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The Effects Of Reciprocal Teaching Strategies On Students' Comprehension Of A Seventh Grade Life Science Text

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THE EFFECTS OF RECIPROCAL TEACHING STRATEGIES ON STUDENTS' COMPREHENSION OF A SEVENTH GRADE LIFE SCIENCE TEXT

by

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ABSTRACT

This action research study was conducted with 7th grade life science students at a public middle school in central Florida. The author used Reciprocal Teaching (RT) as described by Annemarie Palincsar and Anne Brown (1984) to examine changes in student comprehension when reading their life science textbook and changes in how the students used the predicting, questioning, and summarizing strategies. The RT strategies ask students to employ 4 strategies: predict what they will read, generate questions about what was read, clarify any ideas that were not understood in the reading, and summarize the main idea of the reading. Students were given a pre and post reading comprehension test, they completed reading response worksheets to record their predictions, questions, clarifications, and summaries. Students were explicitly taught the 4 strategies prior to using them and the strategies were reinforced through teacher modeling (using think aloud teaching to show students how to use the strategies) and expert scaffolding (giving students the support needed while using the strategies). The teacher-researcher also examined if the students showed change in their level of proficiency when using the strategies after they had been taught them. Analysis of data revealed that student comprehension did increase after being taught the four reading strategies. Data also showed that students became increasingly more proficient when using the strategies as the study progressed. Data analysis also uncovered the unexpected pattern of increased student participation during whole-class and reading group discussions. Further research is needed to examine the effects of teaching highly proficient students specific reading strategies and to see how the explicit instruction of reading strategies affects student participation and achievement during inquiry-based laboratory investigations.

This work is dedicated to my loving husband who listened to all my ranting and raving for the past two years. Also to my parents, who instilled a love for learning in my soul. To my fellow thesis writer Michelle: without our Saturdays I don't think I would ever have finished. Finally, to my students, who are the reason I took on this project.

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CHAPTER ONE: INTRODUCTION

Reports published in the past fourteen years have indicated that the cognitive strategies shared between reading and science could be taught directly, in coordination with each other (American Association for the Advancement of Science [AAAS], 1993; National Research Council [NRC], 1996; National Institute for Child Health and Human Development [NICHD], 2000). Throughout my career as a middle school science teacher, it had been my experience that my students were enthusiastic about learning science in a lab, but not about learning science through print. I felt it was more important to give my students the tools they needed to be scientific thinkers, and not just good science learners. This included how to be good science readers. By utilizing a proven metacognitive reading strategy, known as reciprocal teaching, I hoped to help refine the skills my students would need to think critically about the science concepts that were covered through the activities and labs they enjoyed.

Before I began this study, I hoped to gain a better perspective on how to improve my students' science reading skills and therefore help them become more proficient readers of scientific text. Through the research of how explicitly teaching my students a series of metacognitive reading strategies through a process known as reciprocal teaching (Palincsar & Brown, 1984) I wanted to discover how these strategies affected my students' ability to comprehend scientific text as well as their ability to make predictions, ask questions, summarize, and clarify confusing concepts in text. By teaching and modeling how to use these strategies, I hoped to make inferences that would help my students become critical scientific thinkers.

Purpose

The purpose of this study was to examine my explicit teaching of reading strategies and my seventh grade students' use of those strategies when reading a life science text. By collecting data on the teaching of these strategies and the students' use of the strategies I hoped to identify ways to improve my students ability to comprehend what they read in their science text book and their applications of the taught strategies when reading scientific text. Through the teaching and modeling of these strategies I hoped to effect the students use of reading skills they would need to be critical scientific thinkers in the lab and when reading about science.

Research Questions

This action research study focused on four major questions:

Question #1 What were the effects of the explicit teaching of reciprocal teaching strategies on students' comprehension of a seventh grade life science text?

Question #2 How did the use of reciprocal teaching strategies affect students' ability to make predictions about the text?

Question #3 How did the use of reciprocal teaching strategies affect students' ability to generate questions about the text?

Question #4 How did the use of reciprocal teaching strategies affect students' ability to summarize what was read in the science text?

Data for this study were collected using teacher-researcher field and observation notes, student reading response worksheets, and pre and post reading comprehension tests.

Rationale

As a beginning middle school science teacher my teaching practices were based on students reading the text, defining key terms, doing a one day laboratory investigation, and assessing students learning through a quiz at the end of the week. I quickly learned that my students were not reading the assigned text and vocabulary terms were defined using the glossary. It appeared that the students were only working through the procedures during the laboratory activities and were not thinking critically about their results. This all led to students not having a good understanding of the scientific concepts we were studying.

As I continued my teaching career I attempted different approaches to teaching science. I assigned the reading of passages as in-class assignments. This did not yield any better results from my students than assigning the passages as homework. In turn, I began to use the text less and less and focused more on the hands on aspect of my teaching practices. My students showed more interest, but I was still not seeing the level of scientific thinking I expected from them. I suspected that this was due to the fact that my students were going through the motions of each lab or investigation we conducted, but the actual science concepts were not being addressed during their analysis of the data they collected.

In response I taught science using a lecture approach. Each week I would spend one or two days standing in the front of my classroom talking at my students while they furiously scribbled notes down. This approach left me exhausted, my students unengaged, and it still did not produce the level of scientific thinking I wanted out of my students during laboratory investigations. It was also around this time that reading in secondary

schools came into the spotlight in the state of Florida. Teachers in the content areas were being sent to literacy trainings to bring reading strategies into the science, social studies, and mathematics classrooms. Instead of resisting this movement in Florida's schools, I decided to embrace it. Through analysis of recent data and reviews of the research literature, I saw a chance to not only affect my students' ability to read science, but also a chance to help my students become critical scientific thinkers.

The constructivist approach to teaching challenges students to construct their own knowledge and take responsibility for their learning. Through the utilization of this pedagogy I set out to guide my students into the role of scientific readers in the hopes that it would encourage them to be scientific thinkers. I looked to achieve this goal by first giving them the tools they needed to construct scientific knowledge through print and then through guided scientific inquiry. This approach was incorporated with the Vygotskian view that children learn how to engage in cognitive tasks first through social interactions with more knowledgeable others until the student becomes capable of assuming responsibility for learning and in turn becomes the expert (Vygotsky, 1978).

Significance of Study

Due to increasing demands on students, both in the classroom and in society, teachers were forced into the realization that the reading abilities of their students will impact the success of those students in the content area classroom and that students who leave the school system without the proper reading skills and strategies are at an automatic disadvantage in society (Biancarosa & Snow, 2004). Teachers in the content area needed to become aware that not only are they teachers of that content, but also teachers of content literacy (Hand, Alvermann, DGee, Guzetti, Norris, Phillips, et al.,

2003). Just as science teachers prepare their students for a lab or a test, they also needed to prepare their students to read science text for understanding.

Educational accountability, especially in the area of reading, has been a hot topic both at the national level and the state level since the signing of the No Child Left Behind (NCLB) Act in 2002 which deemed that all students nationally read at grade level by the 2013-2014 school year. In response to that, the State of Florida initiated the *Read to Learn* program which mandated that students who did not read at grade level in the third grade, per the Florida Comprehensive Assessment Test (FCAT), be retained. However, with the inclusion of FCAT science scores in school accountability grades, there could be a shift in the schools focus. Students now needed the skills to read science text for understanding in addition to fiction and non-scientific informational text. According to the Florida Department of Education (2003), when students progressed from elementary to middle school, the focus of the FCAT reading test became more heavily weighted on the side of informational text which added an additional challenge to students who have difficulty with reading comprehension. Biancarosa and Snow (2004) have shown that the expectations of secondary readers were very different from that of elementary readers. In order to become successful in society, students were going to be required to be problem solvers and critical thinkers, and that process was enhanced by teaching students to be critical readers (Biancarosa & Snow, 2004).

Assumptions

Based on a review of literature and past experiences teaching middle school science, I approached this study with several assumptions. The first assumption was that by explicitly teaching my students the reciprocal teaching reading strategies their reading

comprehension of science text would improve which would therefore improve their content understanding. A second assumption was that all students would read the assigned passage. The final assumption was that my point of view on students' reading groups did not interfere with analysis of the data collected throughout this study.

Limitations

There were several limitations to this study. One of those limitations was that students' overall attitudes towards being expected to read twice a week was poor. Many of the students at the school were non-proficient readers which required them to be in either a one or two hour intensive reading block in addition to their regular language arts class. The majority of the students enjoyed coming to science for the hands on experience. As a teacher, it was difficult to be persistent when students are so vocal about not wanting to read. It was also difficult to be persistent when it is more natural to have students participate in labs and inquiry investigations then having students read during class. An additional limitation was not knowing what students' backgrounds were in terms of being taught reading strategies. As previously mentioned, many of the students had either participated in an intensive reading class or were currently enrolled in an intensive reading class. Each intensive reading class incorporated a different approach to teaching students reading skills and these approaches were unknown to the researcher. A final limitation to this study was student mobility. During the twelve-week time frame of data collection, the class observed lost a total of four students and gained a total of five students after the initial teaching phase of the strategies.

Terms

Decoding: The ability to translate a word from print to speech, usually employing the knowledge of sound symbol correspondences; also the act of deciphering a new word by sounding it out (FCRR, 2006)

Explicitly Taught Strategies: Teacher Models and Explains; Teacher provides Guided Practice where students practice what the teacher modeled and the teacher provides prompts and feedback (FCRR, 2006)

Expository Text: Reports factual information (also referred to as informational text) and the relationships among ideas. Expository text tends to be more difficult for students than narrative text because of the density of long, difficult, and unknown words or word parts (FCRR, 2006)

Fluency: Ability to read text quickly, accurately, and with proper expression. Fluency provides a bridge between word recognition and comprehension (FCRR, 2006)

Guided Practice: Students practice newly learned skills with the teacher providing prompts and feedback (FCRR, 2006)

Science Inquiry: Classroom practice that allows students the opportunity to investigate, explore and discover, using their own questions, curiosities and interests and permits students to continue to develop science skills (Pearce, 1999).

Lexile: A unit of measurement used when determining the difficulty of text and the reading level of readers. (MetaMetrics, 2004)

Metacognition: An awareness of one's own thinking processes and how they work. The process of consciously thinking about one's learning or reading while actually being engaged in learning or reading. Metacognitive strategies can be taught to students; good

readers use metacognitive strategies to think about and have control over their reading (FCRR, 2006)

Modeling: Teacher overtly demonstrates a strategy, skill, or concept that students will be learning (FCRR, 2006)

Predictor: Student participant in reading group who guides the group discussion on making a prediction about the text that will be read (Oczkus, 2003)

Questioner: Student participant in reading group who guides the group discussion on generating questions about the text that was read (Oczkus, 2003)

Reading Comprehension: Understanding what one is reading, the ultimate goal of all reading activities (FCRR, 2006)

Reciprocal Teaching: An instructional procedure that is designed to enhance students' comprehension of text through dialogue between students and the teachers with the teacher and students taking turns as the dialogue leader. It is structured by the use of four strategies: questioning, summarizing, clarifying, and predicting (Palincsar, 2004)

Scaffolded Instruction: The process of modeling and encouraging strategic, successful reading by providing structure, organization, questioning, clarification, summarizing, or clarifying information to what is known or what will be found out. Students are given all the support they need to arrive at the correct answer. For example, after an error occurs, the support or assistance a teacher offers may include cues, giving reminders or encouragement, breaking the problem down into steps, providing an example, or anything else so that students can arrive at the correct answer instead of the teacher giving the answer (FCRR, 2006)

Scientific Literacy: The knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity (NRC, 1996, p. 22); not to be confused with the ability to read and understand science text

Self-Monitoring: Refers to metacognition. When students use self-monitoring strategies, they actively think about how they are learning or understanding the material, activities, or reading in which they are engaged (FCRR, 2006)

Summarizer: Student participant in reading group who guides the group discussion about summarizing what was read (Oczkus, 2003)

Think-Alouds: During shared read aloud, teachers reveal their thinking processes by verbalizing: connections, questions, inferences, and predictions (FCRR, 2006)

Webb's Depth of Knowledge Levels in Science: Measure of alignment analysis of standards and modes of assessment; based on four levels (recall and reproduction, skills and concepts, strategic thinking, and extended thinking) (Webb, 2004)

Zone of Proximal Development: "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86)

Summary

The main focus of this action research study was to explore how the explicit teaching of reciprocal teaching strategies affected students' comprehension of life science text and students' abilities to make predictions, ask questions and summarize based on what was read in their life science text. The literature that was analyzed for this research

provided additional insight as to how the metacognitive strategies involved in reading and science were connected. Major themes of the work followed: differences between proficient and non-proficient readers, changes in the expectations of students as readers in the secondary grades, history and development of reciprocal teaching, obstacles and modifications, and implementation of reciprocal teaching in the science classroom. The review concluded with a call for more research in the area of connecting the processes used during reciprocal teaching and scientific inquiry. Chapter three discussed the methods and instruments used in this study to collect data as well as the selection of participants and a description of the setting. Chapter four gave a detailed account of my interpretation of the data and how the data related to each of the research questions. Chapter five provided a conclusion to the thesis and recommendations for further research involving student reading and learning science.

CHAPTER TWO: LITERATURE REVIEW

According to Lemke (2004), the language of science is a multifaceted hybrid made of natural language (as defined by linguists), the set of possible meanings derived through mathematical symbols, and contextualized by visual representations of many sorts. The last decade has put a large spotlight on encouraging inquiry in the science classroom (McKee & Ogle, 2005; Pearce, 1999) and improving reading education (McKee & Ogle, 2005; Saul, 2004). Unfortunately, that reading spotlight has shone almost exclusively on early reading education (Biancarosa & Snow, 2004) and the inquiry spotlight has not taught students how to be more proficient readers of scientific text (Hand, 2003). Students face increasing challenges in adapting to the demands placed on them as readers as they enter the secondary school setting. Those challenges are even more difficult to overcome in the content areas for struggling adolescent readers (Torgensen, 2006). However, many researchers both in the areas of reading and science agree that the metacognitive strategies used to teach better reading comprehension are similar to those strategies that encourage more scientific thinking in students (Baker, 2004; Magnusson & Palincsar, 2004; Hand, 2003; Pratt & Pratt, 2004; Yore, 2004). Reciprocal teaching is one of those strategies.

History, Theoretical Framework, and Process of Reciprocal Teaching

Students struggle with reading comprehension in the content areas for many reasons: the textbook's content may be weak, the teacher may be ineffective at teaching with print and the concepts in the content areas, especially math and science, are difficult concepts to read about (Barton, Heidema, & Jordan, 2002; Radcliffe, Caverly, Peterson, & Emmons, 2004)). Science text proves to be exceptionally challenging for readers

because of the difficult vocabulary and syntax, and also because of the emphasis on use of prior knowledge and inferential thinking (Best, Rowe, Ozuro, & McNamara, 2005). Students may also lack basic decoding abilities or may not have the appropriate reading strategies for dealing with expository text (Best, et al., 2005). Radcliffe et al. (2004) discovered that many teachers who have been trained in using\teaching appropriate reading strategies with their students rarely use them. Science teachers need to recognize that reading science text is not just simply word recognition and information location; science teachers must also view themselves as literacy teachers, and more specifically, science literacy teachers (Hand, et al., 2003).

One of the strategies that have been proven as effective in this endeavor is reciprocal teaching (eg. Brown, 1997; Hart & Speece, 1998; Lysynchuk, Pressley, & Vye, 1990; Rosenshine & Meister, 1994). Reciprocal teaching (RT) is an instructional approach that is used to increase students comprehension of academic text, provides many options for teaching and reinforcing strategies, is easily understood and mastered by both teachers and students, and looks at the process of reading to learn as interactive on the part of the student (Carter, 1997). Developed by Annemarie Palincsar from the University of Michigan and Ann Brown from the University of Illinois at Urbana-Champaign, reciprocal teaching focuses on teaching students how to monitor their own learning as they read text through discussions that are led both by the teacher and individual students (Palincsar & Herrenkohl, 2002). Palincsar and Brown (1984) were the first to introduce the terms *comprehension-fostering* and *comprehension-monitoring*. Comprehension-fostering strategies are strategies that enable students to comprehend what they are reading or have read. Comprehension-monitoring strategies allow students

to identify points during reading where their comprehension has broken down (Oczkus, 2003). The work of Palincsar and Brown was based on the work of Durkin (1979), but shifted the role of the teacher so that the teacher teaches students ways to monitor and facilitate their own comprehension of what was read. In addition to being the creators of reciprocal teaching, Brown and Palincsar have also been major contributors to further research using this strategy in a variety of settings.

When examining reading comprehension, Palincsar and Perry (1995) argued that there are three perspectives that can illustrate how students become competent readers: developmental, cognitive, and sociocultural. Reciprocal Teaching leans heavily on the cognitive and sociocultural perspectives because of its emphasis on self-regulation. Self-regulation is the "ability and inclination to take control of and to monitor one's learning activity" (defined by Palincsar and Perry, 1995). The sociocultural aspect of reciprocal teaching is embedded in student interactions with other class members in a group setting that involves dialogue about reading selections.

The instructional method of reciprocal teaching is based upon two theoretical principles that were major parts of the work done by Vygotsky (Palincsar & Klenk, 1992). These principles are: 1) that social interactions lead to higher cognitive processes; and 2) the "zone of proximal development" which is characterized by Vygotsky as being "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Vygotsky's work in this area complements Bandura's research in the area of social learning. Vygotsky believed that social interaction influences cognitive

development. While Piaget believed that cognitive development happened through four stages, Vygotsky saw it as more of a developmental process that begins at birth and ends at death and that it is too complex to be broken down into stages. This fluid progression of development was believed to be dependent on social interaction and that social learning actually leads to cognitive development. This was labeled as the Zone of Proximal Development (ZPD) and is widely accepted in schools today.

The ZPD is considered to be the distance between the levels of learning that is achieved independently and the learning that is achieved with assistance and modeling provided by an adult or a more capable peer. The ZPD is believed to be the link between what has already been learned and what can be learned. Implementation of this learning perspective requires both students and teachers to act in untraditional roles in the classroom. Students have to not only play an active role in their own learning, but also in the learning of their classmates. The classroom should become more of a learning community with the teacher collaborating with the students and the students collaborating with each other. This allows students to learn in ways that are meaningful to them.

Both clustered desks or tables and room for student instruction, collaboration, and small group instruction should be part of the classroom setup that is designed to promote this type of learning. To continue with the collaboration between members of the classroom, materials should be selected that promotes student interaction. In addition to promoting collaboration, instructional materials and instruction should be designed to stretch the students to a developmental level just above their current developmental level. This is due to Vygotsky's belief that "learning which is oriented toward developmental levels that have already been reached is ineffective from the view point of the child's

overall development. It does not aim for a new stage of the developmental process but rather lags behind this process" (Vygotsky, 1978). Along with this idea comes one of the most important elements of this perspective: partnered students in the collaboration process are on different developmental levels and the student of the higher developmental level is aware of the lower's level to avoid one partner dominating and the other being dragged along for the ride. This idea is based on another of Vygotsky's principles: The More Knowledgeable Other (MKO). The MKO is anyone who has a better understanding or higher ability level of the particular task, process or concept than the learner.

The approach of reciprocal teaching focuses on giving students the skills of reading to learn through a four stage process: predicting, question generating, clarifying, and summarizing (Palincsar, Klenk, & Brown, 1991). These steps are taught in the context of reading to learn from the text and are not broken into component skills or practiced completely separate from one another.

According to Palincsar and Perry (1995) instructional methods, like reciprocal teaching, should be used so that students can apply the strategies in other situations where text comprehension is necessary. This approach has been found the most beneficial to students who have a large discrepancy between their ability to decode text and comprehend text, with the students lacking in their ability to comprehend what is read (Palincsar & Herrenkohl, 2002). It encourages the use of background knowledge to make predictions about the text prior to reading, which makes the text more meaningful to the students (Palincsar et al. 1991). After reading the selected passage, the group leader (which can be either student or teacher) poses questions to the group. This allows students to focus on main ideas and provide a check on their current understanding of

what was read (Slater & Horstman, 2002). Students then engage in the clarification process. Clarification is an extremely important step for students since confusion about the text can lead to misinterpretation (Hashey & Connors, 2003). The final stage, summarizing, focuses on having students identify the main idea of what was read and to prepare them for what will be upcoming in the text (Palincsar & Herrenkohl, 2002).

Why Teach Reading Strategies in the Science Classroom?

Science and reading are closely connected in the classroom. In 1993 the American Association for the Advancement of Science published *Benchmarks for Science Literacy*. Seven years later the National Reading Panel (NICHD, 2000) published recommended comprehension strategies. It was then suggested by Guthrie and Wigfield (2001) that the cognitive strategies shared between science and reading could be taught directly, in coordination with each other. Further research has provided a strong argument that by studying science actively in the classroom, students develop logical thinking, language, and reading competencies (Guthrie & Ozgungor, 2002; Topping & McManus, 2002) while reading and writing about science help students build and reinforce science concepts (Yore, 2003; Palincsar & Magnusson, 2001; Thier, 2002). Yore (2004) makes the argument that scientists must interact with print in order to construct the meaning of text and that students must be taught the skills of interacting with printed language the same way they are taught to interact with equipment in the laboratory setting. Baker (2004) defines metacognition as the ability to reflect on our own thinking, and in an academic context it includes knowledge about us as learners, about aspects of the task, and about strategy use. It includes the planning of our actions, checking the outcomes of our efforts, evaluating our progress, remedying difficulties that arise, and testing and

revising our strategies for learning. Yore goes on to explain that the metacognitive awareness needed in science involves planning your approach, evaluating your comprehension, and regulating your cognitive plan. This runs parallel with what is expected of students when reading print (Hand, 2003). We ask them to be aware of why they are reading, to monitor their comprehension, and look back at what they read to examine what was gained through reading. The need for literacy skills in science is particularly important because anyone lacking these skills will be unable to access the scientific body of knowledge and data (Kamil & Bernhardt, 2004).

The NSES (NRC, 1996) makes the recommendation that the metacognitive skills required in both reading and science should have strong emphasis on skills in context and less emphasis on individual process skills such as observation or inference. Baker (2004) suggests that the use of metacognitive skills by students in both reading and science should not serve as an end, but should have an ultimate goal such as deriving meaning from text or combining science process and scientific knowledge with scientific reasoning to develop their understanding of science. By teaching students these critical metacognitive skills teachers are also encouraging students to evaluate information that students read about or gain through scientific inquiry which proves especially important because students at all levels are likely to accept information conveyed to them as accurate and plausible (Baker, 2004).

Magnusson and Palincsar (2004) showed that teaching science through inquiry provided a strong context for promoting literacy for two reasons: (1) learning from text is authentic to scientific practice and (2) the goals of science instruction and text comprehension instruction can be advanced by using text in inquiry-based science

lessons. Through extensive review of research literature, Magnusson and Palincsar (2004) were also able to make the conclusion that in both text comprehension and science inquiry learning students build meaning by integrating new information with prior knowledge and building mental models of the situations. For both types of learning, text comprehension and inquiry-based science, the learner must be aware of what they are reading or learning and make appropriate adjustments as needed. Science instruction is therefore one of the prime contexts in which teacher could effectively use informational text to achieve multiple learning goals in the classroom. Reciprocal teaching encompasses the metacognitive strategies that are essential for students to comprehend informational text and learn science in an inquiry-based setting.

Why Choose Reciprocal Teaching in the Classroom?

Radcliffe, et al. (2004) demonstrated that explicit strategies promote engagement of prior knowledge and self monitoring in students while reading. Barton, et al. (2002) explains that reading and learning are constructive processes: each learner actively draws on prior knowledge and experience to make sense of new information. The more knowledge and skills that students bring to a text, the better they will learn from and remember what they read. Best, et al. (2005) explains that when students make connections while reading through inferential thought, deep-level comprehension will follow. Deep comprehension, as described by Best, et al. (2005) is requiring more than interpretations of sentences. They must be able to take what they comprehend from the sentence and synthesize that into a comprehension of the paragraph, chapter, etc. Barton, et al. (2002) recommends that teachers incorporate reading and learning strategies that

help students activate prior knowledge, make sense of unfamiliar text styles, and master difficult vocabulary.

Reciprocal teaching applies all of the aforementioned characteristics of an effective reading strategy. Palincsar and Klenk (1992) believe that reciprocal teaching lends itself to being beneficial for reading in the content areas (such as science) because it is designed to act as a supplement for ongoing curriculum. With reciprocal teaching, teachers don't have to stop teaching the curriculum as they teach the strategies. Students are reading to learn the text therefore they are reading to learn the curriculum. This strategy is especially useful for students who will need to be engaged with the text in order to better monitor their learning process (Palincsar and Klenk, 1992). Carter (2002, p. 65) gave several reasons why teachers should choose reciprocal teaching as an appropriate instructional approach to help students comprehend difficult text:

- Because of its emphasis on reading comprehension – particularly in the short term.
- Ease of use and flexibility with various teaching styles and formats.
- Helps novice readers learn and internalize the strategies excellent readers employ as the novices are practicing and developing the skills required to comprehend and learn.
- Reciprocal teaching provided numerous options for teaching and reinforcing the strategies.
- Reciprocal teaching is easily understood and mastered by both teachers and students, regardless of the level of training in reading research and applications.
- Reciprocal teaching is easily taught to parents.

- Reciprocal teaching parallels the new definition of reading that describes the process of reading an interactive one, in which readers interact with the text as their prior experience is activated.

Unlike elementary school, most middle school students do not have only one teacher who instructs in all areas and must adjust to the different teaching styles. Reciprocal teaching allows the students to monitor their progress and assume the ultimate responsibility for their learning from the text regardless of the content covered in a particular class (Slater & Horstman, 2002). This method allows students to take ownership over their reading and learning (Hashey & Connors, 2003). By gaining control of their learning while they read, students also have the potential to become better self-regulators of their reading (Hacker & Tenent, 2002) Reciprocal teaching drastically improves the quality of classroom discussions since all students are able and expected to participate and provide input and thought into the group dialogue (Hashey & Connors, 2003). When combined with the use of reading journals and writing prompts, Reciprocal teaching has also been shown to be very effective in helping students to become more proficient writers (Slater & Horstman, 2002).

Having students keep journals not only allows for easier assessment on the part of the teacher, but it also meets the ultimate goal of reciprocal teaching, which is for student self-regulation of comprehension by providing them with a hard copy of their thoughts and input into the process (Slater & Horstman, 2002; Hacker & Tenent, 2002). Hacker and Tenent (2002) also found that by having students write their summaries led to the synthesizing of complex ideas and required a higher level of processing on the part of the student. In addition to increasing students' comprehension and writing abilities,

reciprocal teaching has been shown to increase students' group participation and increase the use of the strategies in other settings (independent reading, other reading assignments from other classes, etc.) (Slater & Horstman, 2002). Because of reciprocal teaching's reliance on dialogue, this method of instruction also lends very heavily to the promotion of collaboration within the group to make sense of the text (Palincsar & Herrenkohl, 2002). While reciprocal teaching teaches strategies that increases reading comprehension, it also aids in the assessment of reading comprehension.

Historically, reading comprehension was measured by students reading a passage and then answering questions about what they read or retelling what was read (Palincsar & Perry, 1995). Part of the contemporary view on reading comprehension assessment involves measuring students engagement in what they are reading. Reciprocal teaching provides a window into student engagement because of the conversational nature of the process (Palincsar & Perry, 1995). Reciprocal teaching also lends itself to assist in the learning of vocabulary since vocabulary learning generally occurs when students can discuss the possible meanings of a word (Bos, Allen, & Scanlon, 1989; Stahl & Vancil, 1986).

In April of 2004, the Carnegie Corporation of New York, the Alliance for Excellent Education, and a panel of five nationally known and respected educational researchers developed "the fifteen key elements of effective adolescent literacy programs" (Appendix K). These elements are designed to promote action and research in the secondary school setting. Ideally, all fifteen of the elements would be implemented into the school reading programs and the content area classroom. These elements can be independently applied to meet the individual needs of students which assist the teacher in differentiating

instruction for students with varying needs. The optimal mix of these elements is still unknown and may be different for various subpopulations of students, but a large return is expected. These elements were divided into two categories: instructional and infrastructural. Instructional elements are those that are built into the lessons that are taught (such as explicitly teaching students strategies to use before, during, and after reading), where infrastructural are changes that are made the school and/or program (such as professional development or extended time for literacy programs). It is important to note that while the instructional elements may have a large impact on students, they are expected to be more effective when used concurrently with the infrastructural elements. The process of reciprocal teaching includes the majority of these elements. Although reciprocal teaching is an effective strategy, it is not perfect.

Problems with Reciprocal Teaching and Modifications

There are several obstacles that can arise with the use of reciprocal teaching but modifications are easily implemented to help overcome or avoid those roadblocks. Many studies have been done to show the effectiveness of reciprocal teaching in a variety of settings, grade levels, and ages of students (e.g. Brown, 1997; Hart & Speece, 1998; Lysynchuk, Pressley, & Vye, 1990; Rosenshine & Meister, 1994). Although each of the mentioned studies showed gains in comprehension of students who are sufficient decoders but struggled in the area of comprehension, there have been some important obstacles and modifications that need to be addressed. Rosenshine and Meister (1994) suggested that the strength of reciprocal teaching might be in the number and types of strategies provided and not the cognitive processing that is taught. More research needs to be done in order to determine if all four strategies are necessary for improved reading

comprehension, if only one of the four strategies are needed, or if more than the four strategies are needed (Rosenshine & Meister, 1994). Hacker and Tenent (2002) examined the types of obstacles teachers using reciprocal teaching faced and what modifications were used to overcome those obstacles. They suggested that even if a teacher understands the four strategies, if they present the strategies in an incorrect manner or not often enough, the students will not improve in their ability to comprehend text. Over the three year study involving 17 teachers from two elementary schools, Hacker and Tenent (2002) found many obstacles and grouped them into 4 categories: strategy use, dialogue, scaffolding, and additional concerns. Some of the challenges that were observed and recorded were:

- Students not using all four strategies or not using them correctly
- Students creating surface-level questions and summaries
- Student dialogue was superficial and mechanical in their use of the strategies
- Student leaders were not always knowledgeable or motivated which led to other group member becoming passive about their learning or often getting off task
- Often groups had one "trouble maker" who provided a handicap during dialogues

Many modifications were made that helped teachers overcome these obstacles (Hacker & Tenent, 2002). These modifications included using a more scaffolded approach for longer periods of time until students showed the appropriate use of strategies at a whole class level. There was also an increase in the instruction of students on how to be a productive group member and participant in student dialogue. Writing was also heavily used for several reasons. By having students write down their predictions, questions, clarifications, and summaries, the instructor is better equipped to

assess students' comprehension of the reading and can also more easily identify misconceptions that exist. The second benefit found to having students write their responses was that students were better capable of monitoring their progress. It also gave the student groups more to discuss during their dialogue sessions. Writing also assists in the assessment of student comprehension of text because they can be asked to read back their responses or elaborate on what was written. This allows for better understanding on the part of the teacher as to what types of gains are being made in regards to comprehension, and it also opens a door to more dialogue in the classroom about the reading selection (Palincsar & Perry, 1995). Other types of modifications were made as well. Some teachers assigned reading and summarizing as homework as opposed to reading out-loud and group generated summaries. Other teachers had students read the passages twice; once silently and the second time out-loud in their reciprocal teaching groups. This allowed students who lack self-confidence in their reading ability to get comfortable with the passage before having to engage with the group or class. Whole class instruction and discussion was shown to also be very useful in the instruction of reciprocal teaching in middle grades, content area classrooms (Brown & Palincsar, 1987).

While reciprocal teaching is not a perfect strategy, research has shown that it is effective. Through the explicit teaching of the four stages, students can not only become more competent readers, they can become more aware of what makes them a competent and proficient reader.

Summary

Research has shown that the metacognitive strategies that are used during the comprehension of text and the construction of scientific knowledge through inquiry-

based learning are so closely connected that they can be taught in coordination with each other. Science provides an excellent context to achieve multiple learning goals in both the arenas of science instruction and text comprehension instruction. The explicit teaching of the strategies that compose the reciprocal teaching process provides students with the tools they need to successfully utilize the metacognitive processes necessary to be effective at comprehending informational text and constructing scientific knowledge.

Chapter one provided an introduction to the action research study that explored the effects of the explicit teaching of reciprocal teaching strategies on students comprehension of a seventh grade life science text and how students use of the strategies changed over time. Chapter three provided a detailed account of the methods, instruments, and data analysis methods utilized in this study.

CHAPTER THREE: METHODOLOGY

Introduction

The purpose of this action research study was to explore the effects of the explicit teaching of reciprocal teaching strategies on seventh grade life science students' comprehension of life science text and to investigate how the explicit teaching of reading strategies affected students' ability to make accurate predictions, generate questions, and summarize the main idea. Qualitative methods were used to obtain data in this study. The data were collected using multiple sources: science based reading pre and post-test, teacher-researcher generated strategy learning packets, student reading response pages, and teacher-researcher field notes and observations. The following chapter provided a detailed outline of the methods that were used to collect and analyze data about the research questions, and provided information about the setting and subjects used in this research.

Design of Study

This action research study focused on middle school students' comprehension of a life science text and their ability to make predictions, ask questions, summarize main ideas, and clarify confusing concepts. Action research in education is defined by Gay, Mills and Airasian (2006) as the "systematic inquiry conducted by teachers, principals, school counselors, or other stakeholders in the teaching-learning environment, to gather information about the ways in which their particular schools operate, the teachers teach, and the students learn" (p. 499). Action research has been used as a method of solving everyday problems that teachers face in the class (Gay et al., 2006). As stated in the

research questions, the data sought were whether or not the reading strategies, when explicitly taught to my students would help them be more proficient readers of their life science text.

Qualitative methods were used during the data collection process to look at the changes that occurred in the classroom and laboratory setting. This allowed the teacher-researcher to collect narrative data that expressed both the view of the teacher and the students, as well as changes that occurred in student comprehension of their text and the application of the reading strategies. The methods also allowed for detailed verbal descriptions of the interactions between the students in their reading groups as well as the interactions between the researcher and the students. By using multiple methods to collect data, the researcher was able to triangulate the data to show more accurate patterns and themes during the data analysis process.

School Setting

This research was conducted in a public middle school in central Florida. The school contained approximately 850 students in grades six through eight. Approximately 48 percent of students were minorities and approximately 52 percent of students in the school were provided free or reduced lunch. The students who participated in this study were seventh grade students who showed a range of reading abilities.

Classroom Setting

In the seventh grade class selected for this study, data were collected on 22 students. Of the twenty two students, fifteen students were female and seven students were male. The ages of the students ranged from eleven years of age to fifteen years of

age. Two of the students did not speak English as a first language (ESOL) and two of the students were learning disabled. Accommodations were made for these four students. These accommodations included extra time to read passages, translation of the passages by another student or ESOL teacher, and additional scaffolding by the teacher-researcher. This class was selected because it preceded the teacher-researcher's plan period which allowed for a more prompt evaluation of field notes and observations.

The class that students were in was a seventh grade life science class. Science classes at the school did not differentiate between advanced and non-advanced classes until eighth grade. Therefore, students in the examined science class were of mixed ability levels. Background data about student reading levels were collected using the previous year's FCAT reading levels for students. In the class studied the following levels were noted: three students (14%) at level one, two students (8%) at level two, three students (14%) at level three, eight students (36%) at level four, three students (14%) at level 5, and three students (14%) for which no score was available. Lexile reading inventory levels were also analyzed to determine student reading levels. Nine students' (41%) scores revealed a reading level between first and fifth grade. Two students' (10%) scores showed a reading comprehension level of a sixth grader. Only one student's (4%) score was on grade level. The remaining nine students' (41%) scores revealed reading comprehension levels between eighth grade and eleventh grade. One student (4%) enrolled after the initial testing period and therefore did not have recorded scores. The discrepancy between the two instruments was discussed in chapter four.

Instruments

The purpose of this study was to examine the effects of reciprocal teaching on student comprehension of a life science text book when students were explicitly taught how to use the strategies. Students' changes in writing predictions, questions, summaries, and clarifications were also examined. The instruments used in this action research study were selected and designed based on the degree to which each instrument would assist in data collection for each research question. Instruments included a pre/post test which incorporated a reading passage that was expository in nature and contained life science content. Additional instruments that were used included teacher-researcher generated strategy packets, student reading response worksheets and teacher-researcher field notes and observations. The following sections describe why each instrument was chosen and how it was used to collect data.

Pre/Post Test

The pre/post test that was used in this study was selected from a state released FCAT reading test (FLDOE, 2005). This particular text was selected because of the inclusion of expository text and the content was about a life science topic, similar to the text the students encountered in the classroom. The selection also contained diagrams and a map that had to be reviewed by the students, which was consistent with the layout of information in the life science textbook that was used in the classroom. The data collected with this instrument was analyzed to uncover changes in the students' reading comprehension before they had been taught reading strategies then after they had learned and practiced using the strategies. The test was first given to a group of seventh grade students from the previous school year.

Strategy Packets

The strategy packets were used to assist the teacher in teaching the strategies to the class. Palincsar (2004) designed a guide for teachers wishing to implement reciprocal teaching into their classroom. A packet was designed by the teacher-researcher for each of the strategies that were taught using that guide as a reference. The packets used by the researcher were modified for content from the guide to align with the science text used in the classroom. To ensure trustworthiness and credibility, the packets were first piloted with a group of students from the prior school year under the observation of the school's reading coach who had been through reciprocal teaching professional development. After the piloted teaching session, the strategy packets required minor modifications including wording of examples and formatting to make the packets easier to use. During the actual study and after the teacher modeled appropriate use of the strategies, the packets were used to give the students practice using the strategies in a whole class setting using the actual text they would be expected to read. The packets also served as a reference point for the students when they needed assistance with a particular strategy.

Reading Response Worksheet

Student reading response worksheets were used to record students' predictions, questions, summaries, and clarifications throughout the data collection process. This included pre-, mid-, and post-assessment data collected regarding students ability to form accurate predictions, generate questions about the text, identify the main ideas through summarizing, and clarify confusing parts of the text. The worksheet was designed by the Florida Online Reading Professional Development (FOR-PD, 2005) for use in the classroom. These worksheets were reviewed by the teacher-researcher to examine

patterns and themes in students' responses. These patterns and themes included changes in the accuracy of student predictions, the level of questions asked based on Webb's Depth of Knowledge, students' ability to correctly identify the main ideas, and the types of items students needed clarification on as well as how they were clarifying those parts of the text.

Field Notes and Observations

The teacher-researcher kept detailed field notes throughout the instruction of the strategies and the collection of data. Field notes were hand-written to capture students' interaction with the teacher and other students during the modeling, scaffolding, and use of the strategies. Dialogue was hand-written during student reading groups to be analyzed later. The data collected with this instrument was analyzed to determine changes in students' use of scientific terms during reading group and lab group discussions. Field notes were also analyzed to determine the level of student understanding of scientific concepts that were covered during reading group sessions.

Methodology

The following account detailed the process of data collection for this study. The data collection took place over a twelve week period in a seventh grade classroom.

Data Collection

The process of research was started by applying to the University's Institutional Review Board (IRB) to gain permission to conduct this research (Appendix A). After permission was granted by the Office of Research of the University of Central Florida, county and principal consent was granted (Appendix B & C). Following that, all students

were required to obtain signed parent consent form (Appendix D). After all students returned the consent form, the Child Assent form (Appendix E) was read to and signed by the students to ensure the students' understanding that they were not required or obligated to participate in the study. Pseudonyms were assigned to all students for privacy protection. For the duration of the study all data were kept in a locked filing cabinet to which only the teacher-researcher had access and any electronic data were kept in password protected files. After all consent forms and assent forms had been returned and pseudonyms had been assigned, data collection began.

Identification of Student Reading Levels

Background data were collected on student participants. Student data from the reading portion of the Florida Comprehensive Assessment Test (FCAT) were used to determine student reading comprehension ability. The scores represented the grade level at which students comprehended text: a score of five indicated the student read two or more years above grade level; a score of four indicated reading comprehension one year above grade level; a score of three indicated reading comprehension at grade level; a score of two indicated reading comprehension one year below grade level and a score of one indicated that the student's reading comprehension was two or more levels below grade level. In the class studied the following scores were noted: three students (14%) at level one, two students (8%) at level two, three students (14%) at level three, eight students (36%) at level four, three students (14%) at level 5, and three students (14%) for which no score was available. Students' Lexile scores were also evaluated based on county collected data. Similar to data used from FCAT, Lexile (MetaMetrics, 2004) scores were used to assess students' numeric score which corresponded to students

reading at, above, or below grade level. Lexiles is a computer adaptive test that measure students reading comprehension ability and then correlates that data to the FCAT. This test is used in all public middle schools to measure student reading comprehension. The test is administered by a trained literacy coach and proctored by teachers in a controlled test setting. Nine students' (41%) scores revealed a reading level between first and fifth grade. Two students' (10%) scores showed a reading comprehension level of a sixth grader. Only one student's (4%) score was on grade level. The remaining nine students' (41%) scores revealed reading comprehension levels between eighth grade and eleventh grade. One student (4%) enrolled after the initial testing period and therefore did not have recorded scores.

Pre-Test

The next item used in data collection was the reading comprehension pre-test (Appendix F). The test included an informational passage about the destruction of the habitat of the black footed ferret. It included text in the form of a passage, but also included diagrams, maps, and graphs which students had to use along with the text to answer six questions about what was read. The data collected from the pre-test was then compared with the students' reading FCAT and Lexile scores that had been collected from the county database. The comparison of this data allowed the researcher to determine if data collected were accurate assessments of students' reading comprehension abilities.

Students were then asked to complete a reading response worksheet (Appendix G) on a section of text entitled "Tropical Herpefauna" (Appendix H). This was used to collect data on students' abilities to make predictions, write questions, summarize

important parts of the text and clarify confusing parts before having been taught the four strategies.

Modeling & Teaching of Reading Strategies

After baseline data had been collected the teaching of the strategies began. The teaching of these strategies had been piloted the previous school year by the researcher and had been observed by the school's reading coach. The reading coach and the researcher agreed at the completion of the piloting that students need to better see how the strategies were useful to them and how the strategies allowed students to monitor and foster their reading comprehension in science class. This aspect was more strongly implemented in the teaching of the strategies during the actual study.

Students spent two weeks learning the strategies through modeling of the strategies by the teacher and the use of the strategy packets (Appendix I). During those two weeks, two and a half days were spent on the teaching of making predictions, two days were spent on the teaching of generating questions, two days were spent on the teaching of summarizing, and one day was spent teaching the clarifying strategy. Throughout the explicit teaching of these strategies, the school literacy coach acted as a mentor to the researcher to provide feedback about the lessons on the different strategies. The selection of text that was used focused on the development of the microscope, the cell theory, and parts of cells. As the teacher modeled, the students practiced using the strategies as a whole class. This method provided that the strategies were taught, but not at the sacrifice of the content that needed to be covered according to the life science curriculum scope and sequence set by the county. At the end of each strategy, the students gave feedback about what they had learned that day from reading the text. That

feedback was collected in the form of field notes. Field notes were also kept during class discussions and to record and monitor how students progressed in their use of the strategies: (1) making of predictions, (2) generated questions, and (3) summarized.

The predicting strategy was the first strategy that was taught to the students. The teacher-researcher first asked the students to raise their hands if they had ever seen a scary movie. All the students in the class put their hands up. The teacher then asked how students predicted during the movie when something scary was going to happen. The most common response was that they could predict something scary was going to happen by the type of music that was playing or if the music suddenly stopped. The teacher pointed out that making predictions about what was going to happen in a movie was also the same type of strategy that could be used when reading their science text. Just like they used music as a context clue in a movie to determine what was going to happen next, their textbook also had context clues in the form of titles, subtitles, pictures, graphs, and diagrams. The teacher also explained to the students that making predictions about what they would be reading helped to increase their understanding of the text because it made them more aware of what they were reading. The teacher then handed out the strategy packet for making predictions. The strategy was modeled by the teacher to show the appropriate way to make predictions using the life science textbook that is correlated with that curriculum. This was done with the students observing the teacher as the teacher made predictions about the text through a think aloud. As the teacher made predictions, the students recorded various phrases the teacher used that led the teacher to that prediction. The students then shared their observations with the class. The first think aloud was done to show the students how to make predictions by using titles, headings,

and subheadings in the text. The teacher first pointed out the style of their life science textbook was to have chapter titles in blue, section titles in teal, and subtitles in purple. The teacher then looked at a two page spread in the text and analyzed the titles and subtitles to make a prediction about what would be read in the text. This was followed with students practicing making predictions about their life science text using only titles, heading and subheading in a whole class setting. The teacher scaffold instruction to assist students in the use of the strategy. This process was repeated to teach the students how to make predictions by using clues that are in the text. At the end of the class period, students discussed what they had learned by making predictions and then reading the text.

The remaining three strategies were taught in a similar manner. They all started with the teacher asking students to identify times in their life that they had to ask questions, summarize, or clarify something they did not understand. The teacher would then point out to students how these same strategies applied to reading their science text and how those strategies would help them monitor and foster their comprehension as they read their science text. The teacher would then model the appropriate use of the strategies by thinking aloud as she wrote. The students would then practice using the strategy in a whole class setting and review what was learned at the end of the class period.

With the completion of each strategy, the packet for that strategy was placed in the student's reading folder. This folder acted as a portfolio for the students to refer back to when needed. After the teaching of all four strategies was completed, the researcher spent two to three one hour class periods per week using all four strategies with the students in a whole class setting. Students wrote down their predictions, questions, summaries, and points that require clarification on their reading response worksheets

which were kept in their reading folders. This process continued at the whole class level for another four weeks to ensure students were comfortable with the appropriate use of the strategies. After the four week mark, students were placed in heterogeneous groups to begin the process with limited scaffolding from the teacher-researcher.

Students were strategically placed in heterogeneous groups of two to three students. Groups were assigned by the teacher-researcher and were organized based on the baseline data that was collected regarding reading comprehension. The effort was made to have one student of high ability, one student of average ability, and one student of low ability in each group. Research done by Palincsar (2004) has shown that using reciprocal teaching with mixed ability groups is more effective in a shorter period of time. Due to student absences and mobility of students, this was not always possible.

For the first two days of reading groups, the role of group leader was assigned to a particular student by the teacher. Early in this process it was identified that some group members were not actively participating without having a specific role. Therefore, each day when reading groups were going to take place, student seat numbers were placed on the board with a corresponding role: predictor, questioner, and summarizer. The role of clarifier was shared by group members to encourage all students to point out break down of understanding while reading the text.

All of the students were required to read the text silently before participating in group readings, discussions and the practice of the strategies. This was done to ensure some familiarity of the text with all students. The roles changed each day to ensure all students were required to lead the group in a specific part of the strategy. In the event that a group member was absent, the group shared that person's role. During these groups,

field notes were kept by the teacher-researcher about student interactions with each other and student interactions with the teacher. These interactions included students' attention to the task at hand, students' use of science vocabulary, general effort given to the task, and the amount of requests for teacher assistance. Throughout the duration of the study, student reading response worksheets were analyzed for changes in students' predictions, questions, and summaries. After data had been collected and post-assessments given, data analysis began.

Data Analysis

Data produced through this study was examined for patterns and themes that emerged related to changes in student comprehension of their science text and appropriate use of the strategies. Data from the various resources was compared to ensure trustworthiness of the findings. Through the evaluation of pre and post test scores, student reading response worksheets, and field notes, credibility was established. The following sections provided a brief description of the data analysis.

Pre and Post Test

Both pre and post tests scores were compared to note any changes in student comprehension of a life science text once they had learned and used the four strategies. This comparison included examining the number of students who correctly answered questions that were considered moderate and low complexity, questions that involved the use of diagrams and/or the map, and the number of students who answered all or none of the questions incorrectly.

Reading Response Worksheets

The students' reading response worksheets were monitored throughout the data collection process to continually examine changes in students use of the strategies as well as the accuracy of predictions, level of questions generated, and identification of the main idea through the summaries. For example, students reading response worksheets were examined to look at whether or not students who were not making accurate predictions about what they would read in their science text transitioned to making accurate predictions by using the strategy before they read.

Field Notes and Observations

The use of field notes allowed for a more detailed review of the process of teaching the strategies as well as student use of the strategies during whole class discussions and reading groups. It also allowed for recording of dialogue to examine how students' use of the strategies changed even if it was not documented in their reading response worksheets. Field notes were photocopied and then coded using color highlighters. A pink highlight indicated an area where students struggled, a blue highlight indicated an area where students showed growth, and a green highlight indicated where scaffolding was increased to assist students.

Summary

Through the examination of pre and post tests, student reading response worksheets, and teacher-researcher field notes, patterns and themes were revealed regarding student comprehension of their life science text as well as their use of the four reciprocal teaching strategies. The purpose of this study was to explore if the explicit

teaching the four strategies that make up reciprocal teaching (predicting, questioning, summarizing, and clarifying) had an effect on both student comprehension of a life science textbook as well as students ability to use the strategies appropriately while reading the text. The goal of the study was to teach students a reading strategy that would allow them to foster and monitor their own comprehension and assist them in the reading of informational text in life science.

Chapter three presented the methods used in this study as well as the setting in which the study occurred. This included a description of the instruments used and how those instruments were used to collect data and how the data were analyzed. Conclusions derived from and examinations of the data collected were presented in chapter four.

CHAPTER FOUR: RESULTS

Introduction

This exploratory action research study investigated seventh grade life science students' reading comprehension abilities after they had been explicitly taught a reading strategy known as reciprocal teaching. An action research design was selected because it allowed for gaining insight, developing reflective practice, effecting positive changes in the school environment and improving student outcomes and the lives of those involved (Gay, Mills, & Airasian, 2006). Twenty-two seventh grade students in a life science class voluntarily participated in the study during the fall of 2006. This chapter discussed the possible effects of the explicit teaching of reciprocal teaching strategies on the reading comprehension of the students and the students' ability to correctly use the strategies when reading their life science text.

Data collection methods for this study were: reading comprehension pre/post test, student reading response worksheets, and teacher-researcher field notes and observations. Using multiple data sources allowed for the comparison of data across research methods. The research questions for this study were:

Question #1 What were the effects of the explicit teaching of reciprocal teaching strategies on students' comprehension of a seventh grade life science text?

Question #2 How did the use of reciprocal teaching strategies affect students' ability to make predictions about the text?

Question #3 How did the use of reciprocal teaching strategies affect students' ability to generate questions about the text?

Question #4 How did the use of reciprocal teaching strategies affect students' ability to summarize what was read in the science text?

At the beginning and completion of the research, students completed a reading comprehension test that involved a life science text selection. The reading response worksheets were used to collect data about possible changes in students' use of the strategies before they were explicitly taught how to use the strategies and after the strategies had been taught. Teacher-researcher observations and field notes added to the data collection process. Chapter three detailed a typical day in the life science classroom during the teaching of the strategies and the use of the strategies. Table 1 at the end of the chapter summarized the data collected. The following section presented the data that were collected in reference to each research question.

Reading Comprehension

Research Question #1: What were the effects of the explicit teaching of reciprocal teaching strategies on seventh grade life science students' comprehension of a seventh grade life science text?

Background Data

Before teaching of the strategies could begin, background data needed to be collected to examine students' levels of reading comprehension prior to learning the strategies. Data were collected through student scores on both the reading portion of the Florida Comprehensive Assessment Test (FCAT) from the previous school year and students' Lexile score from the current school year. Background data were also collected

by using a pre-test that involved a life science text selection and six questions about the text.

Student FCAT reading scores were used by the state of Florida to determine the reading level of students in grades three through eleven. Students were scored on a range of one to five, with five being the highest score possible. A score of three indicated a student was reading on grade level, a score of two or four indicated a student was reading one year above or below grade level, and a score of one or five indicated a reading level of two or more years above or below grade level. FCAT reading levels from the pervious school year revealed the following data: three students (14%) at level one, two students (8%) at level two, three students (14%) at level three, eight students (36%) at level four, three students (14%) at level 5, and three students (14%) for which no score was available. Students for who there was no score available may have lived out of state, been absent the day of the test and subsequent makeup tests, been home schooled, or attended a private school the previous school year. This data indicated that the majority of the students in the class were considered proficient readers according to the state assessment test.

The Lexile reading inventory was a computer adaptive test that was adopted by the county this study was conducted in as an additional reading assessment to the FCAT. All students were assessed by the test at three different points throughout the school year. The test was designed to give teachers data that could be correlated to student reading FCAT scores. Students' Lexile scores showed a large range in reading comprehension abilities among the students who participated in this study. Nine students' (41%) scores revealed a reading level between first and fifth grade. Two students' (10%) scores

showed a reading comprehension level of a sixth grader. Only one student's (4%) score was on grade level. The remaining nine students' (41%) scores revealed reading comprehension levels between eighth grade and eleventh grade. One student (4%) enrolled after the initial testing period and therefore did not have recorded scores. This data indicated that the majority of the students had a reading comprehension level that was at or below grade level. As a result of the large discrepancy between students reading FCAT scores and their Lexile scores the teacher-researcher discussed students' Lexile scores with the students after they had completed the test. The teacher assessed that four students who scored one or two years above grade level on the FCAT scored one or two year below grade level on the Lexile reading inventory assessment. Twelve students indicated that they did not take the test as seriously as they take the FCAT since the Lexile test does not have as large an impact on them. For example, students who scored a level one, two, or three on the FCAT were placed in mandatory intensive reading programs during the upcoming school year which eliminated an elective from their schedule. The Lexile inventory did not have this impact on students. Eight students also indicated becoming bored with the test as they proceeded through the items because of the length of the test and therefore began to rush through the questions.

The next instrument utilized to collect background data was a reading comprehension pre-test. This instrument was taken from a released FCAT reading test (FLDOE, 2005) and included a life science reading passage about the black footed ferret. The text included diagrams and a map the same way the science text book used graphic items in addition to text. After reading the selection, students were asked to answer six multiple choice questions about the passage. One of the questions was of low complexity

and the remaining five questions were of moderate complexity. According to the FLDOE (2005), moderate complexity questions require students to have flexible thinking and informal reasoning and problem solving skills. High complexity questions require analysis and abstract reasoning on the part of students. The low complexity question asked students to recall information from the text to answer the question. Students could also have reread the text to find the answer. Six students (27%) answered the low complexity question incorrectly. The answers for two of the moderate complexity level questions were found in the main text of the selection. Students needed to read the main selection and use context clues to answer the questions. Nine students (41%) answered one or both of these questions incorrectly. One of the moderate complexity questions required students to read a selection of text and derive the meaning of a word from what they read. Four students (18%) answered this question incorrectly. Of the remaining two moderate complexity questions, one required students to examine a diagram and the other required that students interpret data from a map to answer the questions correctly. Three students (13%) answered the question about the diagram incorrectly and seven students (32%) answered the question involving the map incorrectly. Six students (27%) answered all of the questions correctly and no student answered all of the questions incorrectly. The data collected through the pre-tests indicated to the teacher-researcher that the students struggled with questions that required them to look outside the main body of text as well as with questions where information needed to be derived from the text using context clues.

Teaching the Strategies

During the teaching of the four strategies that are part of reciprocal teaching the teacher-researcher kept detailed field notes about dialogue, questions that arose, and difficulties the students encountered during whole class discussions. These field notes unearthed several patterns about possible changes in student reading comprehension while these strategies were being taught. As was addressed in chapter three, the students were taught the strategies of predicting, questioning, summarizing, and clarifying using the county adopted life science text and reading strategy packets. The content of the text focused on the discovery of the cell, the development of the microscope and cell theory, and structures and functions of plant and animal cells.

The teacher-researcher spent two and one half days teaching the predicting strategy to the class. This included teaching the students about the cause and effect format that most science textbooks are structured around and how to make predictions through titles, headings and subheading, and information in the text. This strategy took longer than teaching the other strategies because it was started on an early-release Wednesday where classes are eight minutes shorter than a regular day. It also introduced the students to the strategy of reciprocal teaching and the purpose for teaching them the strategy. Predicting was taught by using the think aloud strategy where the teacher first models the appropriate use of the strategy by reading the text and thinking out loud how he or she is making predictions about what will be read in the selection. Students were then asked to practice making predictions and they also indicated what parts of their science text led them to make those predictions. The students would then read the selection of text and indicate whether or not their prediction was correct. Based on

observations and field notes collected by the teacher-researcher, this strategy was quickly mastered by the students. Many of the students showed pleasure in mastering this strategy because they had often felt overwhelmed by the text. Students made the following comments while learning this strategy:

> "Once you've done this a few times it's easy cause the sections are all set the same way."
>
> "I can tell what I'm gonna read about since all the important stuff is put in bold."
>
> "It helps me when I pay attention to the headings and subheading because then I know what to look for when I'm reading it."
>
> "I really learned a lot about the microscope today and we didn't read that much!" (September 13, 2006)

The teacher-researcher then spent two days teaching the students how to generate questions about the text. The lesson was broken into two parts: writing questions that check for understanding of the main idea and asking questions about supporting facts. Again the think-aloud method was used to teach the students the appropriate use of this strategy. The students required more practice writing questions than they did making predictions. Most of the difficulty arose in students having a hard time identifying the main idea in the text and asking questions that could be answered in the text. Many students wanted their main idea question to be "what is the main idea?" In response the teacher-researcher began to break the text into smaller sections to try and focus the students' attention on the most important information. She also re-emphasized that the purpose of generating questions was to check for understanding of the science content, not if they knew what a main idea was. Students then began to generate more questions

that checked for understanding. For example, students would ask the following questions after reading a section of text about the cell theory: "What is the cell theory?" The students were still showing difficulty generating questions that supported their main idea question. This problem was especially obvious in students who were non-proficient readers. The teacher-researcher increased the amount of scaffolding she provided and would have students generate the questions about the main ideas, but would write her questions that supported the main idea, while thinking aloud about why she was writing that question, on the board. For example, in response to the main idea question "What is the cell theory?" the teacher responded with the following questions: What does the cell theory say? and What discoveries contributed to the development of the cell theory? She then asked the students why these were supporting questions to the main idea. Students responded with the following:

> "Cause your questions ask questions about the question we gave you"
>
> "The answer can be found in the reading and it helps us answer the main idea question"
>
> "You wouldn't be able to understand the main idea without understanding the answer to your questions." (September 15, 2006)

Ten of the fourteen proficient readers mastered this strategy early on and immediately began to help the struggling readers generate better questions. Through practice, nineteen of the twenty-two students were able to generate questions that focused on the main idea of the text and questions that supported the main idea by asking about facts and topics that had been read about.

The teaching of summarizing took another two class periods to teach. Sixteen of the students, when asked which strategy they thought was easier to learn and use, indicated that they had an easier time with the summarizing strategy than question generating. When asked why they thought it was easier, the typical response was that it was easier because they had practiced the day before identifying the main idea when they were writing their questions. The teacher-researcher noted in field notes that the biggest challenge the more than half of the students faced when writing their summaries was focusing on only the most important information. Many students held the misconception that if it is printed in the text it must be important and therefore should be included in the summary of what was read. On the recommendation of the school reading coach, the teacher-researcher in turn implemented the rule that students could only write a summary that was one to two sentences in length for a section of text. The students became much better at identifying the most important information when the lengths of their summaries were limited. Data collected through field notes also indicated that the more proficient readers had a more difficult time writing the shorter summaries. Their summaries were able to relay the main idea of the selected text, but they wanted to include a larger amount of unnecessary information. The other pattern that arose in the majority of students as they practiced writing summaries was that many students wanted to be very general in their summaries. For example, after reading a selection of text about the role of organelles in the cell, many students' summaries read "This section was about what organelles do." The teacher-researcher encouraged the students to write summaries that would tell a person who read only their summary what the most important part of that section was. She then modeled a more complete summary by writing the following on the

board: “The organelles function to produce energy, build and transport materials the cell needs, and store and recycle wastes.” She then asked the students what was different about her summary and the summary they had written. The students agreed that both summaries said the same thing (what organelles did for the cell) but that the teacher’s summary gave more information. The students became able to write more focused summaries about what they had read in the textbook.

The last strategy, clarifying, was the most difficult for the students to use and would prove to be the most challenging strategy throughout the course of the study. Clarifying required the reader to do two things while reading: identify when they don’t understand something and repair the breakdown in comprehension. The teacher spent two days teaching the class how to use this strategy. This strategy is particularly difficult for the proficient readers because, according to Torgensen (2006), proficient readers automatically recognize when they have a breakdown in comprehension and make accommodations to correct it. These accommodations included continuing to read and using context clues to determine meaning, using an outside source such as a dictionary or the internet to look up a word or concept they don’t recognize, or asking a more knowledgeable person to assist them. Because proficient readers do this automatically, the teacher documented in her field notes that most students, when asked what they found confusing about the text, would respond with the following:

“Nothing”

“I understood everything I read”

“There was nothing confusing, I knew all the words” (September 20, 2006)

The students also had a difficult time determining how they fixed their comprehension when it broke down. Must of the students mentioned that when they get to a part they don't understand they continue to read and hope that will come across clues that will help them fill in the parts of the text they had difficulty with. This strategy also posed a large problem for the non-proficient readers. Most non-proficient readers have low self-confidence when it comes to their reading ability (Torgensen, 2006) which means they are also less likely to ask for help when their comprehension breaks down. Their response to difficult text is to give up reading altogether (Torgensen, 2006). This strategy continued to be the most challenging for students throughout the course of the study.

Throughout the teaching of the strategies the teacher observed and documented a pattern that had not been expected: during the teaching of the strategies student participation increased for all students in the class. During the initial stages of teacher modeling and whole class discussions the teacher was very deliberate about calling on each student in the class at least once for their predictions, questions, and summaries. However, for each of the strategies, after the first 25 minutes of practice, all students had voluntarily offered their examples to the class at least once without the teacher asking them to. This added participation also triggered many conversations about the text that was read. For example, during the teaching of the questioning strategy, the following dialogue took place between several students in the class.

Teacher: "What would be a good main idea question for this section?"

Nick: "I put what is the job of lysosomes in the cell."

Teacher: "Does everyone in the class agree with that main idea question?"

Todd: "I wrote what do lysosomes contain for my main idea question."

Jamila: “That’s a supporting question, not a main idea question.”

Teacher: “Why don’t you think that is a main idea question Jamila?”

Jamila: “Because the entire paragraph isn’t about what lysosomes contain, it’s about what lysosomes do in the cell. Todd’s question is a good question, but not for a question about the main idea”

Teacher: “Todd, do you agree or disagree with Jamila?”

Todd: “I understand what she means. Nick’s question is better for asking about the main idea and mine is a question that supports that question.” (September 14, 2006)

These kinds of discussion occurred throughout the entire process of teaching the strategies. The conversations also helped solidify the concepts for the students to better understand them. During the instruction and teaching of the strategies, the researcher documented how the students responded to each other. They were not confrontational or demeaning which in turn probably encouraged more discussions among the students.

Post-Test Results

After the students were taught the four strategies of reciprocal teaching the students were again given the passage about the black footed ferret to read. Before they read the selection, they made predictions about what they would read, and after they had read they generated questions and wrote summaries about the text. They also pointed out areas that caused their comprehension to break down and noted how they overcame that breakdown of their comprehension. Students then answered the same questions they had answered as part of the pre-test.

Post-test data showed ten students (45%) answering all of the questions correctly. This was an increase of eighteen percent. As with the pre-test, no student answered all of the questions incorrectly. The low complexity question was answered incorrectly on the post-test by two students; a decrease of eighteen percent. The two moderate complexity questions required students to use context clues was answered incorrectly by three students; a decrease of twenty eight percent. Two students incorrectly answered the question asking students to derive the meaning of a word from the text. This showed a decrease of nine percent. Two students answered the question about the diagram incorrectly. This indicated a decrease of four percent. The question that showed the largest difference in the number of students answering it incorrectly was the question involving the map. Seven students answered this question incorrectly on the pre-test. The post-test results showed no students answering this question incorrectly which was a decrease of thirty two percent. Data collected from the post-test indicated that the explicit teaching of reciprocal teaching strategies was possibly effective in increasing students' reading comprehension of their life science text.

Student Use of the Strategies

Before students had been taught the four strategies of reciprocal teaching they read a selection of text titled "Tropical Herpefauna...Tropical What?" (Bruckeim, 2005). The selection was expository in nature and involved a life science topic. After students read the selection, they completed a reading response worksheet about the text. Students had not yet been taught the appropriate use of the strategies, so they followed the directions printed on the worksheet. After students had been taught the correct use of the four strategies, they practiced using the strategies as a whole class and then in reading

groups. Throughout the study students would read selections of text from their life science books and would complete a reading response worksheet about that section. When students had been placed in groups, the students would read the selection in their reading groups and each student had a role to play in the group (predictor, questioner, and summarizer; the role of clarifier was shared among all group members). The reading response worksheets were then analyzed to look for changes in the predictions, questions, and summaries that students wrote about the text. The following sections detailed the data that were collected about students' abilities to use the strategies of reciprocal teaching.

How Did the Use of Reciprocal Teaching Strategies Affect Students' Abilities to Make Predictions About the Text?

After students had completed the reading response worksheets about the tropical herpefauna passage, their predictions could be grouped into two categories: students who gave specific predictions and students who restated the title as their prediction. The following statement is typical of students who restated the title as their prediction gave the following as their prediction:

"I think it will be about tropical herpefauna." (September 11, 2006)

Eight students wrote predictions that fell into the category of restating the title and all eight students wrote the above statement for their prediction. Although this was an accurate prediction, when asked, none of the students could explain what tropical herpefauna was prior to reading the selected text. Of the twelve students who gave specific predictions, eight offered the following:

"I think it is going to be about plants that are rare. Herpefauna sounds like a rare herbal plant."

"I think it will be a plant or animal in the tropical regions of the world. The title says tropical and herpefauna sounds like a plant or animal."

"About reptiles and about them. Theres a lot of reptile names in the reading when I was scanning."

"I think it will be about something tropical, probably an animal. I think this because I looked at the title and glanced at the page."

"I think this is about tropical reptiles. The title told me."

"I think this story will be about rainforest animals or island animals, and what they are. I got this from the title."

"It's going to explain what the word after tropical means. Because after it says "tropical what?" saying it doesn't know what it means."

"I think this story will be about a tropical storm because of the title." (September 11, 2006)

Twelve students wrote predictions that could be categorized as specific predictions. Many of the students who fell into this category wrote that they scanned the text in addition to just reading the title. Of the twelve students who wrote specific predictions, five of those students gave a correct prediction, stating that they thought the selection would be about reptiles and/or amphibians in a tropical setting. One of the twelve students stated that the passage would be about tropical plants and one student predicted that it would be about tropical plants and animals. Another student predicted that the selection would be about a tropical storm and the remaining four students stated that it would be about tropical animals. Two students did not write a prediction at all.

After students had been taught the four reciprocal teaching strategies, they worked as a whole class by reading several selections from their textbook and working through the strategies. As the class read, they completed a reading response worksheet about that section. Students began writing predictions that were specific to the section that was being read. For example, when reading a section about the chemical makeup of cells, students would first look at titles and headings, but then would look at pictures and captions, as well as diagrams or graphs if they were present. They would then write their predictions. Before reading a section titled "Osmosis – the diffusion of water molecules" one of the students made the following prediction:

> "I think this section is going to be about how water moves into and out of a cell. I know from the last section that diffusion is when materials move in and out of a cell and the title tells me that osmosis is the diffusion of water. Because of the picture at the bottom of the page I also think the author is going to tell what happens when a cell has too much or too little water in it." (October 13, 2006)

The student who made that prediction had been simply restating the titles in his previous predictions and had not listed why he had made his prediction on his worksheet. The prediction he made about this section of text showed an accomplishment for that particular student.

After students had spent four weeks practicing the strategies in a whole class setting they transitioned to their reading groups. During this transition almost all of the students had an initial setback in writing their predictions. The majority of students began restating the title of the section as their prediction and either did not provide support for making that prediction or the support they did provide simply stated "I looked at the

title." Through increased scaffolding, such as showing examples on the board and having small whole class discussions while students were working in their reading groups, on the part of the teacher, the students quickly moved back to making specific predictions and stating their reasoning in making those predictions. The final reading selection that was included in this study was a passage about probability and genetics. Some examples of student predictions after the teacher increased the amount of scaffolding have been listed below:

> "How alleles are passed down. There many charts showing the parent and offspring with letters representing alleles."
>
> "It will be about how Punnett squares help you understand how stuff is passed down. The pictures and captions helped me make this prediction."
>
> "It will explain what Punnett squares are and how they work. There are charts showing the heredity."
>
> I think is like boxes are filled in like a math problem. Picture show with one allele contributed by each parents." (ESOL student) (November 30, 2006)

Only two students of the twenty two involved wrote a prediction that restated the title and all of the students wrote an accurate prediction about this section of text. All twenty two students wrote a prediction and only two students did not include support. The data collected through reading response worksheets and through teacher-researcher observations and field notes show that students were able to write better predictions as they practiced with this strategy. Many of the students in class noted during discussions that predicting was especially easy with the text book because of the cause and effects formatting that all the sections of the book have. The students, as recorded in field notes,

also found the coloring of the headings and subheadings useful in making predictions, as well as the abundance of pictures with captions and charts or graphs.

How Did the Use of Reciprocal Teaching Strategies Affect Students' Abilities to Generate Questions About the Text?

As was documented while the strategies were being taught, the teacher-researcher's observations showed that the main challenge students faced while generating questions about the text was during the process of identifying the main idea of the text in order to write a question about and generating questions that could be answered using the text. These struggles were also recorded once students began using the strategies as a whole class and in their reading groups. Prior to being taught the strategies, for example, students were asked to identify what they thought the most important information was in the tropical herpefauna passage and then generate a question about that idea. Samples of typical students' responses were listed below:

> "The Brazilian horned frog has a large sized diet of small rats and mice and it kills immediately then swallows it. How big do they get?"
>
> "The emerald tree boa found in the Amazon, bright green with white cross-bands on back, a yellow belly enables to hide in trees. Is it poisonous?"
>
> "Chameleons (lizard) have prehensile tails; gripping toes; independently movable eyes; long fast tongues which helps them camouflage. What do they eat?"
>
> (September 11, 2006)

For all three of the examples cited, the students rewrote a large portion of each paragraph instead of focusing on the most important part of the paragraph. Students were expected to focus on the role of camouflage on the predation habits of each of the animals or how

the physical structure of the creature was compatible with its environment. Students instead absorbed any detail they could out of the passage. The questions that were then generated were unanswerable from reading the passage and therefore were not questions about the main ideas.

As students began to practice the use of the strategies, they became better at being able to identify the most important information in the passage. As a result, the questions that were then generated by the students became more focused on the main ideas of the selection of text. For example, after students read a passage about the role of certain materials in the cell, some of the students wrote the following as the most important information and questions to go with that information:

> "Proteins make up parts of the cell and body. Why are proteins important to people?"
>
> "The difference between an organic and inorganic compound is carbon. What are some examples of organic compounds?"
>
> "Proteins have big jobs in cells. What are some of the things proteins do in cells?" (October 13, 2006)

The students who wrote the above ideas and questions are the same students who wrote the important information and questions listed prior from the tropical herpefauna passage. In three weeks they had moved beyond writing down every detail they read about and were able to focus on what was most important in the passage they read. In turn, their questions were more focused and all of the questions were answered as they read the text. This pattern was obvious in all students as they practiced this strategy. As students moved from the whole class setting into their heterogeneous reading groups the growth

became even more apparent as the students generated questions and identified important information in the selected passages.

The teacher-researcher observed that as students began to become comfortable working with the strategies in their reading groups, they were willing to help out struggling students and to discuss what the author's objective was in writing that passage. As they became confident about their ability to identify the main ideas, the questions that they generated became higher level questions that required more than just a one word answer directly out of the text. The answer could be found in the text, but it required a better understanding of what was read. The following examples were taken after students read a passage about the role of probability in genetics and co-dominance in their reading groups. Students had already spent time reading and learning about dominant and recessive traits, laws of inheritance, and phenotypes and genotypes.

> "Scientists use Punnett squares to show the outcome of genetic cross and to determine the probability of a particular trait. How does a Punnett square predict outcomes of genetic crosses?"
>
> "Co-dominance is when the alleles are not dominant or recessive so it results in a mix. How is a roan cow who has a red mom and white dad an example of co-dominance?"
>
> "A Punnett square is a chart that shows all the combinations of alleles that can come out of a cross. How does a Punnett square work?"
>
> "Co-dominance shows a mix of traits. Why didn't Mendel's principle explain co-dominance?"

"Co-dominance is when neither one is recessive or dominant. What is the difference between co-dominance and heterozygous?" (November 30, 2006)

The examples came mostly from students who had struggled with this strategy during the teaching phase. With practice and group discussion, the students were more focused on the most important information and were able to generate questions about the text that were more than recall questions. The questions that they generated required a real understanding of the content that was read and past knowledge that had been discussed and learned in the classroom.

With practice struggling readers showed marked improvement in their ability to identify the most important information and generate questions about the text. However, not all students showed such gains. Students who measured two or more years above grade level in their reading abilities through FCAT and Lexile data actually exhibited a pattern of decrease in their ability to identify the main idea and generate questions about the text that was read. Many of these highly proficient readers would state a very general main idea and then restate the main idea in the form of a question for the questioning phase. For example, when reading the selection on Punnett Square and co-dominance, one student listed the following as his main ideas and questions:

"Geneticists use Punnett squares to show all the possible outcomes of a genetics cross and to determine the probability of an outcome. What do geneticists use Punnett squares for?

There are four possible outcomes in a Punnett square. How many possible outcomes are there in a Punnett Square?

> Co-dominance is when one allele is neither dominant or recessive. What is co-dominance?
>
> Mendel didn't observe co-dominance. What type of inheritance did Mendel NOT observe?" (November 29, 2006)

This particular student scored a level five on his FCAT reading test the previous school year indicating a reading level of at least two years above grade level. His Lexile inventory revealed a reading level aligned with that of a ninth grader. This pattern was dominant among the students who measured as highly proficient through FCAT and Lexile. This pattern may be attributed to the students' not feeling challenged by the level of text being read or even boredom with the task. More research is needed to evaluate the effects of reading strategy instruction on proficient readers in the content area classroom.

How Did the Use of Reciprocal Teaching Strategies Affect Students' Ability to Summarize What Was Read in the Science Text?

When students were first asked to summarize what was read in the tropical herpefauna passage, many of the students wrote long and detail filled summaries. The students had a difficult time focusing on only the most important information that was read. For example, one student wrote the following summary about the tropical herpefauna passage:

> "A herpefauna is the collective name for reptiles. A Brazilian horn frog eats many thing in a tropical rainforest. The green and black dart-poison frog is very poiseness. Chameleon has many useful traits." (September 11, 2006)

The student who wrote the above passage admitted to having a difficult time choosing which information was the most important and therefore resorted to writing a little bit

about everything. This was typical for students who struggled writing their summaries. The students who did write shorter, more concise, summaries often missed the main focus of the passage. For example:

> "Herps can camouflage and live in tropical rainforests although they are struggling to survive." (September 11, 2006)

The student wrote a more focused summary about the passage but did not identify that the focus of the passage was what the different animals did in order to survive. The focus of her summary was the concluding paragraph which included a one sentence summary about herps struggling to survive due to habitat destructions.

After students had learned the strategies and they began using them in a whole class setting they became increasingly more proficient at recognizing the most important information in a selection of text and identifying that information in their summaries. This was especially true for the more proficient readers in the class. The students who were higher level readers were faster at identifying the main ideas and writing a summary that reflected their understanding of the text. After reading a passage about active transport in the cell and a class discussion about the predictions that were made and the questions that were generated, one of the students offered the following as her summary:

> "The difference between passive and active transport is whether or not the cell has to use its energy to move stuff. It's kind of like people. If ur active then you use alot of energy. But if ur not active and don't use energy then ur passive." (October 16, 2006)

This student's summary showed a good understanding of what was read and also an application of the knowledge gained from the reading. This style of summarizing was typical of proficient readers' summaries.

The students who were considered not proficient readers did improve in their writing of summaries as well. The discussions that occurred during the reading group meetings appeared to have the largest impact on students' summary writing ability. The following dialogue was noted during a reading group session while students were reading a passage about dominant and recessive alleles in genetics.

> Joey: "The summary I wrote says that in pea plants the allele for tall plants is dominant to the allele for short plants."
>
> Alissa: "But is that the most important info? I mean, what if we aren't talking about pea plants? That just seemed to be an example to me."
>
> Kyle: "I guess it's kinda both. I mean, it's good to know that sometimes one trait shows over another, but it's also good to know where else it can happen."
>
> Alissa: "OK, so what about this for a summary: A dominant allele is a trait that always shows up and a recessive allele only shows up if its partner is also recessive. Each person inherits one allele from their mom and one from their dad."
>
> Joey: "So we don't need to mention pea plants at all? But two of the paragraphs we read was about Mendel and his peas."
>
> Kyle: "They use pea plants because that is what Mendel studied. But the idea can be for anything. It's like why you look sort of like your mom and sort of like your dad but maybe not at all like your sister. We don't have to talk about the pea

plants in the summary because the plants aren't what's important. It's that some traits hide other ones. That's the important part."

Joey: "So it's like why my mom and dad both have brown eyes but I have hazel?"

Alissa: "Yeah, certain traits for eye color are dominant to others and the only way the recessive one shows is if it is with another recessive trait." (November 28, 2006)

This conversation took place between one high level reader and two lower level readers and was typical of the type of dialogue that occurred during the reading group sessions. Joey read significantly below grade level (at least two years) and Kyle was one year below grade level. However, through a discussion about what the summary should be for a selection of text, they were both able to come to an understanding about how traits are inherited and why some traits are shown and others are not. This kind of dialogue proved to be the most valuable part of the reciprocal teaching process to all the students, but particularly for those non-proficient readers. It made the students really pay attention to what they were reading but also encouraged them to help each other through the process. By taking on the role of the teacher the students were able to learn in the process. The following table summarized the quantitative reading data collected for this study,

Table 1: Summary of Student Data

Reading Group	**Language Background**	**FCAT Reading Level**	**Lexile Reading Level**	**Intensive Reading Class**	**Overall Science G.P.A.**	**Pre-test (# correct/6)**	**Post-test (# correct/6)**
Group #1							
Student A	English	4	11th	No	3.0	6/6	6/6
Student B	English/Spanish	4	5th	No	3.0	3/6	5/6
Student C	English	1	2nd	Yes	1.5	2/6	4/6
Student D	English	2	7th	Yes	2.5	5/6	6/6
Group #2							
Student E	English	4	8th	No	4.0	5/6	5/6

Student F	English	3	10th	No	4.0	5/6	6/6
Student G	English	5	10th	No	3.0	6/6	6/6
Group #3							
Student H	English/Spanish	4	4th	No	4.0	6/6	6/6
Student I	Spanish	1	1st	Yes	2.5	2/6	4/6
Student J	English	2	8th	Yes	2.5	5/6	6/6
Student K	English	4	8th	No	3.0	6/6	6/6
Group #4							
Student L	English	n/s	n/s	No	4.0	5/6	5/6
Student M	English	4	5th	No	3.5	4/6	5/6
Student N	English	3	6th	No	3.5	5/6	4/6
Student O	English	4	4th	No	4.0	5/6	5/6
Group #5							
Student P	English	1	5th	Yes	2.0	6/6	6/6
Student Q	English	4	11th	No	3.5	5/6	5/6
Student R	Mandarin/English	n/s	3rd	Yes	4.0	4/6	5/6
Student S	English/Korean	5	9th	No	4.0	5/6	6/6
Group #6							
Student T	English	3	6th	No	4.0	4/6	5/6
Student U	English	n/s	5th	No	2.5	4/6	5/6
Student V	English/Spanish	5	10th	No	4.0	6/6	6/6

Summary

This exploratory action research study focused on how explicitly teaching seventh grade life science students four reading strategies could affect their reading comprehension of their life science text and their ability to use the strategies. Data collection methods for this study were: reading comprehension pre/post test, student reading response worksheets, and teacher-researcher field notes and observations.

While the students were being taught the four strategies that make up reciprocal teaching the teacher-researcher noted the following patterns: students appeared to become more proficient at making accurate predictions about what they read; students showed

some improvements in their ability to identify the main idea and generate questions about the main idea; student summaries were initially lengthy and unfocused but seemed to become better organized throughout the teaching phase; and that students consistently struggled with the clarifying strategy. The teacher-researcher also noted that student participation drastically increased during the process of teaching the strategies to the students. This in turn positively affected students' understanding of how to use the strategies. At times during the teaching phase the teacher-researcher needed to increase the amount of scaffolding for students so they could better understand the use of the strategies. Post-test data results showed a positive change in student reading comprehension of a life science passage. This change may be linked to students being explicitly taught the four reciprocal teaching strategies.

After students had been taught the four strategies they practiced using the strategies in a whole class setting before moving to their reading groups. Each strategy provided students with unique challenges and students were able to show improvement in their use of the strategies over time. The most powerful aspect of reciprocal teaching was the dialogue that occurred in both the reading groups and whole class setting. Through these discussions the students were able to show their use of the strategies and come to a better understanding of the content that was read.

The next chapter documented the implications and conclusions drawn from the collected data. A call for further research was also addressed.

CHAPTER FIVE: CONCLUSION

Introduction

After four years of teaching seventh grade science, I had become personally aware of the challenges my students faced when asked to read informational text for understanding. This awareness led to my interest in looking at strategies that would increase my students' ability to comprehend the text that was read during class. Research has shown that the metacognitive skills required when reading text for understanding and learning scientific concepts through inquiry-based instruction are closely related (Baker, 2004). The focus in science instruction has also shifted from being mainly on inquiry-based practice to a shared goal of developing scientifically literate students who are both scientific thinkers and scientific readers (AAAS, 1993; NRC, 2000). It has been my personal experience that many teachers of science content do not feel it is their job to teach their students how to read their science textbook. They feel that they are teachers of the content and not reading teachers. But students need to be taught the strategies they will need to read scientific text the same way we teach them about laboratory equipment and conducting scientific investigations. If we are asking students to construct their knowledge of scientific content, then shouldn't we also provide them with the appropriate tools to aid in that knowledge construction?

The aim of this action research study was to analyze changes in students' comprehension of their life science textbook after they had been explicitly taught reading strategies known as reciprocal teaching. Palincsar and Brown (1984) developed reciprocal teaching. I also looked for changes in the use of the strategies by the students'

after they had practiced using each of the strategies in a whole-class setting and in reading groups.

The research questions were:

Question #1 What were the effects of the explicit teaching of reciprocal teaching strategies on students' comprehension of a seventh grade life science text?

Question #2 How did the use of reciprocal teaching strategies affect students' ability to make predictions about the text?

Question #3 How did the use of reciprocal teaching strategies affect students' ability to generate questions about the text?

Question #4 How did the use of reciprocal teaching strategies affect students' ability to summarize what was read in the science text?

Throughout the study students generated data in the form of a pre and post-test, student reading response worksheets, and teacher-researcher observations and field notes. During the course of this twelve week study, data that was collected was compared to background and initial data that was collected at the beginning of the study. The results of the triangulated data produced several themes which were related to the research questions. These themes were: student comprehension of their life science textbook increased after being explicitly taught the reciprocal teaching strategies, students made predictions that transitioned from restating the title to making specific predictions about selected text, questions that were generated by the students showed an understanding the content that was read about and past knowledge that had been discussed and learned in class, and the summaries written by students showed a strong understanding of what was read and an application of the knowledge that was gained from the reading. One pattern

that was revealed unexpectedly was an increase in student participation during whole-class discussions about the read text.

Conclusions

This study took place in a middle school in Seminole County, Florida. Data were collected from twenty-two seventh grade participants. Based on my analysis of the data generated over the course of this study I offered conclusions as they related to each of the research questions.

What Were the Effects of the Explicit Teaching of Reciprocal Teaching Strategies on Students' Comprehension of a Seventh Grade Life Science Text?

The students who participated in this study represented all levels of reading proficiency based on background data collected through previous year's FCAT scores and Lexile inventory scores. Prior to being taught the four strategies that make up the reciprocal teaching process all students took a reading comprehension pre-test. After students had been taught the four strategies (predicting, questioning, summarizing, and clarifying) they took the post-test and scores were compared. These scores and the field notes generated implied that student comprehension of their life science text increased after being explicitly taught the four strategies. In addition, student participation increased during the teaching of the strategies and class discussion. This was an unexpected, although pleasant, outcome. This pattern continued when students moved from the whole-class setting to the reading groups after being taught the strategies and spending four weeks working as a whole class.

How Did the Use of Reciprocal Teaching Strategies Affect Students' Ability to Make Predictions About the Text?

Data showed that as students continued to use the predicting strategy, they were able to develop more specific predictions about the reading selection. Before the students had been taught the strategy, their predictions typically restated the title or heading of the section of text that was read. After students had been taught the strategy and began using it in whole groups their predictions continued to become more specific and the students were able to provide supportive reasoning for why they made that prediction. After students moved into their assigned reading groups, the class in general had a setback and would restate the title as their prediction. I increased the amount of scaffolding through whole-class discussion and providing the students with examples of predictions on the board. The students were then able to move forward and again wrote specific predictions while providing support. By the end of the study only two of the twenty-two students were still restating the title as their prediction. The remaining twenty students were writing specific predictions.

How Did the Use of Reciprocal Teaching Strategies Affect Students' Abilities to Generate Questions About the Text?

The main challenges students faced when asked to generate questions about what they read was being able to identify the main idea and asking questions that could be answered through the text. As students practiced using the strategies in the whole-class setting they became more proficient at identifying the most important information in the passage and then generating questions about that information. Their proficiency in

generating questions about the text showed improvement once more as students transitioned into their reading groups. This appeared to be due to the level of discussions that occurred in the reading groups. An additional factor that contributed to this growth was students who were more proficient at reading prior to the study beginning were very accommodating in assisting their group members who were not as proficient or who struggled in generating questions about the text. However, the more proficient readers also showed a decrease in their ability to identify the main idea and generate questions about the text that was read. This pattern may be attributed to the students' not feeling challenged by the level of text being read or even boredom with the task. More research is needed to evaluate the effects of reading strategy instruction on proficient readers in the content area classroom.

How Did the Use of Reciprocal Teaching Strategies Affect Students' Ability to Summarize What Was Read in the Science Text?

Prior to being taught the reciprocal teaching strategies the students wrote summaries that were long and detail filled. Many students, when asked about their summaries, indicated that it was difficult for them to choose which information in the passage was the most important. After students had been taught the strategies they showed a marked improvement in their ability to identify the most important information in the text and transfer that knowledge into their written summaries. Students who were more proficient readers were especially strong when using this strategy. The more proficient readers also showed an application of the knowledge through their summaries. Non-proficient readers did show an improvement when writing their summaries and the

majority of this improvement appeared to occur as a result of discussions that took place in the heterogeneous reading groups.

Discussion

The aim of this action research study was to examine changes in students' reading comprehension after they had been taught specific reading strategies in a life science class. Changes in students' application of the strategies were also studied. The study began with an assumption that by increasing students' reading comprehension their understanding of life science content would also improve.

Based on the data collected, student comprehension of their seventh grade life science textbook did appear to improve after students had been explicitly taught the four reading strategies. It might be implied then that their understanding of the science content improved. Students also showed improvement in their use of the four strategies that make up reciprocal teaching. I believe these changes were due to multiple factors. The first factor that contributed to these changes was the levels of conversation that took place during this study. Whether students were being taught the strategies, using the strategies as a whole class, or working together with the strategies in their reading groups, student dialogue played a critical part in the students understanding what they read and being able to apply that knowledge. These conversations between the teacher and the class and between students who were part of reading groups helped to solidify the content that was being learned and helped students improve their overall comprehension of what was being read in their textbook. However, these changes could possibly have been the result of outside factors that this study was not designed to measure such as students being taught additional reading strategies in other classes at the same time this study took place.

It is my belief, based on the data that were collected, that the students built strong relationships within their individual classes and reading groups. By creating those bonds, students worked together comfortably not only in their reading groups, but also when conducting laboratory investigations and working together on in-class assignments. Through these relationships they were able to share previous experiences and background knowledge about a science concept and were able to help each other when a group member was showing difficulties completing a particular task. These opportunities helped build students overall learning experiences in our life science classroom.

This research study provided me the opportunity to enrich my students' science experience as well as give them tools they could use to become stronger readers of science and informational text. Students were able to experience the pleasure of reading for understanding and actually learning content through print. By reflecting on this study, I was able to modify my teaching practices to improve my students' learning experiences and reading experiences both in and out of the classroom.

The results of this study have shown me the importance of strong student relationships in various group settings and the effects those relationships can have on student learning in the science classroom as well as the science lab. I have shared the results of this study with school administrators and my students in hopes of promoting the importance of reading for understanding in content area classrooms. I also shared the results with my other department members in hopes of showing them that reading strategies can be taught while still teaching science concepts and laboratory investigation skills.

Over the course of this study I became acutely aware of the growth my students were showing in the areas of reading comprehension, science content knowledge, and levels of participation in class and group discussions. Through the analysis of data and reflection on that data I am more equipped to better meet the needs of my students as readers and learners of science, as well as social participants in the classroom. I look forward to conducting more research in the area of reading strategies and how it affects students' abilities during inquiry-based laboratory investigations.

I believe in helping my students to be successful not only in my science classroom, but in academic and social settings they will encounter in life. Through this study I was able to accomplish this goal and open the door for future learning on my part to help my students. The state of Florida's focus on reading will continue through the coming years. If content area teachers can find ways to teach their students to be both proficient readers and learners of content knowledge, then students will continue to be successful. In order to become facilitators of student learning, teachers need to be aware of the struggles that non-proficient readers face in the content area classrooms.

Recommendations

After completing this study, there are several recommendations that I would like to make in the event of the study being replicated. The first recommendation involves the use of a control group. More accurate data may have been collected if groups of students who had been taught the strategies were compared to student groups that had not been taught the strategies. There is also a need for stronger methods if the study were to be replicated. For instance, it was unknown what strategies the students who were enrolled

in an intensive reading program were being taught and what kind of impact that had on the results of this study.

I see a need for continuing to research the effects of teaching students specific reading strategies on students' performance during inquiry-based science investigations. I also see a need to conduct further research on how highly proficient readers, when taught specific reading strategies in a content area classroom, utilize those strategies. A large amount of dialogue has occurred about the connections between reading and science instruction in recent years. However, very little data were available about how increasing students' proficiency in reading affects their proficiency during laboratory investigations. Much of the research was also focused on only those students who are considered non-proficient readers. I would be particularly interested in how the teaching of specific reading strategies in the science classroom affects students' participation during inquiry-based investigations. That is, would students' curiosity about the world of science change if they were taught to read their science textbook for better understanding of the science concepts?

As a teacher, I have students with many ability levels in one class period. The students who were considered highly proficient readers in my life science class faced different obstacles than those of proficient and non-proficient readers. I would like to see a study that examined two things: (1) the effects of teaching specific reading strategy on highly proficient readers' attitude towards science class, and (2) the effect of being the highly proficient reader in a heterogeneous reading group on students' attitudes toward science class. As teachers, we must strive to meet the needs of all students in our classes, not just those in need of extra skills and practice in a certain area.

Science teachers need to begin to accept the ideas that not only are they teachers of science content, but they are also to teach their students how scientists carry out their work. Included in the work of scientists is being able to read and write about scientific ideas and concepts. It is time to engage our colleagues in an informed dialogue about the importance of teaching our students to be scientifically literate. This is even more critical when we expect students to engage each other in inquiry-based investigations in the laboratory setting. By facing this challenge, teachers will be able to meet the needs of all students and all students will be better prepared for the academic and social challenges that they will face in the future.

APPENDIX A: IRB COMMITTEE APPROVAL FORM

THE UNIVERSITY OF CENTRAL FLORIDA

INSTITUTIONAL REVIEW BOARD (IRB)

IRB Committee Approval Form

PRINCIPAL INVESTIGATOR(S): Brooke Malinowski-Bess #06-3506
(Supervisor: Bobby Jeanpierre, Ph.D.)

PROJECT TITLE: The Effects of Reciprocal Teaching Strategies on Students' Comprehension of a 7th Grade Life Science Text

[X] New project submission [ ] Resubmission of lapsed project #_____
[ ] Continuing review of lapsed project # [ ] Continuing review of #
[ ] Study expires [ ] Initial submission was approved by expedited review
[ ] Initial submission was approved by full board review but continuing review can be expedited
[ ] Suspension of enrollment email sent to PI, entered on spreadsheet, administration notified _____

Chair

[X] Expedited Approval

Dated: 5/7/06
Cite how qualifies for expedited review: minimal risk and #7

[ ] Exempt

Dated: _____
Cite how qualifies for exempt status: minimal risk and _____

[X] Expiration Date: 5/16/07

IRB Reviewers:

Signed: _____
Dr. Sophia Dziegielewski, Vice-Chair

Signed: _____
Dr. Jacqueline Byers, Chair

Signed: Tracy L Dietz
Dr. Tracy Dietz, Vice-Chair

Complete reverse side of expedited or exempt form

[ ] Waiver of documentation of consent approved
[ ] Waiver of consent approved
[ ] Waiver of HIPAA Authorization approved

NOTES FROM IRB CHAIR (IF APPLICABLE): _____

APPENDIX B: COUNTY APPROVAL LETTER

SEMINOLE COUNTY
PUBLIC SCHOOLS

WILLIAM VOGEL, Ed.D.
Superintendent

Educational Support Center
400 E. Lake Mary Boulevard
Sanford, Florida 32773-7127

RONALD L. PINNELL, Ed.D.
Executive Director of
Secondary Education

RAYMOND L. GAINES
Executive Director of
Secondary Education

Telephone: (407) 320-0039
Facsimile: (407) 320-0293
Suncom: 351-0038

Visit Our Web Site
www.scps.k12.fl.us

April 24, 2006

Ms. Brooke Bess
59 Pine Drive
DeBary, FL 32713-2827

Dear Ms. Bess:

I am in receipt of the proposal and supplemental information that you submitted for permission to conduct research in the Seminole County Public Schools. After review of these documents, it has been determined that you are granted permission to conduct the study described in these documents under the conditions described herein.

Your school principal has the authority to decide if he wishes to participate in your study or if it is appropriate to release any requested information. You are expected to make appointments in advance to accommodate the administration and/or staff for research time. Furthermore, any processing or comparison of data will be your responsibility and shall not impact our Testing Department.

Please forward a summary of your project to my office upon completion.
Good Luck!

Sincerely,

Ron Pinnell

Ronald L. Pinnell, Ed.D.
Executive Director
Secondary Education

RLP/jr

APPENDIX C: PRINCIPAL APPROVAL LETTER

Markham Woods
Middle School
Educational Support Center/Annex
1722 W. Airport Boulevard
Sanford, FL 32771

Roger Gardner
Principal
(407) 871-1706

Larry Tyree
Guidance Counselor
(407) 871-1732

Fran Pace
Executive Secretary
(407) 871-1705

Mary Houck
Bookkeeper
(407) 871-1710

http://www.scps.k12.fl.us

April 6, 2006

To Whom It May Concern:

Brooke Malinowski-Bess has discussed her research questions and methods with me for completion of a thesis for the UCF/Lockheed Martin master's degree program. I am aware that she will be gathering data during the fall of the upcoming school year. I officially give my permission for Brooke to conduct research this fall.
If you have any questions, you may contact me at Roger_Gardner@scps.k12.fl.us.

Thank you,

Roger Gardner

Principal, Markham Woods Middle School
Seminole County Public Schools

APPENDIX D: PARENTAL CONSENT FORM

LETTER OF CONSENT

Dear Parent/Guardian.

In addition to your student's seventh grade science teacher, I am also currently a graduate student at the University of Central Florida working towards my master's degree in K-8 Math and Science Education. Under the direction of Professor Bobby Jeanpierre in the College of Education Lockheed Martin Teaching Academy, I am conducting a qualitative action research study on the effects of the implementation of reciprocal teaching on students' comprehension of their science text. Reciprocal teaching is an instructional method that teaches the students how to monitor their learning as they read text through four strategies: predicting, generating questions, summarizing, and clarifying. The focus of my research is to examine how students' comprehension is affected by teaching them these reading strategies.

Throughout the fall 2006 semester I will be utilizing this instructional approach with your child's class. I will be collecting data in the form of student test scores, my own personal field notes, observations, student reading journals, and interviews with students. Some interviews may be audio taped for a thorough review of student responses. The research will focus only on the methods mentioned above. All journals, test results, field notes, audiotapes will be kept in a locked filing cabinet when not in use and will be destroyed at the completion of the study.

Your child's participation in this study is voluntary. If you choose not to have your child participate or to withdraw them from the study at any time, there will be no penalties nor will it affect your child's grade and your child will still be allowed the same educational opportunities as those who do participate. There will be no compensation for yourself as parent/guardian or for you child for the child's participation in the study.The results of the research may be published, but your child's name will not be used. Any publications developed from this study will use pseudonyms for the middle school and the participants in the study. There are no foreseeable risks or discomforts if you agree to allow your child to participate in this study. There may be no direct benefit to your child. However, your child's participation in the research would add to the body of knowledge concerning students' reading comprehension of science text. Please sign and return the bottom portion of this letter giving your consent for your child to participate in this study. If you have any questions concerning this research study please call me at (407) 871-1750 or send an email to Brooke_Bess@scps.k12.fl.us. Dr. Bobby Jeanpierre can be reached at (407) 823-4930. Information regarding your student's rights as a research participant may be obtained from:

Barbara Ward, CIM
The Institutional Review Board (IRB)
The University of Central Florida (UCF)
12201 Research Parkway Suite 501
Orlando, FL, 32826-3246

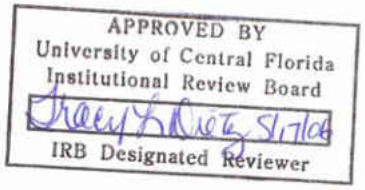
Sincerely,

Brooke R. Bess

_____ YES! I give my consent for my child _____ to participate in this action research study and understand that I may decide at any point in time to disallow participation.

_____ YES! I give my consent for my child to be audio taped for the purpose of data collection and understand this data will be kept under lock and key for the duration of the study and that it will be destroyed upon completion of the study.

_____ _____ _____
Signature Printed Name Date



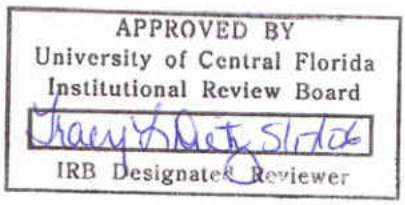
APPENDIX E: CHILD ASSENT FORM

CHILD ASSENT FORM

I understand that my participation in this study is not required and that I may stop my participation at any time. The information that my teacher collects will be about a reading strategy and if that helps students understand what they read in their science textbook. I have been told that I can stop my participation in this study at any time. If I choose not to participate, I understand it will not affect my grade in any way and that I will still get the same opportunities in class that the students who are participating will get.

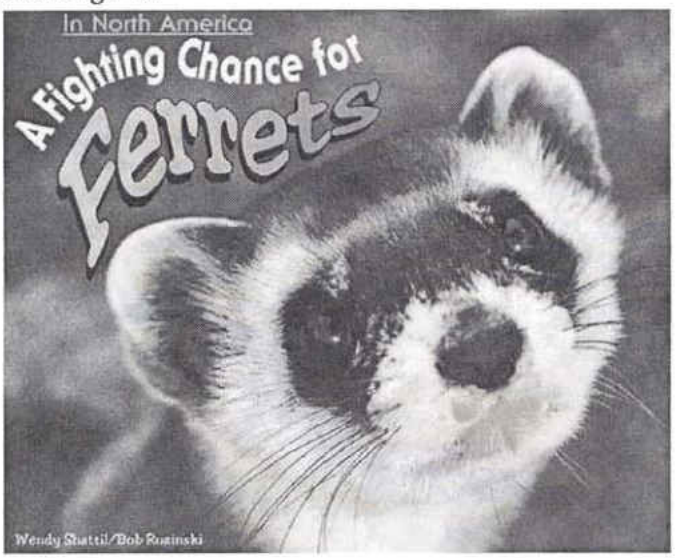
_____ _____

Signature Printed Name



APPENDIX F: PRE/POST TEST

Read the article "A Fighting Chance for Ferrets" before answering Numbers 40 through 45.



On the edge of extinction—can ferrets make a comeback?

A curious black-footed ferret pops its head out of a prairie dog burrow. Black-footed ferrets—members of the weasel family—are so rare that they were once thought to be extinct. Luckily a few survivors were found in Wyoming. Read on to find out how scientists are helping ferrets cope in the wild again.

Black-footed ferrets cannot live without prairie dogs. These ferrets live, hunt, and raise their young only in large prairie dog towns—vast networks of tunnels on prairies in parts of the western United States.

For a hundred years, ranchers have shot and poisoned prairie dogs, believing that they compete with their cows and sheep for grass. Ranchers are also concerned that prairie dog burrows cause cattle and horses to trip and break their legs.

Most large prairie dog towns were wiped out. Ferrets disappeared, too. Scientists say that to support a ferret population a town must cover hundreds of acres.

By the 1970s black-footed ferrets were assumed to be extinct. But in 1981 a black-footed ferret was discovered on a remote ranch in Wyoming. Excited by the find, scientists from university, state, and federal wildlife organizations scoured the surrounding area. During the next four years, they found more than a hundred ferrets!

Disease swept through the colony, killing ferrets and prairie dogs alike. In a last-ditch effort to save black-footed ferrets, scientists managed to rescue 18 of them before the colony was completely wiped out.

Pampered and well fed in their new enclosures, the surviving ferrets bred. Within seven years there were 400 black-footed ferrets in a controlled environment. It was time to try reintroducing them to the wild.

There are many hurdles to overcome when trying to return human-raised animals to the wild. Used to being fed and protected, the animals must quickly learn to find their own food and avoid danger. Another problem is that humans and ferrets share the same land. Local ranchers were concerned about the restrictions that might be placed on grazing land. Protecting reintroduced black-footed ferrets from disturbances might restrict the ranchers' fencing and grazing areas. Wildlife agency officials worked with the ranchers to find acceptable compromises.

In 1991 the first black-footed ferrets were released into prairie dog towns in Wyoming. The next summer there were four new wild-born ferret litters on the prairie. But most of the reintroduced ferrets died. Looking for ways to help more ferrets survive after release, scientists started a preconditioning program. Inside dirt pens young ferrets learned to navigate through prairie dog tunnels in a real burrow and fight and kill live prey. Researchers hope the program will give black-footed ferrets a fighting chance.

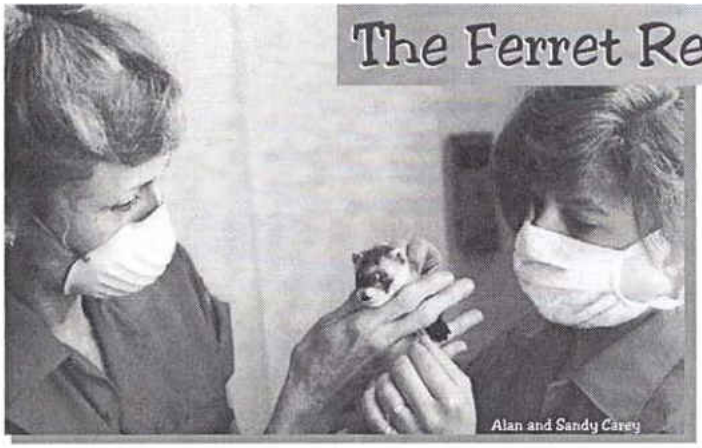
BY FIONA SUNQUIST

Hanging On

Today populations of reintroduced ferrets such as the one above survive in Wyoming, South Dakota, and Montana (see map, black dots). An Arizona release site is planned soon (black star).

Photo by Wendy Shattil/Bob Rozinski

The Ferret Rescue Project



Alan and Sandy Carey

Ferret Checkup

Wearing masks and coveralls, biologists Donna Zeiler, on the left, and Kyla Borghi examine a young black-footed ferret at the Sybille Wildlife Research Unit in Wyoming. To avoid carrying diseases into the breeding unit, researchers shower and change into clean clothes before entering.

Ready For Release

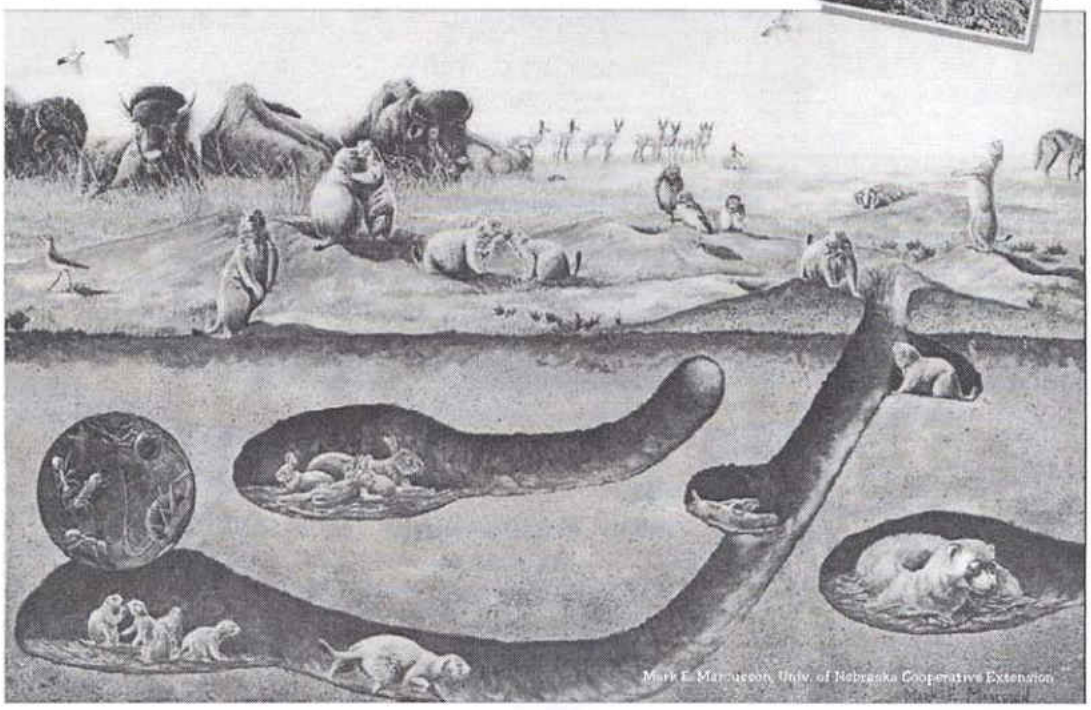
A black-footed ferret carries a miniature radio transmitter around its neck. The radio sends beeping signals that can only be heard with special electronic receiving equipment. By monitoring the signals, scientists can find out more about the lives of these secretive, nocturnal animals.

Luray Parker/Wyoming Game and Fish Department

Sharing the Prairie

An alert black-tailed prairie dog (right) scans for predators such as hawks and coyotes. Prairie dog towns are always guarded by several of these lookout dogs. If the sentry spies a predator, it gives a high-pitched bark to warn other members of the colony. The name *prairie dog* comes from this barking alarm call.

Many other animals depend on prairie dog colonies for food and shelter. (See diagram below.) Ferrets, rabbits, spiders, snakes, mice, and burrowing owls use prairie dogs' tunnels as shelter and a safe place to raise their young. Prairie dogs' constant grass nibbling stimulates new tender growth that attracts plant eaters like bison. New research confirms just how important prairie dogs are to the whole prairie ecosystem.



"A Fighting Chance for Ferrets" by Fiona Sunquist, from *National Geographic WORLD* Magazine's September 1996 issue, text copyright © 1996 by the National Geographic Society.

Now answer Numbers 40 through 45. Base your answers on the article "A Fighting Chance for Ferrets."

40 Prairie dogs and ferrets are ALIKE in that they both

F. bark like dogs.
G. live in shared burrows.
H. have similar markings on their coats.
I. eat grass as the main part of their diet.

41 According to the map on page 35, ferrets

A. will soon outnumber prairie dogs.
B. are experiencing a natural comeback.
C. once lived in all parts of the United States.
D. once were common in the central United States.

42 How are radio transmitters helpful to scientists researching ferrets?

F. The radio signals tell scientists what ferrets are eating.
G. The radio signals inform scientists about new ferret litters.
H. By listening to signals from the transmitters, scientists can track ferrets' movements at any time.
I. By monitoring signals from the transmitters, scientists can tell what environmental dangers ferrets face.

43 Which statement about ferrets is LEAST accurate?

A. Ranchers often attempt to destroy ferrets and their habitats.
B. Hundreds of acres are necessary to support a ferret population.
C. Wild-born ferrets are vital to maintaining the prairie ecosystem.
D. Human-raised ferrets are able to adjust quickly to living in the wild.

44 Read this sentence.

An alert black-tailed prairie dog scans for predators such as hawks and coyotes.

Predators are animals that

F. are desert dwellers.
G. hunt particular species.
H. are larger than their prey.
I. live near prairie dog towns.

45 What is the purpose of the large illustration on page 36?

A. to emphasize the size of prairie dog colonies
B. to explain how prairie dogs build their tunnels
C. to describe the ways prairie dogs guard their colonies
D. to show how other animals can use prairie dogs' tunnels

APPENDIX G: READING RESPONSE WORKSHEET

Name:_____

Chapter or Book title: _____

Reciprocal Teaching Worksheet

http://www.itrc.ucf.edu/forpd/

Prediction: Before you begin to read the selection, look at the title or cover, scan the pages to read the major headings, and look at any illustrations. Write down your prediction(s).	
Prediction:	**Support:**
Main Ideas: As you finish reading each paragraph or key section of text, identify the main idea of that paragraph or section.	**Questions:** For each main idea listed, write down at least one question.
Main Idea 1: _____	**Question 1:** _____
Main Idea 2: _____	**Question 2:** _____
Main Idea 3: _____	**Question 3:** _____
Main Idea 4: _____	**Question 4:** _____
Main Idea 5: _____	**Question 5:** _____
Summarize: Write a brief summary of what you read.	
Clarify: Copy down words, phrases, or sentences in the passage that are unclear. Then explain how you clarified your understanding.	
Word or Phrase:	**Clarify:**

APPENDIX H: TROPICAL HERPEFAUNA PASSAGE

Tropical Herpefauna... Tropical What?

by Lori Bruckeim

Herpefauna (commonly referred to as herps) is the collective name given to reptiles and amphibians. Perhaps because of scary rumors or just plain curiosity, these creatures fascinate most people. When we explore the world of tropical herps, we find that individual species possess unusual survival adaptations.

Did you ever think that a frog could eat other frogs or mice? The Brazilian horned frog (or Ornate horned Frog) has a huge mouth which accommodates its large-sized diet of small rats or mice, and has earned the nickname, "Pac Man." This frog quickly grabs any potential prey that passes by, kills it immediately with its powerful jaws, and then swallows it.

The Green and Black Dart-Poison frog is another interesting frog found in South America. These small, colorful frogs actually hatch their eggs inside bromeliads. Their skin contains numerous glands which secrete poisonous substances, and its vivid coloration serves as a warning to potential predators. So powerful is this poison that Indians use it on their arrows to hunt prey.

Tropical rain forests are also home to a variety of diverse and unique reptiles. Many use their camouflage coloration to assist in avoiding predators and acquiring prey. The emerald tree boa, found in the Amazon, is bright green with numerous white crossbands on its back and a yellow belly. This adaptive coloration enables the snake to hide in the trees. Once the boa has seized its prey (mainly birds and lizards), it constricts using its powerful muscles.

Chameleons, which are found in India, Africa, and Madagascar, have several unique characteristics including: prehensile tails; gripping toes; independently movable eyes; long, fast, sticky tongues; and the ability to camouflage when necessary. These adaptive traits enable these lizards to be successful in their own environments.

As tropical habitats dwindle at an increasingly rapid rate, herps struggle for survival. We can help them through knowledgeable conservation efforts.

APPENDIX I: STRATEGY PACKETS

PREDICTING

- Just as a meteorologist predicts the weather, it is important for you to learn to predict when you are reading.
- Predicting means telling what you believe will come next.
- We can predict using several clues in the text.

CLUE - Predicting from a Title: Our textbook is divided into books, chapters, and sections. We will be working in Book C (Cells and Heredity) for this activity.

The title of chapter one in book C is Cell structure and function. Based on that title, what do you predict the entire chapter will be about? _____

_____

_____

_____

Look at the title of section one, on page 16 of book C: **"Discovering Cells"**

1. What are some predictions you can make about what we will read in this section?

_____

_____

_____

_____

2. Now think about what you already know about cells and predict what the author might discuss. _____

_____

_____

_____

Look at the title of section two on page 23 of book C: **"Looking Inside Cells"**

3, What do you predict this section will be about (you should already be asking yourself what you already know about the topic). _____

_____

_____

_____

Now you should try it on your own. Look at the following titles of sections three and four and predict what that section of text will be about:

"Chemical Compounds in Cells" on page 33 of Book C

4. Based on what you already know or would like to know, what do you predict will be in this section of text?

_____

_____

_____

_____

5. What support do you have do backup your prediction? _____

"The Cell in Its Environment" on page 40 of Book C

6. I predict this section will be about _____

7. The reason I think this is because _____

CLUE - Predicting from Headings: Each section in each chapter has headings and subheadings. Headings are printed in teal and subheadings are printed in purple in our books.

- Individual headings give you an idea of what that section of text will be about and subheadings group that information.
- Predicting from headings is similar to predicting from titles.
- If you use both the title and headings, you can make more accurate predictions about what we will be reading.

Look at the heading **"First Sighting of Cells"** on page 17 of book C.

8. Since we know it is under the title "Discovering Cells," what would be a good prediction about what is written in this section? _____

Look at the subheading **"Robert Hooke"** on page 17 of book C.

9. Since we know it is under the heading of "First Sighting of Cells" which is under the title "Discovering Cells," what kind of information do you predict we will read about in this section?

Look at subheading **"Anton van Leeuwenhoek"** (Lay vun hook) on page 18 of book C.

10. This also falls under the heading of "First Sighting of Cells." Predict what information will be included in this section: _____

11. Predict what the section of text under the heading "The Cell Theory" (page 20, book C) will be about and give support for your prediction: _____
_____
_____
_____
_____

12. Predict what information will be included under the heading "How a Light Microscope Works" (page 21, book C). _____
_____

13. What support do you have to make this prediction? _____
_____
_____
_____

CLUE – Predicting from the Text: We can use the structure of the text to make predictions.

- Use pictures, captions, and graphics to predict what we will read about.
- Use the actual text to make predictions about what will next AND to determine if your prediction was correct or not.

14. I am going to read the first three paragraphs of section two, "Looking Inside Cells" (page 23, book C), to you. In the space below, list things that I did or said as I made my predictions. Also pay attention to the parts of the text I used to make my predictions.

- You have learned that you can make predictions after reading the title, by using headings, by thinking about questions that an author asks, and by using information in the text.
- You have also learned that you combine the information the author gives you with what you already know to make predictions.
- When we check or confirm our predictions, we know we are *really* paying attention to what the author is saying.

QUESTIONING

- Questions are a big part of being in a classroom. Besides classroom discussions, what are some other occasions or situations in school when questions are important?

- There are several reasons why it's important to learn to ask good questions as we read:
    - Asking questions is a good way to check ourselves to make sure we have understood the material we have read.
    - Asking questions helps us focus on important information in a passage.
    - Asking questions can even help us prepare for taking tests.

- What are some of the words that we use to begin sentences that are questioning sentences?

- Let's practice using question words by asking questions about some sentences. For the first four sentences, you will be given a questions word. In the second group of four sentences you will be thinking of your own question words to use (try to use a different question word for each sentence).

1. For the first sentence ask a question about the information in this sentence that begins with the word 'what.' **Cells are the basic unit of structure and function in living things.**

QUESTION: _____

2. Ask a question about the next sentence that begins with the word 'why.' **No matter how hard you look with your eyes alone, you won't be able to see individual skin cells because cells are very small.**

QUESTION: _____

3. Ask a question about the next sentence that begins with the word 'when.' **The invention of the microscope made it possible for people to discover and learn about cells.**

QUESTION: _____

4. Ask a question about the next sentence that begins with the word 'how.' **In 1663, Hooke observed the structure of a thin slice of cork using a compound microscope he had built himself.**

QUESTION: _____

5. **A microscope is an instrument that makes small objects look larger. Some microscopes do this by using lenses to focus light.**

QUESTION: _____

6. **A simple microscope contains only one lens. A light microscope that has more than one lens is called a compound microscope.**

QUESTION: _____

7. **At about the same time that Robert Hooke made his discovery, Anton van Leeuwenhoek (Lay vun hook) also began to observe tiny objects with microscopes.**

QUESTION: _____

8. **Leeuwenhoek looked at many other specimens, including scrapings from teeth. When Leeuwenhoek looked at the scrapings, he became the first person to see the tiny single-celled organisms that are now called bacteria.**

QUESTION: _____

- Now that you can write questions using question words, we are going to look at different types of questions.
- Read the paragraph below and then look at the questions that are listed under the paragraph:

Over the years, scientists have continued to use and improve the microscope. They had discovered that all kinds of living things were made up of cells. In 1838 a German scientist names Matthais Schleiden (SHLY dun) concluded that all plants are made of cells. He based this conclusion on his own research and on the research of others before him. The next year, another German scientist, Theodor Schwann, concluded that all animals are also made up of cells. Thus, stated Schwann, all living things are made up of cells.

A. **Who were Schleiden and Schwann?**
B. **How did improvements in the microscope help scientists?**
C. **What did Schleiden discover about plants?**
D. **How did Schleiden's discovery help Schwann's statement that all living things are made of cells?**
E. **What other scientists contributed to Schwann's theory?**

9. How are questions (a) and (b) similar or different? _____
_____
_____

10. How is question (c) similar or different to questions (a) and (b)? _____
_____
_____

11. How is question (d) similar or different to the other questions? _____
_____
_____

12. How is question (e) similar or different to the other questions? _____
_____
_____

- You should now know that there are different types of questions. Some questions ask for facts that are obvious in the reading, some questions ask for the main idea of the passage, some questions have an answer that can be *inferred* by combining the answers to other questions, and some questions cannot be answered without further research. Those types of questions are not helpful in checking our understanding of what we read.

- Read the paragraph below and then look at the questions below it:

  Schleiden and Schwann had made an important discovery about living things. However, they didn't understand where cells came from. Until their time, most people thought that living things could come from nonliving matter. In 1855, a German doctor, Rudolf Virchow (Fur koh) proposed that new cells are formed only from existing cells. "All cells come from cells," wrote Virchow.

  A. Before 1855, where did most people things living things came from?
  B. How did Virchow prove that "all cells come from cells"?
  C. What did Virchow add to the existing theories about cells?

13. Put an X next to the question that focuses on the main idea of the paragraph and explain why you chose that question and not the other two: _____
_____
_____

- Read the paragraph below and look at the questions below it:

  The observations and conclusions of Hooke, Leeuwenhoek, Schleiden, Schwann, Virchow, and others led to the development of the *cell theory*. The cell theory is a widely accepted explanation of the relationship between cells and living things. The cell theory states: 1) all living things are composed of cells, 2) cells are the basic unit of structure and function in living things, and 3) all cells are produced from other cells.

  A. What is the cell theory?
  B. Who created the cell theory?
  C. What experiments were done to prove the cell theory?

14. Put an X next to the question that focuses on the main idea of the paragraph and explain why you chose that question and not the other two: _____
_____
_____

- Now that you're able to identify questions that are better to ask in order to check understanding of the main point, you're ready to try asking your own questions.

15. First, read the paragraph below. Then decide what the paragraph is mainly about. Finally, write a question that checks for understanding of the most important point or idea in the paragraph:

The cell theory holds true for all living things, no matter how big or how small. Since cells are common to all living things, they can provide information about all life. Because all cells come from other cells, scientists can study cells to learn about growth, reproduction, and all other functions that living things perform.

MAIN IDEA: _____

QUESTION: _____

16. Let's try it again. Read the paragraph below. Then identify the main idea of the paragraph and write a question that checks for understanding of the main idea.

Microscopes use lenses to make small objects look larger. But simply enlarging a small object is not useful unless you can see the details clearly. For a microscope to be useful to a scientist, it must combine two important properties – magnification and resolution.

MAIN IDEA: _____

QUESTION: _____

- So far we have practiced writing questions that check for understanding of the main idea in the passage we read. Now we are going to reread the paragraphs and look at another type of question.
- Questions about facts that support the main idea also help us check for understanding as we read a passage.

17. Reread the paragraph above question #9. Write the main idea below. Put a + next to the question(s) that ask about specific facts that support the main idea. Finally, give your reasons for choosing that question(s).

MAIN IDEA: _____

REASONS: _____

_____

18. Reread the paragraph above question #13. Write the main idea below. Put a + next to the question(s) that ask about specific facts that support the main idea. Finally, give your reasons for choosing that question(s).

MAIN IDEA: _____

REASONS: _____

_____

19. Reread the paragraph above question #14. Write the main idea below. Put a + next to the question(s) that ask about specific facts that support the main idea. Finally, give your reasons for choosing that question(s).

MAIN IDEA: _____

REASONS: _____
_____

- Now you are going to try to write questions about facts in a passage that support the main idea. Read each passage and first identify the main idea in that passage. Then write a question that asks about a specific fact that supports the main idea.

20. Read silently the first paragraph under the subheading "magnification" on page 21 of book C as I read aloud. Identify the main idea and then write a question about a specific fact that supports the main idea.

MAIN IDEA: _____

QUESTION: _____

21. Read silently the second paragraph under the subheading "magnification" on page 21 of book C as I read aloud. Identify the main idea and then write a question about a specific fact that supports the main idea.

MAIN IDEA: _____

QUESTION: _____

- We are now going to practice identifying the kinds of questions we have been talking about today.
- Read the paragraphs under the subheading "Resolution" on page 22 of book C.
- After you have read the paragraph write the main idea below and then read the questions below. Put an X by the question that checks for understanding of the main idea. Put a + by the question(s) that ask to check understanding of important facts that support the main idea. Finally, put a – next to the question(s) that you would NOT ask in order to check for understanding.
  - **A. What is resolution?**
  - **B. Why is good resolution important for scientists who study cells under a microscope?**
  - **C. Why is good resolution not needed when reading the newspaper?**
  - **D. Why do dots appear when an image from the newspaper is viewed under a microscope?**
- Now try writing your own questions. Read the passage under the heading "Electron Microscopes" on page 22 of book C. Then write the main idea, one question checking for understanding of the main idea, and one question about a specific fact that supports the main idea.

MAIN IDEA: _____
MAIN IDEA QUESTION: _____
FACT QUESTION: _____

Summarizing

- What is a summary? _____
- When is an example, other than in class, of a time that you have had to summarize something? _____
- Summarizing helps us check if we understood what we read. If we have trouble summarizing, then we know we need to reread the information.
- There are some steps to follow when we summarize:
    1. **Identify the topic**
    2. **Leave out unimportant information**

RULE 1: Identify the topic – we identify what the text is mostly about

1. Read the two paragraphs under the heading "Cell Wall" on page 24 of book C.

TOPIC: _____

RULE 2: Leave out unimportant information – sometimes an author includes information to describe an idea more clearly or will repeat the same information in different words. However the information is unimportant because we would still be able to understand the main point without it.

2. Look at the two paragraphs under the heading "Cell Wall" again. What is the most important information in these paragraphs? _____
_____
_____

3. What information could we leave out of our summary? _____
_____
_____
_____

4. What would be a good summary of this passage? _____
_____
_____
_____
_____

- Just a note...sometimes paragraphs can have more than one point and several items that are important...so be on the look out for those!

- Let's try this again...Read the paragraphs under the heading "Cell Membrane" on pages 24 and 25 of book C.

5. TOPIC: _____

6. What is the most important information in this passage? _____
_____
_____

7. What information do we not need to include in our summary? _____

_____

_____

8. What would be a good summary of this passage? _____

_____

_____

_____

_____

- One more time...Read the paragraph under the heading "Organelles in the Cytoplasm" on page 28 of book C.

9. TOPIC: _____

10. What is the most important information in this passage? _____

_____

_____

11. What information do we not need to include in our summary? _____

_____

_____

12. What would be a good summary of this passage? _____

_____

_____

_____

_____

- On your own paper summarize the following passages using the rules we just learned:

13. Read all the text under the heading "Nucleus" including "Nuclear Membrane," "Chromatin," and "Nucleolus" on pages 25 and 28 of book C. **REMEMBER that a selection of text may have more than one main point or topic sentence and to include the <u>most</u> important information in your summary!**

14. Read about mitochondria on page 28 and summarize.

15. Read about endoplasmic reticulum on page 29 and summarize.

16. Read about ribosomes on page 29 and summarize.

17. Read about Golgi bodies on page 29 and summarize.

18. Read about chloroplasts on page 29 and summarize.

19. Read about vacuoles on page 30 and summarize.

20. Read about lysosomes on page 30 and summarize.

21. Read about bacterial cells on page 30 and summarize.

Clarifying

- Clarifying makes you pay attention to what you DON'T understand when you read
- Clarifying needs to be done WHILE you are reading…immediately clarify a word or idea when you don't understand it.
- Think of clarifying as problem solving for reading
- There are four strategies to figuring out the meaning to words:
    1. Look for little words inside big words
    2. Look for base or root words, prefixes, and/or suffixes
    3. Look for a comma following an unfamiliar word. Sometimes the author will give the definition after a comma.
    4. Keep reading to see if you can get a sense of the meaning.
- If you don't understand ideas in the reading, try these fix-up strategies:
    1. Stop and think about what you have already read.
    2. Reread.
    3. Adjust your reading rate: slow down or speed up.
    4. Try and connect the text to something you read in another book, what you know about the world, or to something you have experienced.
    5. Visualize.
    6. Reflect on what you have read.
    7. Use print conventions (key words, bold print, italicized words, and punctuation).
    8. Notice patterns in the text structure.

- **ASSIGNMENT: Make a book mark that you can use to help you clarify words and ideas that you have trouble understanding.**

APPENDIX J: STUDENT WORK

Reciprocal Teaching Worksheet

http://www.itrc.ucf.edu/forpd/

Prediction: Before you begin to read the selection, look at the title or cover, scan the pages to read the major headings, and look at any illustrations. Write down your prediction(s).	
Prediction: I think this story will be about rainforest animals or island animals, and what they are.	**Support:** The title.
Main Ideas: As you finish reading each paragraph or key section of text, identify the main idea of that paragraph or section.	**Questions:** For each main idea listed, write down at least one question.
Main Idea 1: what the story is going to be about.	**Question 1:** What does Herpefauna commonly refered as?
Main Idea 2: How the Brazilian horn Frog kills his prey!	**Question 2:** The Brazilian Frogs has another name. What is it?
Main Idea 3: How the Green & Black Poison-Frog kills their prey.	**Question 3:** Where do the frogs lay their eggs.
Main Idea 4: Diffrent reptiles in the rainforest.	**Question 4:** Name one reptile in the rainforest.
Main Idea 5: Talking about the Chameleons.	**Question 5:** What are some characteristics the lizard has?
Summarize: Write a brief summary of what you read. What kind of frogs are in the rain forest & reptiles. How they stay alive & eat.	
Clarify: Copy down words, phrases, or sentences in the passage that are unclear. Then explain how you clarified your understanding.	
Word or Phrase:	**Clarify:**

Nar _____

Cha _____

Reciprocal Teaching Worksheet

on the back

FORPD
http://www.itrc.ucf.edu/forpd/

Prediction: Before you begin to read the selection, look at the title or cover, scan the pages to read the major headings, and look at any illustrations. Write down your prediction(s).	
Prediction: I think it will be about tropical herpefauna.	**Support:** It says "Tropical Herpefauna" in the title.
Main Ideas: As you finish reading each paragraph or key section of text, identify the main idea of that paragraph or section.	**Questions:** For each main idea listed, write down at least one question.
Main Idea 1: what tropical herpafauna is.	**Question 1:** Why do they use such a big word?
Main Idea 2: It tells about a frog that eats other frogs and mice.	**Question 2:** How could it eat something that's the same size.
Main Idea 3: A frog that has deadly poison.	**Question 3:** How can such a small thing be so deadly?
Main Idea 4: It tells about a snake that uses camoflaugt to get their prey.	**Question 4:** How does the reptile adapt?
Main Idea 5: It tells about the traits of a chameleon.	**Question 5:** How did it get/or learn all of the traits?
Summarize: Write a brief summary of what you read. This story tells about reptiles, and what they do to survive.	
Clarify: Copy down words, phrases, or sentences in the passage that are unclear. Then explain how you clarified your understanding.	
Word or Phrase: Tropical herpefaura.	**Clarify:** Read words after that, and figured out the words.

Reciprocal Teaching Worksheet

http://www.itrc.ucf.edu/forpd/

Prediction: Before you begin to read the selection, look at the title or cover, scan the pages to read the major headings, and look at any illustrations. Write down your prediction(s).

Prediction: I think punnet squares are boxes that will help you understand...	**Support:** captions, pictures

Main Ideas: As you finish reading each paragraph or key section of text, identify the main idea of that paragraph or section.	**Questions:** For each main idea listed, write down at least one question.
Main Idea 1: What punnet squares and what they do.	**Question 1:** What are punnet squares? Tools that help you understand laws of probability
Main Idea 2: How you can use punnet squares and what they are made of.	**Question 2:** What can you use a punnet square for? To calculate the probability of offspring
Main Idea 3: How you predict punnet squares probabilities.	**Question 3:** If two guinea pigs with the alleles Bb are crossed what the probability that an offspring will have white fur?
Main Idea 4:	**Question 4:**
Main Idea 5:	**Question 5:**

Summarize: Write a brief summary of what you read.

punnet squares are tools that help you understand probabilities of an offspring. You can use punnet squares to calculate also.

Clarify: Copy down words, phrases, or sentences in the passage that are unclear. Then explain how you clarified your understanding.

Word or Phrase: I didn't understand the part of the guinea pigs	**Clarify:**

c.90-91 read
c.92-93 read

Reciprocal Teaching Worksheet

http://www.itrc.ucf.edu/forpd/

Prediction: Before you begin to read the selection, look at the title or cover, scan the pages to read the major headings, and look at any illustrations. Write down your prediction(s).

Prediction:	**Support:**
I think it will be about Punnett squares and how we use the Punnett squares.	→ there is capture of punnett square and I saw the sub titles.
I think it will be about Phenotype, genotype, Codominance what is that and what do they do.	→ there is a chart of these and I saw sub title.

Main Ideas: As you finish reading each paragraph or key section of text, identify the main idea of that paragraph or section.	**Questions:** For each main idea listed, write down at least one question.
Main Idea 1: A punnett square is a chart that shows all the combinations of alleles that can result from a genetic cross	**Question 1:** What is punnett square?
Main Idea 2: a phenotype is physical appearance, or its visible traits.	**Question 2:** what is phenotype?
Main Idea 3: Genotype is its genetic make up, or allele combination.	**Question 3:** What is genotype?
Main Idea 4: Codominance is the alleles are neither dominant nor ressive.	**Question 4:** what is Codominance?
Main Idea 5:	**Question 5:**

Summarize: Write a brief summary of what you read.

I Learn that the Punnett square is a chart shows all the possible combination. And the genotype is like (TT, Tt, tt) and Phenotype is (Tall, Tall, short)

Clarify: Copy down words, phrases, or sentences in the passage that are unclear. Then explain how you clarified your understanding.

Word or Phrase:	**Clarify:**
Inheritance	Inheritance - influence
pinkish	Pinkish - Color of light pink
roan	roan - brown, white, a gray animal.

APPENDIX K: THE FIFTEEN KEY ELEMENTS OF EFFECTIVE ADOLESCENT LITERACY PROGRAMS

Table 1. Key Elements in Programs Designed to Improve Adolescent Literacy Achievement in Middle and High Schools

Instructional Improvements	Infrastructure Improvements
1. Direct, explicit comprehension instruction	10. Extended time for literacy
2. Effective instructional principles embedded in content	11. Professional development
3. Motivation and self-directed learning	12. Ongoing summative assessment of students and programs
4. Text-based collaborative learning	13. Teacher teams
5. Strategic tutoring	14. Leadership
6. Diverse texts	15. A comprehensive and coordinated literacy program
7. Intensive writing	
8. A technology component	
9. Ongoing formative assessment of students	

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