the HyperStudio stack. The students fill out the chart on the six elements for life. The students will learn about the location, feeding habits, environment, physical characteristics and interesting facts about the blue whale.

Assessment: With a study partner, the students will "self-talk" their knowledge about text structure. The study partner helps point out information that the other person missed.

Homework/Reflection: The student will write a three-part passage. One part is a summary of what he or she learned about the animal. The second part is whether the student feels that this animal should be included in the probe. The third part is what the student learned about declarative electronic text structure.

Day Four

Activities: Day four focuses on the procedural aspects of reading print hypertext structures. In groups of four, the students will write a recipe on how to read an informational text in the book format. The recipe will include at least 5 ingredients and 5 directions. The recipe will be shared with the class via the overhead. Discussion on part of book, cuing, headings and subheadings will be emphasized. Graphic organizers of definition, time order, compare/contrast, descriptive and problem/solution text structures will be reviewed.

In hypertext, the researcher shares the three different text structures--a lineal chunk (or node) linked arrangement, sets of chunks to sets of chunks arrangement, and hierarchical hypertext arrangement. Flowcharts was explained.

Assessment. The researcher has many "first pages" of web-sites and the student must identify what type of arrangement the first page indicates. Explanations of reasons for the choice will be clarified.

Homework/Reflection: In the reflection journal, a time-order sequence paragraph on "How do you read a hypertext article?" is written.

Day Five

Activities: On this day, partners will "self-talk" about procedural elements and habits to use while studying tube worms, an unique animal with unusual use of gas, temperature, energy source and nutrients.

Assessment: The partners will develop a flow chart or map of the navigation pattern found in this study. The students will also completed the rows and column of Appendix D- Day One.

Homework/Reflection: The students individually will reflect on what they learned and felt about tube worms and navigation.

Day Six

Activities: On day six, the evaluative portion of text structure is found. The students will take on the role of an editor and evaluate the use and appropriateness of a set of information. Points as audience, authorship, publishing and availability should be discussed. The students will create an evaluation matrix for judging websites. Four articles about coyotes are chosen and the students are to be editors for a children's magazine and rank order the four sites as in importance for a fifth grader. Reasons for the ranking must clarify the choices.

Assessment: Active participation in the activities for the day should be assessed. Also, the quality of the rational for one article.

Homework/Reflection: The stimulus question is "What makes a good web site? How do you know if a website is good? How does a web editor evaluate a site? What is the most important things have you learned about a website? Why?"

Day Seven

Activities: An introduction to reading URL address will start the day's activities. Seven websites addresses about coyotes will be used. Then the analogy of a mall will be given. Groups of two will use the HyperStudio stack to evaluate articles about the Venus Fly Trap.

Assessment: Students will add onto the Appendix D: Day One chart.

Homework/Reflection: In the reflective journal, the student will decide on what animal they will research and why that animal should be included.

Day Eight

Activities: The article for today is about starfish and regeneration. The instructions will be minimal and the students will write a summary paragraph about the animal and how the reader used the physical aspects, the navigation clues, and the evaluation to learn the material.

Day Nine

Activities: This day is for the students to start the research process for the fifth living object which should be included on the probe. The Matrix of Evaluation will be completed (Appendix G: Unit Plan- Day Nine- Evaluation). A time-line will be finalized. The final presentation mode will be agreed upon by the class. A descriptive report on the animal and why this should be included on the probe should be one part of the presentation (Appendix: H: Unit Plan- Day Nine- Project Format). The students designs his or her project with the presentation mode and the Matrix of Evaluation in mind.

Days Ten, Eleven, Twelve, and Thirteen

Activities: The students will research, write and plan their project. On day thirteen, the presentation will be made. One day after day twelve, the post interview will be completed.

Assessment: The students self-assess their products using their individualized evaluation matrix (Appendix G: Unit Plan- Day Nine- Evaluation). The students will also evaluate the presentations by giving two positive comments and one suggestion comment.

Performance Assessment:

The performance assessment task is that each child, as either a zoologist or biologist, must select the fifth animal or plant that best represents the uniqueness of Earth life to include in a NASA probe to Jupiter in 2004. The selection will be presented in either a print or hypertext form and will be self-assessed by the student creator. Also an election of the one animal or plant as presented by the student, which should be included in the probe, will be held.

Instructional Materials and Supplies

Student Materials.

- HyperStudio stacks will be made on four topics: blue whales, Venus fly traps and carnivorous plants, tube worms and starfish.
- Computers with Internet access
- A Reflective Journal for daily reflections
- Paper and pencils for daily work.
- Materials for the final product

Teacher Materials:

- HyperStudio stack on blue whale, carnivorous plants and Venus Fly Traps, tube worms and starfish
- Product List-Appendix H
- Evaluation Matrix-Appendix G
- Six Element Chart-Appendix D
- Large sheet of butcher paper for recording the Six Elements for Life
- A stack of an encyclopedia, an almanac, a picture book, a textbook
- A stack of "boxes" from electronic sources-an encyclopedia, an almanac
- A KWL chart on butcher paper
- Overheads and overhead markers
- Graphic organizers of definition text structure, time order text structure, compare/contrast test structure, descriptive text structure and problem/solution text structure
- Graphic organizers of lineal chunk (or node) linked arrangement, sets of chunks to sets of chunks arrangement, and hierarchical hypertext
- First pages of many Internet sites.
- Overheads of the examples of hypertext paragraphs in case the Internet is down.
- Example of a flowchart or a map
- Four varied Internet articles about coyotes

Support Personnel

The support personnel which might be used are:

The computer lab aide or the computer support person to help with the set-up of hardware.

The librarian to help secure materials or time for research in library.

The teacher to help secure computer laboratory time for the final day.

APPENDIX D

UNIT PLAN-DAY ONE
COMPARISON/CONTRAST MATRIX FORM

The Six Aspects for Life	1.	2	3.	The "row" conclusions
Balance of Liquid				
Gas for metabolism				
Nutrients for subsistence				
An energy source				
A reproductive cycle				
A means for dispersal				
The "column" conclusions				

APPENDIX E

UNIT PLAN-DAY TWO
KWL – PHYSICAL ASPECTS
AND
TEACHER REFERENCE

What do I know about the physical aspects of	
Informational Books	Electronic Information

Print and Hypertext characteristics

Characteristics	Academic, professional, business prose Straightforward, explicit, factual Writer conscious of content and organization Contains definite pattern of organization Focuses on the exploration or presentation of subject matter
Audience	Others
Purpose	Inform Describe Explain a process, idea, or situation Analyze
Forms	Report Slide/Tape Agenda Review Observation Examination Letter Profile, Portrait Essay Advertisement Newspaper Article Research paper Schedule
Graphic Organizers	Definition Descriptive Compare/Contrast Time Order Problem/Solution or Cause/Effect
Print Graphic Organizers	Definition Descriptive Compare/Contrast Time Order Problem/Solution or Cause/Effect
Hypertext Graphic Organizers	Hierarchical hypertext Chunk- or node-linked Sets of chunks or nodes are linked to another set of chunks or nodes.

APPENDIX F

UNIT PLAN-DAY FOUR
INTRODUCTORY WEB PAGES

Introductory pages of each of these web pages were copied for student use.

<u>Europa and life in space:</u>

wysiwyg://65/http://planetscapes.com/solar/eng/europa.html

http://oposite.stsci.ed/publinfo/

http://www.wnet.org/hawking/mysteries/html/uns_shostak-1.html

http://mustang.coled.umn.edu/Exploration/Science.html

http://www.hq.nasa.gov/

http://www.seds.org/billa/tnp/europa.html

http://www.jpl.nasa.gov/ice_fire/europao.htm

http://www.nationalacademies.org/ssb/comp-europamenu.htm

http://pirlwww.lpl.arizona.edu/HIIPS/Publications/greenberg_tectonics/

<u>Other examples:</u>

http://www.encyclopedia.com/browse/18.html

http://www.amsu.org/ecosci/sld001.htm

http://www.georgehart.com/trilobites/trilobite.html

http://206.67.52.250/   (EHow)

wysiwyg://21/http://206.67.52.250/Center/catIndex/0,1004,1063,00.html   (Ehows: Dogs)

wysiwyg://23/http://206.67.52.250/3How/eHow/0,1053,10108,00.html   (Ehow: Collies)

http://www.ehow.com/eHow/eltow/0,1053,8321,FF.html

http://webster.commnet.edu/grammar/

APPENDIX G

UNIT PLAN-DAY NINE
EVALUATION OF PRODUCTS

		Degree of Quality				
Personal Goals for Unit	Do Over	Low.................. Moderate.................. High				
		1	2	3	4	5
Originality Goals						
Organization Goals						
Mechanical Goals						
Growth Goals						
Productivity Goals						
Other Goals:						

Student Signature _____ Teacher Signature _____

Date _____ Date _____

APPENDIX H

UNIT PLAN-DAY NINE
PRODUCT LIST

Select a product format.

advertisement	art gallery	board game	bookcover
bulletin board	ceramics and paragraphs		charts
poetry	collections and illustrations		comic strip
computer generated product	dance	drama	editorial
essay	fable	fact file	filmstrip
recorded speech	illustrated story	journal	large scale drawing
letter	letter to editor	magazine	movie
mural	museum exhibit	musical composition	oil or acrylic painting
pamphlet	photo essay	photographs	picture dictionary
poster	radio show	scrapbook	sculpture
story	slide/tape show	song	textbook article
TV documentary	written report		

or ask the teacher if another idea is appropriate.

APPENDIX I

TWO VIGNETTES

TIA

Tia was the most grateful in learning about the Internet and its uses. She was about midway in the group at the beginning. She had used this source for some research, but she felt that she didn't use it as effectively as she should. She had a parent to support her when the technology didn't work or didn't do what she wanted.

Tia wanted to be quick in looking for things. When things didn't go right she was upset. She wanted the procedures to go smoothly and efficiently and she wanted to learn all she could. When she was doing her research, many times she thanked the researcher for showing her the "clues" which could make the research easier and the way to read an address. She commented, "This site does not help me and I don't know where I am. I am going to use the skills that you taught me on how to get home...now I am home. Thank you for teaching me that."

Her mood was more upbeat as time on the Internet increased. She was not afraid that she would be lost. She knew her clues to keep herself on the right procedure. As she read the addresses, she evaluated each source as to effectiveness. She was writing a project about the sea urchin and skipped three sites before she decided to enter Sea Urchin Information System and discovered that it was a good site. She used the evaluative skills to save her time to get to a site which was appropriate.

LINK

Link was very inexperienced with using the Internet and preferred to use books as a research source. He loved new information and questioned information that he thought were incredulous. He rarely used hypertext as a research source. He learned in his research sessions at school that searching for a topic required information and refinement. His topic was the swallow-tail kite bird. He started off listing "kite" as his topic to search. He had so many hits that he was confused. Then he wrote the word "bird" and had even more hits. He just rambled through these two searches for the first research session. Then he commented at the beginning of the second session that he couldn't find anything. He told the researcher what he had done the first session and then she helped him refine his search to bird-kite-swallowtail. He was thrilled when he had a reasonable amount of hits for the search. The researcher helped him find more "clues" to help him with his search. They read each address together with the researcher asking him questions about the source and author. As he evaluated each address, he found three sites that he thought were particularly important. He wrote down the sites and then he started taking notes and drawing pictures. He had participated in the lessons on clues and procedure but he needed additional guided practice to apply his knowledge. He said in his final interview that each site could be filled with about 20 to 30 clues and that he must pay attention to them to effectively get information. But, he was a student who needed a knowledgeable peer, teacher, or relative to guide him in a particular task until he was competent.

APPENDIX J

PRODUCT DESCRIPTIONS

PRODUCT DESCRIPTIONS

Hannah chose the tuatara because it was a really unique animal for millions of years and it could show us what life was like before humans came on Earth. She developed an outstanding report on the living fossil. She wrote a paragraph or two on each of these topics: Introduction, the purpose for including this animal on the probe to Europa, the six essential elements for life (nutrients, balance of liquid, gas, energy, reproduction, and dispersal), a fact file, basic information, habitat, and classification. She included six graphics to illustrate each section and use for the title page. She created a pie chart for the six essential elements of life and included that graphic in that section. She used seven references for her report. One student wrote on a evaluation sheet that if there was a contest for best paper that Hannah would win. Another student wrote that the information was really good and that the pictures were wow.

Bob chose to represent the viperfish with a page and a half typed report and a 8½ by 11 inch colored pencil drawing. He was fascinated that the fish was found in the "twilight zone" parts of the very deep cold ocean. He wrote about its characteristics, the six elements for living, interesting facts, and why it should be an example for the Europa probe. The students enjoyed the excellent drawing showing the viciousness of the animal.

Angelina was fascinated with the glass lizard because it was a lizard but resembled a snake. She wrote that this legless lizard had movable eyes and external ear openings. Angelina added that people have to handle this lizard carefully because its tail can break off. She wrote a three paragraph report telling its characteristics, its location and the types of species. She constructed a 3-D diorama of the lizard and its habitat. The

students liked the "cool, awesome" information and model because it resembled a zoo display.

Crystal and Sara Ann looked for the information separately and then combined the facts into a radio play which they performed in front of the class. Sara Ann used primarily four sites to learn about the chimpanzee and Crystal used three to learn about the snow leopard. The skit was about the girls trying to persuade Mr. Weiler, the NASA representative for the probe to Europa, to include the snow leopard and the chimpanzee as examples of unusual Earth life. The characteristics, range, diet, benefit to society, and its endangered status were given. The other students enjoyed the information given in this creative format.

Gabriella chose the sea cucumber because its body is adaptive and not disturbed by any sealife. She created an informative fact file using four sites. In her bibliography she mentioned that three of the sites were made in 2001 and the third site was published on September 16, 1998. She specifically stated that no authors were mentioned but that PBS had put up one site. The other three sites were from sites about reefs and sea aquariums. The fact file consisted of one to two paragraphs in each of the four areas: environment, description, food, and defenses. She was most repulsed about the possibility that the sea cucumber expels its insides and then grows new ones back to confuse the enemy. The students also felt that was the best part of her fact file.

Ed did a report and poster on the Siberian tiger. The one page hand-written report emphasized that the Siberian tiger was the biggest tiger and its roar could be heard from a mile away. The report was divided into the interesting facts, the description, the range, the hunting techniques, the camouflaged coat and its scientific name. The three by four

foot poster had a large drawing of the tiger laying down in the center. Then circling the tiger were key words as What? Where? Why? When? How? and a short sentence or two response. Two interesting facts were placed in voice bubbles emitting from the tiger's mouth. He used zoo sites for most of his information. The students particularly liked the poster and thought the tiger was well drawn.

Jeff used particularly two sites to locate his information about banded geckos to write a report and publish a graphic. He displayed his information on a large sheet of white poster board. The title was written in orange letters on brown background and glued along the top of poster board. In the center was a large graphic of a banded gecko. The graphic was magnified until it was about 8 by 11 inches. Then Jeff used his colored pencils to shade in the colors and fill in the details which had become fuzzy when the graphic was enlarged. Spoking around the graphic, he divided his report information into paragraphs: Location, Description, Uniqueness, Food and Bibliography. The students in the class liked the picture but wanted more information about the animal.

Harry wrote an acrostic poem about aloe vera, the specimen he thought should be included in the probe to Europa. He felt that this "medicine plant" was "radical" and could help with burns and other cures. Harry's representation was very creative but it also showed that he was absent during one of the research sessions. He only used the information he found during his first and shorter session. The poem was attractively mounted and a magic marker drawing of the plant highlighted the display.

S.S. used five Internet sites to create a trifold pamphlet and a synthetic clay model about the red-eyed tree frog. Her trifold had sections on Introduction, What does a red-eyed tree frog eat?, What does a red-eyed tree frog look like?, Where do red-eyed tree

frogs live?, How do red-eyed tree frogs reproduce? , interesting facts, and bibliography. Using pictures and information from the Internet, she constructed a model. Her model was about four inches long and three inches wide and painted to represent the true coloring. She felt that this small interesting frog's most interesting characteristic was its red eyes which can help scare off predators. The students were most impressed with the information in the pamphlet and the "cool" clay sculpture. One student wrote on the evaluation that the colorful model and the brochure "stands out."

Owen used graphics effectively to create her tri-board display. For four of her graphic displays (8½ inch by 11 inch), she first copied pictures of cone snails and overlayed a sentence or two upon the graphic. She added a bar graph which she created about the toxicity of the snail to other poisonous creatures and added two colorful illustrations of the snail with descriptive paragraphs. She also wrote a two page single-space typed report about the reasons for choosing the animal, the location, the poisonous quality, the six elements for survival, the reproduction, and its description and she displayed it on the tri-board. She finished up her display with a clay replica of the animal. Owen felt that this animal should be included in the probe because it had the most complex venom that people know about. She mainly used three sites to construct this tri-board display. The students were amazed that she could get such "awesome" pictures from the Internet and she told them how to put text on the pictures.

Nick created a two feet by three feet chalk and magic marker drawing silhouette and a fact file of the turquoise poison dart frog. He was interested in this animal because the frog is very poisonous. Seven short paragraphs about its description, toxicity, location, food, food chain, use of poison, and predators were hand-written and cut out and

displayed on another sheet of paper next to the painting. A graphic from an Internet site was the base for the painting which was done in a greenish turquoise color, black for the body, olive green for the eyeball, and rosy-red for the tongue. Product time was used primarily for the drawing and less time was used for the information. Nick was extremely pleased with his painting and a student wrote on his evaluation, "sweet project" which made Nick happy.

Lillie used nine sites to write her report and create a soap dispenser about her favorite animal, the Komodo dragon. She especially liked the fact that this "living dinosaur" could smell prey over five miles away. Her table of contents stated an introduction, physical characteristics, location, habitat, behavior, diet and eating habits, the mating ways, the li'l ones, the fearsome bite, saving the species, interesting facts and bibliography as parts of her report. In her report, graphics from the Internet illustrated each section. On the cover, the head of the dragon was made from seeds and construction paper. The soap dispenser was a great hit with the students. The exterior was made of cloth and resembled the head of the Komodo dragon. From its tongue (the soap dispenser itself), came the "forty different types of bacteria" with the dragon's saliva. The students were relieved that hand lotion came out of the dragon instead of saliva.

Jennie used three reference sites and her family as the sources for her report, an eight item multiple choice test, a graphic and a drawing. About two-thirds of her report was fact files from a web-site describing the description, location, feeding and scientific names. The other one-third was Jennie's reasons why the green water dragon should be included in the probe to Europa. Her mother brought in the animal for children to see and many questions were generated and answered by Jennie. Jennie showed that she had

learned much information from the Internet. For the multiple choice test, a stem was similar to: "How big do green water dragons regularly grow to be?" Three answers were possible: a. 10 feet long, 3 feet long, and 5 feet long. The students took the test and Jennie orally explained the correct answer. The students especially liked the green water dragon climbing all over Jennie's torso and head. They also enjoyed matching their knowledge in a game format and Jennie explaining the correct answers.

Ty wrote a script and produced a movie with his sister as the main photographer. Ty's role was the lead character on the Platypus Hunter show searching the bluffs along the lake for the elusive platypus. He used an Australian accent to relay the detailed information about its description, location, diet, interesting facts, and venom. Two commercials added humor to the program. Two sites were used for most of the information. The students loved the video and the originality that was present. The students spontaneously clapped when the movie was shown.

T.W. was absent the research days and had to do her research at home. She wrote an acrostic about the sand dollar. The acrostic included the location, description, scientific name, and similar species. For as little time that she had, she included the basic information in the acrostic poem of ten lines.

Link did a photo essay of the swallow-tail kite. He also did a sculpture out of Ivory soap. Link is really fascinated with all types of birds. His five page photo essay consisted of his pen and ink drawings and paragraphs about the introduction, location, breeding, description, and types of food eaten by the bird. The short, three to four sentence paragraphs were filled with interesting information. He got some information from the Internet, but also relied on a field guide to get more information. His drawings

show his interest and love of birds. The students were interested in the soap sculpture. They loved his drawings, but commented that his writing should have been neater.

Tia did a index card fact file on the sea urchin. She chose this animal because she liked the way it moves and that it has a water vascular system. The facts were color coded and labeled as to description, interesting facts, location, and age. Each card contained one fact. The section on interesting facts had 13 purple cards. She used primarily two sites to get most of her information. The students liked the color coding and the interesting information. One student commented that she wished that Tia had included some pictures so that she would know what the sea urchin looked like.

APPENDIX K

INSTITUTIONAL REVIEW BOARD APPROVAL

Oklahoma State University
Institutional Review Board

Protocol Expires: 8/16/02

Date: Friday, August 17, 2001   IRB Application No ED01130

Proposal Title: STUDENTS' KNOWLEDGE AND USE OF POST-TYPOGRAPHIC STRUCTURE IN USING INFORMATIONAL TEXT

Principal
Investigator(s):

Mary Francis Swanson   Bruce Petty
Rt 1 Box 478   261 Willard
Stroud, OK 74079   Stillwater, OK 74078

Reviewed and
Processed as: Expedited (Spec Pop)

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive Secretary to the IRB, in 203 Whitehurst (phone: 405-744-5700, sbacher@okstate.edu).

Sincerely,

Carol Olson, Chair
Institutional Review Board

VITA $\mathcal{2}$

Mary Ruth Swanson

Candidate for the Degree of

Doctor of Education

Thesis: FIFTH GRADE STUDENTS' SHIFTS IN KNOWLEDGE OF HYPERTEXT
STRUCTURE

Major Field: Curriculum and Instruction

Biographical:

Education: Graduated from Kingfisher High School, Kingfisher, Oklahoma in
May, 1960; received Bachelor of Science degree in Elementary Education
from Oklahoma State University, Stillwater, Oklahoma in May, 1964;
received Master of Science degree from Purdue University, West Lafayette,
Indiana in Education in 1969; and received a Master of Science in Teaching
from University of Wisconsin-Superior, Superior, Wisconsin in 1980.
Completed the requirements for the Doctor of Education degree at
Oklahoma State University in May 2002.

Experience: Taught for over thirty-three years in Colorado, Germany, Indiana,
and Wisconsin in grades three though nine. Had experience in team
teaching, self-contained classrooms, Title I and Chapter One math and
reading resource programs, pull-out elementary gifted programs, and a self-
contained gifted program. Was active in the building leadership team for
the school. Served as mentor teacher for first year teachers school and
district-wide. Taught gifted classes at Carthage College and literacy classes
at Oklahoma State University.

Professional Memberships and Presentations: Had state committee chairmanships
in Wisconsin Reading Association, presented at the International Reading
Association conference, presented multiple times at the Wisconsin Gifted
and Talented Council, presented at the Illinois and national gifted
conferences, chair and participated in local Chapter One and Title I
organizations, and was active in city and school gifted and reading councils.