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# Close Reading Strategies & Reading Comprehension

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Capstone Project: Close Reading Strategies and Reading Comprehension

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Professor Lee Ann Townsend

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### **Abstract**

One large area of reading struggle for many students is reading comprehension. With the implementation of the Common Core State Standards comes an increase in complex texts in classrooms and the skills needed to successfully be able to read and comprehend such texts. Students need to be able to peel back the layers of the complex texts they are responsible for reading so they can reach the underlying meaning. In other words, students are being asked to close read. Due to close readings emphasis on breaking down texts to reach meaning, teachers are teaching some close reading strategies to their students. This study focuses on the close reading strategy of text coding. Text coding allows students to track their thinking and leave notes, or codes, as they read a given text. With teachers being responsible for helping students to become college and career ready, they will need strategies to pull from to help their students successfully comprehend complex texts. This study takes a look at how effective the strategy of text coding is in doing so.

## Chapter 1

### *Introduction*

Reading, in general, is one of the most important skills that students will encounter in school, and it is a skill that is not unimportant when students leave a classroom (Bharuthram, 2012). The ability to just decipher words, however, is not enough to truly comprehend what is being read. Students need to be able to “learn how to recognize or decipher words from print, and they also need to learn how to comprehend the message that words convey” (Nation, Cocksey, Taylor, & Bishop, 2010). Students are exposed to having to read both in and out of the classroom on a daily basis; they may read words in books or magazines, they may read captions on video games or recipes, but what good does it do them if they cannot make sense of the words they are reading? Reading comprehension is a critical factor affecting the success of students (Karasakaloğlu, 2012).

One step teachers can take to increase students’ reading comprehension skills is through reading comprehension strategies, or “cognitive tools which can enhance the student's academic performance in the situations when the process of comprehension gets harder and harder” (Karasakaloğlu, 2012). Especially now with the implementation of the Common Core Standards in classrooms, students are expected to be able to read and comprehend more complex texts. One method that is being used to help students engage successfully with complex texts is close reading. Close reading can be broadly defined as “a focused rereading of a text in which you go beyond a basic understanding of the text” (Dalton, 2013). One strategy of close reading that can be used in classrooms is text coding. Text coding is what this study is focused around. The data collected from this study will be beneficial for future educational professionals to determine if

text coding is an effective close reading strategy for student reading comprehension improvement.

### ***Problem Statement***

The task of reading comprehension is not something that comes easy to every student, many students struggle with this skill, especially with academic texts (Cromley & Azevedo, 2007). With the Common Core state standards being implemented into classrooms, comes an increase for students being responsible for reading and comprehending more complex texts (Peery, 2013). These standards stem from “the observation that many students emerging from the K-12 world are not ready to engage with complex text of the kind they must work with in college” (Snow & O’Connor, 2014). It is the responsibility of the teacher to be able to successfully teach their students and help them to achieve this more complex and in-depth comprehension of academic texts. This can be a difficult task to accomplish with the various needs of individual students that need to be met. Nonetheless, teachers need to find a way to meet individual needs and still provide good quality instruction that meets the standards.

Close reading is one take on tackling this emphasis on complex texts. The goal of close reading is to help students learn from complex texts independently, to enhance their college and career readiness by more carefully examining the language the author is using, and by focusing questions on information presented in the text itself versus information from outside sources (Snow & O’Connor, 2014). Text coding is one close reading strategy teachers can use in their classrooms to try and accomplish this goal. According to Pryor & Cox (2009) text coding is a way students can remember what they believe is important, focus on their thoughts and what they are reading, and text coding can help them quickly identify places they both comprehend and places where they have questions and ideas for inquiry.

### *Significance of the Problem*

“By third grade, most children who have not learned to wield comprehension processes enjoyably and profitably will have fallen so far below their peers that they will never regain their lost ground, even if they have decoding skills that are on grade level” (Geary, 2006). This statement exhibits why being able to decode words is not enough, students need to be able to comprehend what they are reading, it is a necessity for success both in and out of the classroom. Unfortunately, millions of students struggle with reading comprehension and as a result these students risk both school and workplace failure (Geary, 2006). Ultimately, the goal of every teacher should be to meet the needs of their students. If their students are struggling in the area of reading comprehension then teachers need to find ways to help their students learn, practice, and apply reading comprehension skills.

In regard to the Common Core State Standards, they are here to stay and teachers are responsible for meeting these standards with the instruction in their classrooms. It is true that the standards have increased the rigor of reading material and expectations of reading comprehension achievement for students, but that is what makes it even more imperative to have solid and effective reading comprehension instruction (Peery, 2013). This study takes a look at the close reading instruction method and the benefits it can have on student reading success when implemented appropriately into classroom instruction. More specifically, this study looks at one specific strategy of close reading, text coding. “It is evident that text coding can be a very beneficial tool for students as they become proficient at making connections with what they read” (Pryor & Cox, 2009). Text coding can not only be used to help students comprehend what they read, but text coding can help students take notes and help them with future inquiry (Pryor

& Cox, 2009). This study can help determine if text coding is an effective strategy to help improve the reading comprehension of students that teachers can add to their strategy tool box.

### ***Purpose of the Study***

There are many methods and practices that exist in education today that claim to help improve reading comprehension abilities of students. It can be overwhelming searching through various research trying to find a practice or strategy suitable for your students. Also, there is not always time for trials in the classroom to see if a strategy or technique is effective. This study has a very narrow focus of one strategy of one method. The information this study provides is concrete evidence of whether text coding is an effective strategy that can be used in a classroom to help improve the reading comprehension abilities of students in regard to academic texts.

### ***Background to the Study/Personal Rationale for this Study***

Reading comprehension is a skill that students need throughout all grade levels, and this skill is not unimportant when students leave school (Bharuthram, 2012). Students will continue to use the skill of reading comprehension in their daily lives. As important as this skill is, however, it does not come easy to many students. There are some factors that contribute and play a role in the struggle of reading comprehension abilities and it is important for teachers to keep these factors in mind. Some contributing factors that exist are; more focus on testing versus content learning, the classroom discourse between teachers and students, teachers not having the appropriate training and experiences for a given technique or strategy being taught, lack of research based teaching practices being used in the classroom, and outside factors such as parent education and school involvement (Doyle & Zhang, 2011; Nystrand, 2006; Scharlach, 2008). It can be easy for teachers to want to live in a bubble where their classroom is not affected by

anything but what goes on inside the classroom during the day. The reality of the situation, however, is that there are outside factors that can contribute to student struggle and behavior. I work in an urban school district and I see the affect some of these factors have on students. As teachers, it is our responsibility to take these factors as they are, accept them, and find ways to still successfully reach each individual student. It is important for teachers to be aware of what resources exist for them to use and what methods and strategies they can implement into their instruction. This study provides evidence of the effectiveness of one strategy that can help improve students' abilities in the very crucial skill of reading comprehension.

### ***Study Approach (Conceptual Framework, Methodology and Design)***

For this study I used a qualitative study approach. According to Clark & Creswell (2015) qualitative research “is a type of research in which the researcher studies a problem that calls for an exploration of a phenomenon; relies on the views of participants; asks broad, general questions; collects data consisting largely of words (or text) from participants; describes and analyzes these words for themes; and conducts the inquiry in a subjective and reflexive manner.” This research study falls right into the qualitative research design. The study is based off of broad general questions, heavily relies on the participant, and will be presented in a subjective manner. Qualitative research, though, can be looked at as an umbrella term which has various research designs that fall under it. This research study is a qualitative research design, but more specifically, this research study fits the single subject design.

The single subject's design intent is to “test the effect of one or more treatment conditions on one or a few individual participants” (Clark & Creswell, 2015). For the case of this research study there is only one participant being used. The treatment condition being looked at is the strategy of text coding and its effect on a student's reading comprehension



abilities. There are some key procedures that need to be kept in mind when conducting a single subject study. For starters, the administration should only be to one or a few participants, this study has one participant. Also, the data should be repeatedly measured and graphed before, during, and after the intervention (Clark & Creswell, 2015). Text coding is the only strategy being looked at in this study. Each session the participant will be practicing the use of this strategy and the participant's work will be collected and analyzed for the effect text coding has on their reading comprehension. This analyzed information will be continuous over the course of the research study.

I believe that through the use of a single study research design I will be able to provide all the attention and focus needed to really determine whether text coding is an effective strategy that can be used to help improve student reading comprehension abilities.

### ***Summary***

Being an educator with the goal of becoming a reading specialist reading comprehension is high on my list of skills that I feel are crucial for students to master in order for them to be successful in all aspects of their life. I am aware that there are various factors that can affect students' academic performance in school, regardless though, I still need to be able to reach all students and meet their needs. With reading comprehension being a common skill that many students struggle with it is even more important for teachers to be aware of the practices and strategies that exist that can be implemented into classroom instruction. Studies show that through the teaching and use of good strategies there will be an improvement in student reading comprehension skills (Yu-Fen, 2006). What is great about strategies is that they do not come with a "one size fits all" mentality that some other teaching practices may do. Given the opportunities to learn, practice, and apply appropriate strategies students may become more

aware and conscious about their own leaning style, they may be more productive in their learning, and the independence in academic activities is likely to increase because they are not so dependent on others anymore because they have tools that work for them to help them (Karasakaloğlu, 2012). This is an important study because it looks closely at one strategy, text coding, which may be effective for many students to help them increase their reading comprehension abilities and increase their learning independence.

## **Chapter 2: Literature Review**

The supporting research for this study came from various sources and covered different topics. The main focus of this research study is the close reading strategy of text coding. However, to understand the importance of this study it needs to be understood why reading comprehension is such an important skill for students to master. The factors affecting students reading comprehension also need light shed on them. The Common Core Standards also need consideration due to their impact on current instructional practices. The sources and articles that follow have been broken down into these themes as to better portray what information each source or article exhibits and why that information is important for this research study.

### ***Research***

Clark & Creswell's, Understanding Research: A Consumer's Guide, is not a source that provides information relating to close reading or text coding, instead it provides important information surrounding how to conduct a research study. "By developing your skills for understanding research, you will open up resources and knowledge that can help you become better informed about topics important to you personally and professionally" (Clark & Creswell, 2015). Conducting a successful research study is dependent on one's knowledge of the

important factors of conducting research. Learning about conducting proper research is also important for one's professional career. "By learning how research is done, you can better recognize and evaluate the information that researchers include in their reports" (Clark & Creswell, 2015). Teachers are life-long learners. Yes they have their professional degrees, but just because they are no longer in a college classroom does not mean their learning stops. It is important for teachers to be aware and keep up with the new teaching practices as they are changing daily. Students as well are always different and teachers need to be prepared to meet the needs of each individual student. This source provides the necessary information for teachers and how to read and comprehend different research studies.

### ***Importance of Reading Comprehension***

Bringing the focus back to the topic of study, reading comprehension, it is important to understand why reading comprehension is such an important skill for students to master. According to Karasakaloğlu (2012) "Reading comprehension [is a] critical factor affecting the success of the student." Again, it is not enough to simply decode text a reader must comprehend the text. Nation, Cocksey, Taylor, & Bishop (2010) emphasize "poor comprehenders have difficulty comprehending connected text, despite having age appropriate levels of reading accuracy and fluency." As for when reading comprehension is important, it is not just inside the classroom, but outside of the classroom as well, students are faced with having to comprehend what they are reading from books to video game captions. Geary (2006) mentions, "the demand for literacy skills is high and getting higher. The U.S. economy today demands a universally higher level of literacy achievement than at any other time in history, and the demand for a literate populace will increase in the future." The future brought the Common Core Standards and they have increased the rigor of reading comprehension expectations for students. Reading

comprehension, however, does not come easy to every student, especially in regard to academic texts (Cromley & Azevedo, 2007). With this increased rigor of instruction, does not mean reading comprehension is any less important. In fact it is even more crucial for teachers to understand what factors are contributing to struggles in reading comprehension so they can counter act them.

### ***Factors Affecting Reading Comprehension***

There has to be a reason why 24% of fourth graders and 29% of eighth graders could meet criteria for proficient reading, but less than 7% of fourth, eighth, and twelfth graders could critically analyze, comprehend, or apply information acquired by reading text (Pilonieta, 2010). Geary (2006) goes on to say, “By third grade, most children who have not learned to wield comprehension processes enjoyably and profitably will have fallen so far below their peers that they will never regain their lost ground, even if they have decoding skills that are on grade level.” Not for all cases of students who struggle with reading comprehension, but for many, there are contributing factors for this struggle and they are important for teachers to understand.

One reason looked at for why students struggle with reading comprehension is the lack of evidence-based pedagogy (Nystrand, 2006). According to Martin Nystrand from the University of Wisconsin-Madison (2006), there is a “folk wisdom” of education that is based on the experience of human beings over time passing information on from one generation to the next. This folk wisdom allows unsystematic techniques and does not demand scientific knowledge of mechanisms of learning or organizational principles (Nystrand, 2006). In other words, this educational teaching is not based on any proven scientific research but rather on what teachers have been doing in the past, regardless of its effectiveness; and times have certainly changed. This system is fine if what is to be learned is relatively simple, however, if the tasks increase in

complexity the system tends to fail (Nystrand, 2006). What this issue is trying to express is that both researchers and educators, when looking at language and literacy, need to assess what they know and see what is going on with today's students, then they need to make decisions on how best to respond to any challenges that arise. This may mean having to modify or adjust their teaching and techniques.

Classroom discourse has also been looked at in regards to why students struggle with reading comprehension. "To a great extent, the language used by teacher and students in classrooms determines what is learned and how learning takes place" (Nystrand, 2006). This struggle looks at the communication between teachers and students and what makes effective or ineffective communication. "Effective classroom discourse needs to be understood and practiced not as an executed instructional 'treatment' yielding daily measurable achievement gains, but rather, as a medium for instruction" (Nystrand, 2006). This statement is referring to the importance of things not only needing to be taught but they also need to be put into practice. However, this is not the case in all classrooms. More and more there is being seen in classrooms scripted lessons and activities. This tightly scripted teaching, though, is what is hindering the effectiveness of the learning (Nystrand, 2006). When looking at reading comprehension, it is known that it is not enough to just decode words but meaning also has to be taken from the words; this is just like teaching, it is not enough for a teacher to simply teach material, the students need the opportunity to go out and practice what they have learned in order to make meaning and to comprehend the importance of their learning. Scripted lessons often do not allow for deviating from the script, which takes away valuable teaching and learning. It is also well known that not all students learn the same; there are different learning styles that exist.

Therefore, there should be various modes of classroom discourse to reach the different students (Nystrand, 2006).

Backtracking a little now, the skill of word decoding has been commented multiple times on how it is not the only skill needed to be a good reader, creating meaning is what is also highly important; a truth is, though, that before meaning can be created from words a student does need to know how to decode them. Sometimes this becomes an issue when students are reading texts that are on levels not appropriate for them (Lesaux, Lipka, & Siegel, 2006). In this case it may not be an issue of their decoding or comprehension skills, but rather, the level and difficulty of the text they are reading. Other times, however, researchers note that “working memory is critical to the reading process since the reader must decode and/or recognize words while remembering what has already been read, and must then retrieve information such as grapheme-phoneme conversion rules” (Lesaux, et. al., 2006). This issue of working memory also falls under the skill of phonological awareness. Phonological awareness refers to the ability to detect and manipulate sounds of language; it is the awareness of the spoken sounds in language versus the representation of sounds in written language (Sodoro, Allinder, & Rankin-erickson, 2002). There is an important relationship between decoding and comprehension. Students will not be able to create meaning from anything they read if they cannot first decode what they are reading. It is very important, though, to not confuse word decoding and comprehension, while they are both important and related skills, just because a student can decode and read words does not mean that they comprehend what is being read.

Another issue that plays a role in why students struggle with reading comprehension actually falls back on the teacher. It is not uncommon for some teachers to express their concern about their ability to effectively teach all of their students to become successful readers

(Scharlach, 2008). According to some research “[t]he most important thing about reading is comprehension. It is the reason why we read” (Scharlach, 2008). Reading comprehension is a very important skill for students to be able to have and it is a skill that needs help in developing and growing. Regardless, though, “there is still very little comprehension instruction occurring in the classroom on a daily basis” (Scharlach, 2008). The reason behind this is that the teachers themselves struggle with the teaching of different reading comprehension strategies, many times with trying to create purposeful comprehension instruction. Also, reading comprehension programs can often be overwhelming in regards to the time it takes to learn them and requirement for implementation (Scharlach, 2008). There are resources available to help, though, with teachers and their learning and understanding of different comprehension strategies or techniques, which should be taken advantage of. Regardless of what direction teachers or schools choose in improving reading comprehension, this instruction is an “urgent priority” (Scharlach, 2008).

It is not just factors in the classroom, however, that affect a child’s reading comprehension. Parent education, involvement, and home life can also play affecting roles. Studies show “that programs involving parents *can* result in positive effects on children’s language and literacy development” (Doyle & Zhang, 2011). There are many different ways that schools and teachers can involve the parents of their children in their education; there are workshops, home activities and volunteer opportunities, and these are just naming a few. By having parents involved in their child’s education “[c]hildren do not regard school isolated from parents, and gain self-confidence” (Tezel-Sahin, Inal, & Ozbey, 2011). Parent involvement not only allows children to spend valuable time with their parents but they also get to know some members of their peer’s families as well. Then from a teachers’ perspective, having this extra

support and involvement outside of the classroom allows students to have extra practice and support in necessary skills. However, parent involvement is not standard across all schools and families. The recruitment and retention of families, especially families that are considered at risk, continue to be a concern (Doyle & Zhang, 2011). There are different reasons why there seems to be a limited amount of parent involvement. Some of the reasons deal with the parents' insecurity with their level of education and knowledge, and some parents feel it is the school's job to teach their children. Time also becomes an issue with parents not being able to take time away from work, or if children come from single parent homes; then there are also the misconceptions of what it means for parent involvement (Doyle & Zhang, 2011). All of these put aside, though, trying to find ways to involve parents in their child's education can have a positive impact on their success.

### ***Common Core***

The Common Core State Standards play an important role when referring to reading comprehension. With the Common Core state standards being implemented into classrooms, comes an increase for students being responsible for reading and comprehending more complex texts (Peery, 2013). For students who already struggle with reading comprehension this increased rigor of expectations can be daunting. According to Snow & O'Connor (2014) the common core state standards stem from "the observation that many students emerging from the K-12 world are not ready to engage with complex text of the kind they must work with in college." Teachers need to be prepared to meet these increased standards. For students who may be struggling it is even more imperative that teachers have an arsenal of resources and strategies that they can use in their classrooms.



### ***Close Reading***

Close reading is one method of practice that is making its way into many classrooms. Ultimately the goal of close reading is to help students become more independent in their learning and to help them learn from complex texts, which in turn will increase their college and career readiness (Snow & O'Connor, 2014). This is a practice which determines to help students break down a complex text into more manageable pieces so it can be comprehended and internalized. Sisson & Sisson (2014) put it into words stating that close reading deals with “the power of deconstructing text into its constituent parts as a means to come to a deeper understanding and more finely honed interpretation of the text as a whole.” Close reading can be an effective method of reading comprehension practice when it is implemented appropriately into the classroom. Similar to reading, however, close reading is really an umbrella term which encompasses a variety of different strategies that can be used to obtain the goal. One strategy is text coding.

### ***Text Coding***

Before text coding is talked about it is important to understand what a strategy is and why they are beneficial to students. It is known that not all students learn the same, therefore, there needs to be a variety of different strategies that can be chosen from; a variety of strategies that meets the needs of different children. So what is a strategy? One definition states, “reading comprehension strategies are defined as cognitive tools which can enhance the student's academic performance in the situations when the process of comprehension gets harder and harder” (Karasakaloğlu, 2012, pg. 1942). In other words, reading comprehension strategies are conscious, deliberate, and flexible plans that can be adjusted and used in a variety of different ways by the reader to help them attain a certain goal (Pilonieta, 2010, pg. 152). Research has

discovered that “good readers use a variety of strategies while reading. In contrast, poor readers use fewer strategies and are less likely to learn them unless they receive explicit strategy instruction” (Pilonieta, 2010, pg. 152). This why it is important for teachers to teach their students reading comprehension strategies, to provide them with tools they can choose from to help them break down a text to find meaning. It is not enough, however, to simply teach what different reading comprehension strategies are, “students not only need to know what strategies to use, but also when, why, and how to use these strategies appropriately and effectively” (Yu-Fen, 2006, pg. 315).

“Today's students are proficient at communicating in code, but what they don't realize is that they can use these codes to help them improve their skills in content area reading and writing” (Pryor & Cox, 2009). What Pryor & Cox (2009) are referring to are students' use of code in their daily life in activities such as text messaging. If students can make the connection between using codes socially to using them academically they can be used to help increase their reading skills. Text coding “symbols help students to focus on their reading and ‘hang on’ to their thoughts” (Pryor & Cox, 2009). Pryor & Cox (2009) also mention that text codes can help students identify areas of confusion or questions they have and help them take notes and keep their thoughts organized. If taught and use appropriately, “it is evident that text coding can be a very beneficial tool for students as they become proficient at making connections with what they read” (Pryor & Cox, 2009).

This study is focused around the close reading strategy of text coding and whether or not it is an effective strategy that helps to improves students' reading comprehension abilities. It is not as simple, though, to simply look at text coding and call this study complete. It is important to understand why reading comprehension is important so the importance of this study is made

clear. It is also important to know what factors may affect reading comprehension. Before teachers can go about solving a problem they need to understand what the problem is. Teachers also need to keep in mind the effect the common core state standards have on classroom instruction and how instruction may be changing. When all of this information is understood is when the importance of close reading and text coding is made clear. This study looks to shed light on this strategy and its potential benefits to teachers and students.

### **Chapter 3: Study Design**

This study was designed to be a qualitative, single subject research study. The purpose of the study was to look at the effects the strategy of text coding has on a students' reading comprehension. There was one participant for this study. The study took place over a seven week period. Data collection was in the form of a Fountas and Pinnell Baseline Reading Assessment, reading interview, and student work. The researcher also kept a reflection journal after each session. A preliminary exploratory analysis was conducted before analyzing the data. Research was validated by using the methods of bracketing, triangulation, member checking, and auditing.

#### ***Positionality as the Researcher***

I graduated from Keuka College with a degree in Regular and Special Childhood Education. I also have a minor in Spanish and a concentration in American Sign Language. I have since extended my certification Birth-2<sup>nd</sup> Grade Regular and Special Education. I am currently in the process of earning my Master's degree in B-12 Literacy. Ideally my goal for my future career is to be a reading teacher, so reading comprehension is a very important skill high on my list for students to master. I currently work in a public school in an urban setting and I see every day the struggle my students have when it comes to comprehending what they are reading.

I provide 1:1 instruction for my students because I am their teacher assistant. This has allowed me to get to know the strengths and weaknesses of my students very well, in regard to reading skills. Many of my students fall under the category of students who are able to decode words, but cannot make meaning of what they read. Having the goal of earning a Master's in Literacy and becoming a reading specialist, I am always looking for new practices and strategies that I can use with my students. As any teacher knows, each of their students is different and comes with their own strengths and needs. Not every strategy I use with one student will work with another. It is very important for me to be continuously adjusting my practice to meet the needs of my students. I believe this study is important because it provides evidence of working with an actual student, the data presented is not hypothetical. This study can be taken and used by teachers how they see fit to meet the needs of their students. I believe using text coding is one more strategy teachers can add to their tool box of options.

### ***Research Questions***

This study will attempt to answer the following question:

- Is text coding an effective strategy for improving reading comprehension abilities?

### ***Participants and Setting***

This research study required one participant other than myself, the researcher. I worked with one eighth grade student from a class I am a teacher assistant to participate in this study. The student attends a public school in an urban setting. This student does have an Individualized Education Plan (IEP). The selection of this student was based on a purposeful sample from the classroom in which I work. I consulted with the cooperating teacher for recommendations and sought consent from the student and their parent(s)/guardian(s). This research study took place

in the school's library. I met with the student two times a week for thirty minute sessions during the student's study hall period or when student had completed all necessary class assignments.

The research period began in January of 2015 and continued, what was supposed to be six weeks but turned into seven, to the third week of February.

### ***Participant: Kenny***

Kenny is the pseudonym for the student participant in this study. Kenny goes to school in an urban setting and is in an 8<sup>th</sup> grade 12:1:1 classroom. He has been attending school in an urban setting his entire life. Kenny does have an Individualized Education Plan (IEP). He has been labeled as Emotionally Disturbed (ED). In regard to accommodations and modifications for Kenny, extended time and repeated and simplified directions are what is required. Kenny lives with his grandmother and his younger sister.

### ***Procedures***

This study was conducted over a seven week period between January and February of 2015. During these twice a week sessions the researcher provided the participant with reading excerpts from his class content of the week to text code. The content of focus for this study was eighth grade science. The reading excerpts came from Glencoe's (2012) text titled, Integrated Science, published by McGraw Hill. These sessions took place during the participant's study hall period and after he had completed his class assignments. The sessions took place in the participant's school library. What follows below is an outline of the lessons over the research period.

#### **Week One:**

Day One: Conduct reading interview and lay groundwork for the research sessions.

Day Two: Use Fountas and Pinnell Benchmark Reading Assessment to find participant's instructional reading level.

## Week Two:

Day One: Mini-Lesson on what a strategy is. This is followed by an introduction to the close reading strategy of text coding with example text codes provided by researcher. Researcher models how to use text coding while reading a given text.

Day Two: Reviewing of text coding strategy followed by researcher again modeling the use of the strategy. Make point of paying attention to pictures and graphs provided in readings as important information.

## Week Three:

Day One: Researcher guides as participant text codes.

Day Two: Researcher guides as participant text codes. Emphasizes the focus of breaking down and thinking about what is being read.

## Week Four:

Day One: Participant absent from school.

Day Two: Participant absent from school.

## Week Five:

Day One: Participant text codes as researcher provides support. Participant answers reading comprehension questions following reading.

Day Two: Participant independently codes a given text and answers reading comprehension questions.

## Week Six:

Day One: Participant independently codes a given text and answers reading comprehension questions.

Day Two: Participant creates personalized text codes and uses them to independently code a given text and answers reading comprehension questions.

## Week Seven:

Day One: Participant uses personalized text codes to independently code a given text and answers reading comprehension questions.

Day Two: Final assessment using a text at participants instructional reading level.

The focus of these lessons and data collection is to look at whether the close reading strategy of text coding did or did not affect the participant's reading comprehension. The findings of my research will benefit teachers and educators. This study will determine whether text coding is an effective close reading strategy for student reading comprehension improvement.

### ***Criteria for Trustworthiness***

As with any research study it is important to make sure the research is credible, dependable, and valid. This study is credible, dependable, and valid due to various trustworthiness criteria I used during my data collection. One criterion is persistent observation. At all times during this study I was with my participant observing him. This remained true for each thirty minute session twice a week over the seven week period. There was never a time when my participant was alone. This has ensured that the work samples collected are in fact the participant's own work. With the prolonged engagement of this study as well, seven weeks, the data collected will be substantial and concrete. Over the course of the research period I used member checks. My keeping of daily reflections ensured my data matches the daily goals of each lesson and highlighted any areas of each lesson that may need to be adjusted or highlighted aspects that are concerning or are successful. Transferability was also used as I have explained the setting and will be explaining the outcome of each session. As for the participant, a pseudonym was used when referring to him. The pseudonym created is *Kenny*. *Kenny* has been used whenever anything relating to the participant has been expressed. Dependability was also used. The research process has been described and the steps I have taken have been broken down. Confirm-ability is present as my reflections will be based directly on the participant's responses and work samples.

My goal as sole researcher of this research study is to conduct a credible, dependable, and valid study. I have included many of the criteria for trustworthiness in my study to ensure this happens.

### ***Methods of Data Collection***

There were various methods of data collection for this research study. Student responses to lessons and activities were hand recorded in a notebook and student work was collected. Reflections were written after each session and a Fountas and Pinnell Benchmark Reading Assessment was administered to find the participants instructional reading level. A pseudonym was created for the student. I conducted one interview at the beginning of the research period focused around the student's reading habits and likes or dislikes about reading. The purpose of the interview was to help gain insight to the student's overall attitude toward reading and whether the student knows what a strategy is. The interview consisted of six questions self-created by the researcher and the answers were hand recorded, again, a pseudonym was used. I also wrote reflections after each session highlighting any important insights gained from the session. The purpose of the reflections were for myself to look back at the effectiveness of each session and to see if there were any reoccurring themes or ideas that I noticed. The participant, given the pseudonym of Kenny, has the accommodations of extended time and simplified directions as his needs according to his IEP. Throughout the process I was looking to see if the needs of the participant were being met and if any part of my teaching needed to be adjusted.

This was a qualitative, single-subject design, research study. To prepare the data I transcribed field notes verbatim. Everything that is presented in this research study is word for word what was expressed during each session. To help explore the data I collected I conducted a preliminary exploratory analysis. I read through all of my data to gain a general idea of what I had and made the decision that I had enough data before concluding my data collecting. I was able to grasp my data as a whole before breaking it down into themes or ideas. To help keep track of my thoughts and ideas I wrote reflections after each session. I also wrote brief notes on



the sides of pages during each lesson. Clark and Creswell (2015) describe this act as keeping “memos” while data collecting. Once I had the overall idea of the data I collected I then went through and coded the data I collected. Using different colors I was able to organize and break down the overall idea I had about my data into smaller more focused ideas. From my created codes I was able to continue to narrow down my data into three main themes that were evident throughout my data. The themes I found were all recurring and interconnected between each other and the research questions which I set out to answer.

Regarding the validation of the information presented in this research study, I used the methods of bracketing, triangulation, member checking, and auditing as suggested in Clark and Creswell (2015), throughout the data collection period. As mentioned, after each session I reflected on the events of the lesson, I also wrote memos as the lesson was in progress in the margins of pages. When it came to analyzing the data, I pushed my own personal thoughts and bias aside so my personal perspectives did not persuade data findings. There were different forms of data collection for this research study which were all triangulated during the analyzing. I compared data from the reading interview, the benchmark assessment, my memos, and student work to compare evidence of themes found through each data source. I also member checked with my participant about the findings I concluded and his own perspective regarding the research study. This reinforced that the information provided in this research study is complete and realistic, that the themes are appropriate, and that the interpretations are fair and representative of participant perspectives (Clark and Creswell, 2015). The last form of validation I used for this research study was to have it audited. I had a second researcher take a look at the data I collected. They went through and coded some of the data to determine their own themes and ideas and they were in agreement to the ones I initially concluded.

### Chapter 4: Data Analysis and Findings

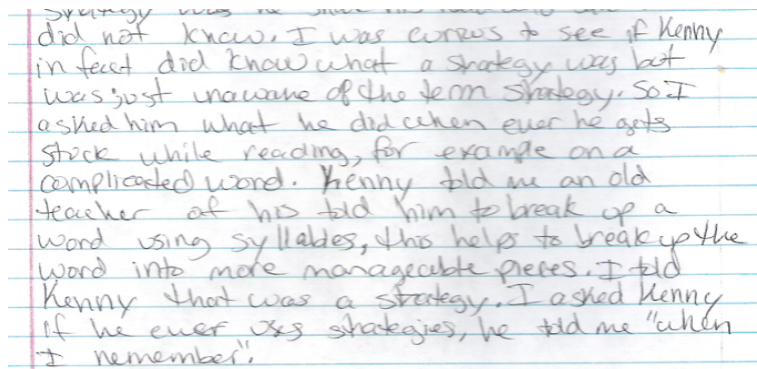
The following section breaks down the data that was collected over the seven week research study. The information is presented in a narrative form. An appendix has been added which exhibits evidence of Kenny's student work, supporting the use of the strategy of text coding.

The goal of this research study was to look at the strategy of text coding specifically to see how it affects a students' reading comprehension. First, I needed to get to know Kenny more as a reader. I did this by administering a reading interview. This provided me with needed information relating to Kenny's background or prior knowledge of strategies and what he thinks his strengths and weaknesses are in regard to reading. This gave some insight as to what direction would be best to start teaching. This information was important because his attitudes and behavior towards reading could affect his reading and behavior during our time together. If he already knew what strategies are I did not want to over teach that particular aspect, on the other hand, if he did not know what they are I did not want to assume and move on too quickly.

To help answer some of these questions I administered a reading interview to Kenny. Appendix A exhibits the interview given. Question number five states, *What do you do if you get stuck when you are reading, for example on a difficult word or idea?* This question was designed to gain an understanding of whether or not Kenny had any knowledge of strategies or techniques that he used while working independently. Kenny responded to this question saying, "Sometimes I might highlight or underline a hard word and come back to it later. An old teacher of mine taught me how to break words down into syllables to make them easier." This response provides evidence that Kenny does have some knowledge of tools he can use to help him when he finds that he is stuck while reading. Kenny's response to question six, however, shows that he

is unfamiliar with the term *strategy*. Question six states, *Do you know what a reading strategy is? If yes, do you ever use reading strategies when you are reading? If yes, what reading strategies do you use?* This question has more than one part to it, but it all stems from the knowledge of what a reading strategy is. Kenny responded to this question by saying, “No, I don’t know.” Kenny’s response to question five is contradictory to his response to question six. The responses to these two questions are evidence of Kenny not being familiar with the term *strategy*. Following the reading interview a conversation was had about how what he described for question five could actually be an example of what a strategy is. Knowing that Kenny did in fact have some knowledge of strategies, and tools that can help him while he is reading, allowed me to have an idea and some insight as to where to begin our lessons.

The results of this reading interview were important in determining the first steps to take with preparing lessons for Kenny. It turns out that he does have knowledge of what some strategies are, but he was just unaware they fell under the term *strategy*. While administering the Fountas and Pinnel Benchmark Reading Assessment Kenny came across the word *destructive*. He paused his reading and began breaking the words into syllables, *des-truc-tive*. After saying the syllables twice he was able to correctly pronounce the word. Breaking words into syllables is the strategy Kenny used most often over the course of the seven weeks. While reading excerpts from his science text book he continued using the strategy of breaking words up to their syllables. Other examples of words he broke into syllables were; *inherited*, *recessive*, and *chromosomes*. This was the only strategy Kenny used on his own while reading, other than coding a text. I asked Kenny, “Do you always use this strategy when you come across a word you do not know?” Kenny responded by saying, “when I remember.”



strategy was the same as I had learned  
did not know. I was curious to see if Kenny  
in fact did know what a strategy was but  
was just unaware of the term strategy. So I  
asked him what he did when ever he gets  
stuck while reading, for example on a  
complicated word. Kenny told me an old  
teacher of his told him to break up a  
word using syllables, this helps to break up the  
word into more manageable pieces. I told  
Kenny that was a strategy. I asked Kenny  
if he ever uses strategies, he told me "when  
I remember".

The image above is evidence of this conversation had between Kenny and myself. From this conversation I concluded that Kenny sometimes needs to be reminded of when to use strategies, or be reminded that he knows some strategies that can help him when he does get stuck.

Breaking up words into their syllables did not always work. When Kenny came across the word *heterozygous* and *homozygous*, he attempted to break up the words into syllables but he had trouble putting the whole word together. After three attempts of trying to figure out each word he skipped the words and did not go back to them. He was reading this text at a fast pace and when he came across words he did not know he would mumble the word or skip it. When he came across *heterozygous* and *homozygous* again in the text he skipped them again, this time not trying as hard to decode them. After Kenny finished his reading I asked him, "I saw you got stuck on those two big words, breaking them into their syllables did not seem to be working. Do you know any other strategies that might be able to help you figure the words out?" Kenny responded to this question with a head shake and by simply saying, "no."

The strategy of text coding, being the main focus of the study, was also a reoccurring one. Kenny was unfamiliar with this strategy at the start of the study. Using gradual release of responsibility over the course of the seven weeks together, Kenny had the opportunity to see the strategy modeled, apply the strategy with support, and use the strategy independently. The chart below portrays the text codes Kenny was learning.

Important (★)	You believe this is an important idea in relation to the topic.
Interesting (I)	While this idea may not be of high importance, it has captured your interest.
Connection (C)	You can make a personal connection to this idea, or this idea is connected to another text you have read or a previous discussion in class.
Question (?)	This idea leaves a question in your mind. For example, the meaning may be unclear, you may wonder about the author's intent when he or she wrote this idea, or the idea raises a new question for you.
Agree (A)	You agree with this idea and want to discuss why.
Disagree (D)	You disagree with this idea and want to discuss why.

Harvey, S., & Goudvis, A. (2007). *Strategies that work teaching comprehension for understanding and engagement* (2nd ed.). Portland, Me.: Stenhouse ;.

Initially Kenny expressed discomfort with using this strategy. He commented during week three, when he began to text code with my support, “I keep forgetting to code. I need to remember what each of the symbols mean.” Exhibit B of the appendix shows Kenny’s first attempt at coding a text. He used two different codes throughout the text, (I) for interesting and (?) for I do not understand, and he coded seven times. Text coding is brand new to Kenny and it was apparent that he was not used to it. When looking back at his coding after finishing the reading he commented on his work, “I didn’t really use that many did I?” This comment sparked a conversation. I asked Kenny, “Why didn’t you use any other text codes?” Kenny responded by saying, “I guess I kind of forgot. The interesting one and question mark one are just the easiest for me?” Kenny’s level of unfamiliarity began to fade as our time together progressed.

By week five Kenny had begun to internalize the text codes and use them throughout his reading. He had begun using them as notes and references to go back to when answering reading comprehension questions. He began engaging with the text and really started thinking about what he was reading. He started using the code (C) for personal connections. He also began to underline parts of the text he believed were important. Kenny justified each code he used. For the (C) code for example, he wrote it next to, *The chance that the coin will land heads-up is one-half, or 50 percent.* He verbally connected this information with learning probability in math

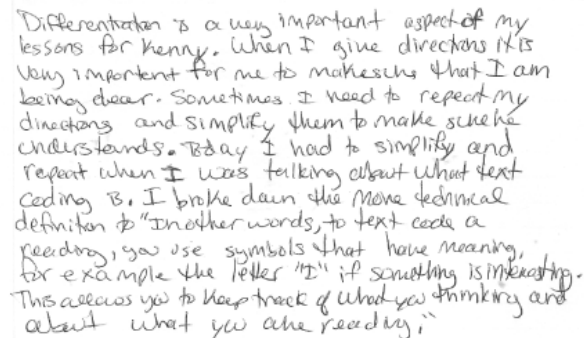
class, and how they had to flip coins and tally heads or tails. This is exhibited in Figure C of the Appendix.

Figure D of the appendix takes a look at Kenny's text codes and reading comprehension questions. It can be seen that Kenny still needed some practice with using text codes to help him answer reading comprehension questions, but he was making growth with using text codes. He got 2.5/5 questions correct week five. Flash forward to the end of week six and Kenny answered 4/5 reading comprehension questions correctly. This is exhibited as Figure E in the appendix. By this point in the study Kenny had created his own personalized text codes. These were personal to him and held meaning for him. He did not forget any of these codes that he created while he was coding a text. Kenny's personalized text codes are exhibited in Figure F of the appendix.

As mentioned before, Kenny has an individual education plan (IEP). He has the accommodations of extended time and simplified and repeated directions. During the lessons this was something I needed to keep in mind and be conscious of.

While initially teaching Kenny what text coding was, I made sure to repeat and modify directions for him. My reflection after the week two lesson where Kenny was learning what text coding was for the first time is transcribed as follows. "Text coding is a strategy that helps students to keep track of their thinking while they are reading. As students read they code the text by using symbols to mark their thinking as they go along. This allows them to engage more with the text." Knowing Kenny needed simplified and repeated directions I then rephrased what I had initially said. "In other words, to text code a reading, you use symbols that have meaning, for example the letter *I* if something is interesting. This allows you to keep track of what you are

thinking and think more about what you are reading.” The picture below is evidence supporting this claim from my reflection from that lesson.



Differentiation is a very important aspect of my lessons for Kenny. When I give directions it is very important for me to make sure that I am being clear. Sometimes I need to repeat my directions and simplify them to make sure he understands. Today I had to simplify and repeat when I was talking about what text coding is. I broke down the more technical definition to "In other words, to text code a reading, you use symbols that have meaning, for example the letter 'I' if something is interesting. This allows you to keep track of what you are thinking and about what you are reading."

During week four when answering reading comprehension questions were introduced I provided the following directions to Kenny. “After reading the questions go back and use the codes you marked in your reading to help guide you to the right answer.” Kenny responded to this with by squinting his eyes, giving a slight head nod and by saying “okay.” I then repeated the directions. “Read the question first you are trying to answer. Then go back and look at the codes you made when you read. Look for key words or ideas you coded that can help find the right section of the text where the answer is.” This differentiation of instructions is important because without it Kenny would not have fully understood what he was being asked to do.

Differentiation not only appeared while giving directions, but it also appeared within the strategy use itself. When Kenny began text coding he was using only two different codes throughout a total reading. Figure B of the Appendix exhibits this. This was the first session of week three of working together. By the second session of week three Kenny added a third code. He was now using (?) for I do not understand, (I) for interesting, and (\*) for that is important. He coded a total of six times. Also while Kenny was reading, he became stuck on the word *heterozygous*. Before when he came across this word he mumbled through it and moved on without taking much time to decode it and figure it out. This time when he came across the word

instead of mumbling over the word and skipping it, he stopped and broke it up as best he thought and successfully deciphered it. Kenny was showing progress and really started to think about what he was reading.

I noticed as Kenny was text coding he was only using, on average, three of the six text codes that we were practicing with. During week four, as exhibited in Figure C, he began using the code of (C) for connections. He never used (A) for agree or (D) for disagree though. I asked Kenny, “Why do you never use the agree or disagree codes?” Kenny responded by saying, “I just don’t really understand them. They don’t really mean anything to me.” Text coding is supposed to be meaningful to the reader so the codes can help them track what is important or what they do not fully understand. If Kenny is being told to use codes which do not hold much meaning to him he is not going to use them and he may not get the maximum potential benefits out of using the strategy. In response to this, Kenny created his own personalized text codes. Kenny’s text codes are exhibited in appendix Figure F. Kenny first used his text codes during week six. Kenny used all of the codes he created while coding. His text coding with his personalized text codes is exhibited again in Figure E of the appendix. The personalization of the text codes also helped him to more accurately respond to reading comprehension questions. He used his personalized text codes to answer reading comprehension questions when he got 4/5 comprehension questions correct.

The reading passages Kenny was text coding came from his class science text book. Due to this, each lesson revolved around the content. Kenny was learning about heredity and genes. Each passage was a progression from the previous lesson.

I asked Kenny at the start of the data collection process, “Do you have any background knowledge about heredity and traits?” Kenny responded with, “I know traits come from your



parents.” This was the extent of information Kenny shared about traits and heredity. He did not have an overwhelming knowledge of this content. This lack of knowledge affected Kenny and his understanding of what he was reading. His first text coding of a reading passage, exhibited as Figure B of the appendix, shows Kenny used (?) for I do not understand (I) for interesting the most when he coded. He did not make any connections when he began reading, most of his codes were of not understanding. By the end of week three he started to add (\*) for important when he came across bolded words. I asked Kenny, “What is important about the bolded words you coded?” Kenny responded by saying, “Bolded words usually mean a vocabulary word. So if they are bolded they are important to know.” I countered his response by asking, “Do you know what any of the bolded words mean?” Kenny shook his head and said, “No, not really. But they are important to learning about traits and heredity.” Kenny was able to use his knowledge of nonfiction texts to recognize this.

When we started working together we had a conversation about the characteristics of nonfiction books. The chart below shows some of the characteristics we talked about.

How does nonfiction text look different from fiction?	<ul style="list-style-type: none"> <li>• There may be chapter titles and section headers that preview information.</li> <li>• Each page has words in a variety of fonts and type sizes.</li> <li>• <b>Bold</b> or <i>italic</i> fonts may be used to signal important words or phrases.</li> <li>• Diacritical marks may be used to guide pronunciation.</li> </ul>
How are graphic aids used?	<ul style="list-style-type: none"> <li>• Maps, charts, diagrams, photographs are usually included to illustrate or summarize information.</li> <li>• Captions or labels must be examined carefully for relevant information.</li> </ul>
How is the vocabulary different?	<ul style="list-style-type: none"> <li>• There may be more words that are unfamiliar. Look for multi-syllabic words like “photosynthesis” that may be difficult to pronounce.</li> </ul>
What do we know about nonfiction?	<ul style="list-style-type: none"> <li>• There is a great deal of information to be understood and remembered.</li> </ul>

Scholastics (2015). What's Special About Nonfiction? | Scholastic.com. Retrieved March 25, 2015, from <http://www.scholastic.com/teachers/lesson-plan/whats-special-about-nonfiction>

Understanding these characteristics were important to understanding some of the content he was reading. Being a nonfiction book Kenny was reading from, he needed to be aware of

characteristics of nonfiction books. He needed to know that bold or italicized words are important. He needed to know that headers and titles will hint as to what is in a particular section of the text. He needed to know that captions, labels, and pictures should not be overlooked because they will provide more information that may not be in the reading itself. With this knowledge Kenny would be able to have the tools to effectively attack a nonfiction text. Kenny needed to be reminded at times to keep some of these characteristics in mind. During week three he finished reading a passage. This page from the science text book had a picture and captions on it. When Kenny said he was done I asked if he had taken a look at the picture at the bottom of the page. Kenney admitted he had not. He went back and took a look at them. Figure G exhibits Kenny's coding of both text and pictures.

When it came to answering reading comprehension questions, initially Kenny struggled. The first time he attempted to answer reading comprehension questions on his own after reading a text at his instructional level he answered 5/10 correctly. The content stood in the way of his comprehension. With the strategy of text coding giving him a tool to dig deeper and think more closely about what he was reading he was able to improve his reading comprehension. His final assessment of answering reading comprehension questions following a text at his instructional level was 7/10 correct. Kenny needed a tool to overcome the content he was unfamiliar with so he could focus on finding meaning.

### **Findings**

The purpose of this study was to determine if the strategy of text coding could help improve a students' reading comprehension skills. I gradually worked with Kenny over the course of seven weeks, meeting with him twice a week, to learn and practice the strategy of text coding. Over the course of the data collection time I collected different types of data. I kept a

reflection journal which I wrote in after each session. I took some time to write and reflect about what occurred during our session. “Great teachers are constantly thinking, asking, revising, and producing new materials—all in a quest to reach more students” (Prusak & Barney, 2014). By keeping this journal I was able to have a quick glance of what occurred during the session. I was able to track Kenny’s progress and jot down any themes or trends I noticed. During this time I also administered a Fountas and Pinnel Benchmark Reading Assessment to determine Kenny’s instructional reading level. I conducted a reading interview as well as collected student work. The reading passages used for this study were all nonfiction books. I was able to analyze my data and narrow down the content into three reoccurring themes noticed throughout each type of data collected; text coding is an effective strategy for improving reading comprehension, differentiation supported the use of text coding to improve reading comprehension, and text coding is an effective strategy to aid a student’s comprehension of content reading. The themes are all interconnected and each relates back to the research question being investigated.

***Theme 1: Text coding is an effective strategy for improving reading comprehension.***

The first theme, text coding is an effective strategy for improving reading comprehension, was the main focus this research study set out to investigate. Kenny did not have much knowledge of strategies at the beginning of this research study. Throughout the study he used, besides text coding, the strategy of breaking words up by their syllables if he came across a word he did not know. If this strategy did not work for a particular word, Kenny would skip the word and move on. Reading comprehension strategies can be defined as conscious, deliberate, and flexible plans that can be adjusted and used in a variety of different ways by the reader to help them attain a certain goal (Pilonieta, 2010). Having a tool box of strategies allows students to become independent in their reading. They will need to rely less on their teacher and

more on their own abilities to get through a reading. Research has discovered that “good readers use a variety of strategies while reading. In contrast, poor readers use fewer strategies and are less likely to learn them unless they receive explicit strategy instruction” (Pilonieta, 2010).

Strategy instruction is crucial for teachers to incorporate in their lessons. Text coding proved to be an effective strategy for Kenny in his reading comprehension. With appropriate strategy instruction with teaching students not only what strategies are, but when and how to use them appropriately, reading comprehension can be improved.

The theme of the text coding strategy improving comprehension supports the research question that states, *Is text coding an effective strategy for improving reading comprehension abilities?* Kenny is proof that text coding can be effective for some students in improving their reading comprehension. The results of Kenny’s final assessment show that with the use of the text coding strategy he was able to increase his reading comprehension skills. His initial reading comprehension score while reading a text at his instructional level was 5/10. After explicit instruction of how to use text codes, and personalizing them to make them his own, his final assessment of reading a text at his instructional level was 7/10. Kenny showed growth by using text coding as a strategy.

By teachers being aware of various strategies and how to teach their students to use them appropriately, students can build their own strategy tool box. Kenny is an example of student who showed growth and progress when explicitly taught a reading comprehension strategy. Lack of strategy knowledge may also contribute to why students struggle with reading comprehension. Reading comprehension is a difficult skill to master. When students get stuck they need some sort of tool or strategy to help them overcome their problem. Kenny exemplified this struggle when he did not have a strategy to help figure out how to decode certain words. Not

having the strategies to help students when they get stuck may lead to students not reading a given text as closely as they should. This leads to the idea of close reading, which text coding is a strategy of. Close reading involves a student digging deeper into a text to pull out more layers of meaning. Kenny is an example of student who at one time did not close read a given text. He read through it at a quick pace and did not stop to decode some words he did not know. By using the strategy of text coding he learned to slow down and really think about what he is reading.

***Theme 2: Differentiation supported the use of text coding to improve reading comprehension.***

The second theme, differentiation supported the use of text coding to improve reading comprehension, also helps to answer the research question of this study. Lack of differentiation may be a contributing factor to student struggle. If teachers teach with a one size fits all mentality that their students are all going to learn the same, for the students who do not learn a certain way, they are going to fall behind. Kenny is an example of a student who needs differentiation to be successful. This is apparent in his need for simplified directions as well as his need to personalize the text codes. The codes were not as beneficial to him initially because they did not have meaning to him. By differentiating them he was able to think deeper about what he was reading and go back to the reading to help more successfully answer reading comprehension questions. Differentiated instruction needs to be kept in mind by teachers. Students do not all learn the same, by teaching each student the same way is not going to make all students progress at the same rate. Students need instruction tailored to their needs, just like Kenny needed simplified instructions and personalized text codes.

***Theme 3: Text coding is an effective strategy to aid a student's comprehension of content reading.***

The third theme, text coding is an effective strategy to aid a student's comprehension of content reading, also helps to answer the research question of this study. The purpose of using the strategy of text coding is to close read and really find meaning and understanding in a given text. If there is a barrier of content related words, students' understanding and ability to create meaning from a text is hindered. Also, if students are unable to understand what they are reading they will not be able to comprehend the main idea and points. Kenny struggled with comprehending some of the content he was reading because he was unfamiliar with some of the content related terms such as *heterozygous* and *homozygous*. Reading comprehension is an important skill for students to master in order to gain new information. They need to be able to create meaning from text. Reading comprehension allows students to create meaning and apply that meaning to different contexts. Kenny is an example of a student who did not have the necessary tools to comprehend what he was reading and struggled to answer reading comprehension questions. He did not have much prior knowledge about the content of traits and heredity, this affected his performance because he had no information to pull from to make many connections. Due to this, he was not learning as much as he needed. With the strategy of text coding he was able attack content he was unfamiliar with and find meaning by breaking the text a part and more closely reading. Despite the content of the passages, Kenny was able to overcome his unfamiliarity and improve his own reading comprehension abilities.

***Summary:***

The data collection and analyzing answer the main research question of, *Is text coding and effective strategy for improving reading comprehension abilities?* The answer to this question is yes. From the progress shown from week to week and with the results of the final assessment, Kenny did improve his reading comprehension ability. Not only was he able to

prove his reading comprehension ability, though, he was also showed growth in becoming a more proficient reader. When he first began he was reading at a fast and did not always stop to try and decode words that he did not know. After his reading he was not always able to recall what he read. Looking at the end of our time together, Kenny was engaging more with his reading. He was taking the time to code and make connections. He became conscious of what exactly he did not understand. He slowed his reading down so he was able to retain it and really think about it. Through the process of gradual release of responsibility Kenny was able to learn and apply the strategy on his own and in a personal way. At the conclusion of our time together I asked Kenny, “Do you think you would ever use this strategy in the future when you are reading independently?” Kenny responded by saying, “Yes! I really think I would. Now that I know how to use it I think it could really help me. My grandmother will be happy too. She always said my reading comprehension needed help. Now I can show her what I learned.”

## **Chapter 5: Conclusion**

### ***Summary of the Major Results***

The research study conducted was looking at the effect the close reading strategy of text coding had on a student’s reading comprehension abilities. The concluding data supported the strategy of text coding as helping to improve a student’s reading comprehension ability.

Through explicit instruction and gradual release of responsibility the participant was able to learn and apply the strategy of text coding to a given text at his instructional reading level. Student growth can be seen in more than just one area throughout the course of data collection time.

While the participant was able to learn a strategy that can help him improve his reading comprehension abilities, he also showed growth in his quest to becoming a proficient reader.

### *Discussion Relating Results to the Literature*

With the implementation of the common core standards there is an increase in complexity of texts that are required in classrooms. The reason behind these changes in standards is to better prepare K-12 students to becoming college and career ready (Peery, 2013). With this increase of text complexity comes an increase of knowledge students need to have in order to be able to decode vocabulary and create meaning from these texts. Reading comprehension can be difficult for a typical student to master let alone a student with a reading disability. According to Katz and Carlisle (2009) “Evidence has suggested that students with reading disabilities need more explicit and prolonged instruction in higher level decoding strategies, vocabulary, and comprehension strategies in order to acquire these reading skills.” There needs to be differentiation of instruction to ensure that all student needs are being met. Kenny is a student with an individual education plan (IEP). Katz and Carlisle (2009) support his need for “sufficient guided practice applying these strategies during reading so that deployment of strategies becomes habitual.” I used the gradual release of responsibility instructional method throughout this study to do just that. To allow Kenny the opportunity to apply the text coding strategy until it started to become a habit.

Fisher and Frey (2014) define close reading as, “an investigation of a short piece of text with multiple readings ... through text- based questions and discussion, students are guided to deeply analyze and appreciate various aspects of the text, such as key vocabulary and how its meaning is shaped by context.” The objective of this study was to have the participant engage with the text he was reading and create meaning from it. The strategy of text coding was used to help the participant do this. Text coding is defined simply by Pryor and Cox (2009) as, “a way of marking a text so that students remember what they thought was important.” Through the use



of text codes the participant was able to engage with a given text, think deeper about what he was reading, and go back to the reading to answer text-dependent questions. In the end, this strategy proved effective for this participant after explicit instruction and guided practice.

### ***Personal Reflections of the Researcher about the Meaning of the Research***

After conducting this study I can say it has influenced my own practice. I hypothesized going into this study that text coding would be an effective strategy to help my participant improve his reading comprehension skills. After analyzing the data my hypothesis was correct. The effectiveness of the strategy of text coding, however, was not the aspect of this study that has influenced me the most. Yes it is good to know that I can have this strategy in my tool box to teach future students of mine to help them close read and comprehend what they are reading, but what grabbed my attention the most throughout this study was the instruction of the strategy. What I discovered, and what was reinforced from previous beliefs, was that the way a strategy is taught plays a big role in how effective that strategy is. It would have been easy for me to have taught my participant what text coding was, showed him example text codes, modeled it once, and let him go at it alone. After finishing this study, analyzing the data, and looking back at my reflections from each session, I know that path of action would not have been effective.

My student participant, Kenny, as mentioned, has an IEP. He needs explicit directions that are simplified and repeated. To have simply taught him once what text codes are without any repeating or examples, he would not have grasped the concept to its fullest. He may have been able to gain an idea, but not whole picture. This became apparent through Kenny's facial expressions. When he would shrug his shoulders or squint his eyes, they were indications of not fully understanding. This goes for the guided practice that occurred as well. I modeled for Kenny how to use the strategy and talked through my thinking. I then guided and supported him

as he attempted the strategy. Finally he independently used the strategy of text coding. This all happened over the course of seven weeks, not three lessons.

Working as a teacher assistant I am witness to the hectic schedules teachers have. There is often not enough time in the day to complete and get through all that has been planned. Flexibility is crucial to running a successful classroom. As I look toward the future of my own classroom I think about having a student like Kenny. I will not be able to teach the class one way. I will need to differentiate my instruction. I will need to model, more than once, and allow multiple opportunities for application. This may not always be easy and time may not always allow for it, but it needs to be a goal of mine. I need to strive for individualized instruction. It may take longer in the beginning, but in the long run, students will become more independent as they are given the opportunity to engrain knowledge in their head, not glance at it as it passes by. Kenny was beginning to engrain the strategy of text coding and expressed his thoughts about him wanting to continue to use it. This has allowed him to be that much more of an independent learner.

I also took away from this study the realization that growth does not always come in leaps and bounds. Often times growth needs to be looked for on a smaller scale. Kenny is an example of a student who showed this smaller scale of growth. Yes he was able to improve his reading comprehension through guided practice of text coding, but he also made strides toward becoming a more proficient reader. He began the study by reading so fast that he was unable to recall any information he read. By the end of the study he was controlling his pace and really thinking about what he was reading. Kenny also started the study by sometimes skipping over words he did not know without giving much thought as to how it would affect his comprehension of the reading. By the end of the study he took the time to decode unfamiliar words or to code

them so he could go back to them and figure them out. These were smaller signs of growth besides the overall growth of reading comprehension. As a teacher I need to see and support growth in all sizes and shapes.

### ***Implications for Practice***

Looking at this study as a whole there are some implications for practice that can be taken away. As mentioned above, it is important for teachers to provide opportunities for learning and application. The gradual release of responsibility is one method of teaching that can be followed. Differentiating instruction is also important to keep in mind. Thoughtful grouping of students could be a possibility based on the make-up of student abilities and needs of a classroom. When all is said and done, it is important that there is not a one size fits all mentality of instruction. Not all students learn the same. No matter which way a teacher goes about teaching a lesson, each individual student need needs to be taken into consideration.

### ***Limitations of the Study***

As with any research study, there are limitations. Some limitations of this research study include; lack or random sampling for selecting participants, small sample size, and lack of control of confounding variables. For this study the participant was chosen from an easy available group of students for which I am a teacher assistant. There was also only one participant chosen for this study. The sample size was very small. Explicit and individualized instruction was easy due to only having one participant, this may have been a little different had there been more participants. As for lack of confounding variables, my participant has an IEP. The results of this study may not be able to be generalized on a widespread scale. The results may vary if the study was conducted using participants who do not have an IEP. Also, the participant for this study was absent for one week of the data collection time. He was home sick.

This was an uncontrollable factor but one that needed to be handled. This led to some re-teaching and reviewing some material and straying slightly from the initial plans of action.

### ***Future Research Needs***

As a result of this study and some of the limitations it presented there are some future research needs that could be explored. Seeing as this study had only one participant, future studies could involve a larger sample group. This would make the results of the study more able to be compared to a typical classroom with multiple students. The studies could be conducted with a sample group of only participants who have IEP's, only participants who do not have IEP's, and/or a mixed sample group of participants who have IEP's and participants who do not. Another future study that could be done could be focused around the type of texts used. This study was focused around nonfiction texts. Perhaps a study could be focused around fiction texts to see what would result.

### ***The Overall Significance of the Study***

In the end, the findings of this study highlight the importance of teaching students strategies they can keep in their tool box to help them become more independent readers and help improve their reading comprehension abilities. This study draws attention to the importance of methods of instruction; explicitly teaching, modeling, supporting, and providing multiple opportunities for application. The findings of this research can help teachers to add to their knowledge of what strategies are effective in helping students improve their reading comprehension abilities.

## Appendix

Figure A

Reading Interview  
 Reading Interview  
 (Self-Created by Researcher)

1.) What do you like about reading?

I like poetry books. I like how they rhyme. Sometimes I like reading alone because it is hard to concentrate with lots of people around.

2.) What do you dislike about reading?

Sometimes there are a lot of pages and I get bored with it or get frustrated when I do not know a word, like a big word.

3.) What kinds of things do you read in school? Do you prefer reading some forms of texts versus others? (Books, magazines, newspaper articles, etc.)

We read different types of books (adventure, mystery, horror) I like books with pictures sometimes because I can imagine the pictures moving as I read. My favorite books are mystery books. Sometimes we also read articles.

4.) Do you read outside of school? If no, why not? If yes, who do you read with (Parents, Friends, Grandparents, By Yourself, etc.)? What kinds of things do you read outside of school?

I read at home, I read comic books or poetry books. I read a couple times a week, sometimes when I finish my homework. At school I read with teachers and classmates. At home I read by myself.

5.) What do you do if you get stuck when you are reading, for example on a difficult word or idea?

Sometimes I might highlight or underline a hard word, and come back to it later. An old teacher of mine taught me how to break words down into syllables to make them easier.

6.) Do you know what a reading strategy is? If yes, do you ever use reading strategies when you are reading? If yes, what reading strategies do you use?

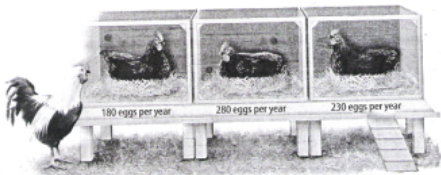
No. I don't know. [Had a conversation about his answer to the previous question. How some of those were in fact strategies].

7.) Do you think it is important for people to understand what they read? Why?

Yes. Because when you are asked questions in class or have to summarize what you read you need to know and understand what you read. [When asked if understanding what you read is important outside of school] Yes because you need to know what directions and signs say when you drive.

Figure B

Kenny's First Attempt at Text Coding



▲ Figure 4 In selective breeding, plants or animals with desired traits are bred to produce offspring with those traits.

**Heredity—the History and the Basics**

For thousands of years, humans have been slowly improving their crops, such as corn and apples, as well as their farm animals through a method called selective breeding. **Selective breeding** is the selection and breeding of organisms for desired traits. Suppose you are a farmer who owns the hens shown in Figure 4. The average number of eggs per year produced by each hen is shown below its nest. If you wanted to breed hens that produced more eggs, which hen would you breed with the neighbor's rooster? Why?

Throughout history, people have successfully used selective breeding to produce trees that grow larger fruit or cows that produce more milk. However, people did not always get the results they expected. It was not until an Austrian friar named Gregor Mendel began experimenting with pea plants that people understood more about how selective breeding works.

**Reading Check** What is selective breeding?

**Mendel's Experiments**

In 1856, Gregor Mendel began experimenting to answer the question of how traits are inherited. At the time, most scientists thought that traits blended from parents to offspring, similar to the way two paint colors blend when mixed. But Mendel did not accept the blending hypothesis.

**Crossing True-Breeding Plants** To test his ideas, Mendel carefully selected pea plants with specific traits and bred them. As shown in Figure 5, Mendel chose plants that produced only green pods, called true-breeding, and crossed them with true-breeding plants that produced only yellow pods. All the offspring, called hybrids, produced only green pods. The yellow-pod trait seemed to disappear, not blend with the green-pod trait.

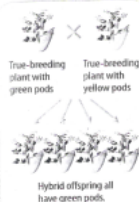


Figure 5 All of the hybrid offspring of these two true-breeding plants had green pods.

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**Crossing Hybrids** When Mendel crossed two hybrid plants with green pods, the cross resulted in offspring with green pods and offspring with yellow pods, as shown in Figure 6. These offspring were in a ratio of about 3:1, green to yellow. Mendel tested thousands of pea plants. He tracked traits such as seed shape and flower color. The crosses between hybrids for each trait produced a similar 3:1 ratio. Mendel proposed several ideas to explain his results.

**Dominant and Recessive Alleles**

Mendel proposed that instead of blending, some traits of organisms are dominant, while others are recessive. A **dominant trait** is a genetic factor that blocks another genetic factor. A **recessive trait** is a genetic factor that is blocked by the presence of a dominant factor. When an individual has one dominant allele and one recessive allele for a trait, the dominant trait is expressed. This explains why the offspring of the true-breeding green-pod plants and the true-breeding yellow-pod plants all produce green pods. Green pods are a dominant trait, and yellow pods are a recessive trait.

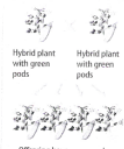


Figure 6 When hybrid plants are crossed, offspring produced are in a 3:1 ratio.

**inquiry MiniLab** 20 minutes

**How can you model Mendel's principles?** Recall that during sex-cell formation, different combinations of alleles can occur randomly.

- Obtain two allele cards. Determine if your parent plant is green or yellow. Join the group that has the same color plant as you do.
- Pair up with one student from the other group. Randomly choose one of your allele cards, and have your partner do the same. Write the allele combination of these cards in your Science Journal. Repeat this process to create the genetic identity of a second offspring.
- Assume the identity of one of the first-generation offspring. Take the appropriate allele cards to represent your identity. Declare if you are a green or a yellow plant. Record your results on a class data sheet.
- Pair up with another person in your class. Choose a card at random, and have your partner do the same. Write down the allele combination of the second-generation offspring you created. Repeat three more times. Then record your data on the class data sheet.

**Analyze and Conclude**

- Identify** What color was your parent plant? What allele combination gave the plant its color?
- Analyze** What were the totals for yellow and green plants in the first-generation offspring? What allele combinations made up these plants?
- Key Concept** Determine the ratio of yellow to green plants in the second-generation offspring. How does this compare with the ratio that Mendel discovered with his crosses?

Lesson 1 797

Figure C

Week 5 Session 1 Text Codes

**Laund Lab** 20 minutes


Can you model probable outcomes? **CC.12-7-1**

The study of heredity includes studying probability. Probability is the likelihood that a specific outcome will occur and usually is measured in terms of percentages.

- Read and complete a lab safety form.
- Obtain a **Group ID card**.
- If you are in group A, obtain a coin and flip it 100 times. For each flip, record whether the coin landed heads-up or tails-up in your Science Journal.
- If you are in group B, use your imagination to flip a coin 100 times. For each flip, record whether the coin landed heads-up or tails-up.
- Hand in your data to your teacher. Your teacher will use the data to try to determine which group actually flipped a coin.

**Think About This**

- How did your teacher determine which data were real and which were not real?
- Key Concept** How are data used to help determine probability? How do you think the sample size used in an experiment affects the reliability of data?



**Math Skills**

**Use Probability**  
Probability is a ratio that compares the number of ways a certain outcome occurs to the number of possible outcomes. If you have a regular six-sided die, what is the probability of rolling an even number?

$$\frac{\text{number of sides with even numbers}}{\text{total number of sides}} = \frac{3}{6}$$

Reduce to lowest terms.

$$\frac{3}{6} = \frac{1}{2}$$

**Practice**  
With the same six-sided die, what is the probability of rolling either a 3 or a 5?

**Review**

- Math Practice
- Personal Tutor

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**Rediscovering Mendel's Work**

Today, Gregor Mendel is considered the father of genetics. Soon after he published his results on pea-plant genetics, however, his work mostly was forgotten. Scientists continued to support the idea that traits blended from parents to offspring. They did not know about genes and chromosomes.

Mendel's work was rediscovered in 1900. At this time, genetics was a rapidly growing field of science. Scientists had discovered chromosomes and could see them inside cells. They also thought that the cell nucleus contained genes. Scientists soon realized that genes were on chromosomes in the nucleus. They confirmed that genes were Mendel's dominant and recessive factors. The next step was to learn more about how to predict patterns of inheritance.

**Reading Check** Explain why the rediscovery of Mendel's pea-plant experiments was important to genetics.

**Predicting Genetic Outcomes**

Think about flipping a coin into the air. The chance that the coin will land heads-up is one-half, or 50 percent. The chance that the coin will land tails-up is also one-half, or 50 percent. The chance of a coin landing heads-up two times in a row is  $\frac{1}{2} \times \frac{1}{2}$ , which equals one-quarter, or 25 percent.

**Probability**

If you flipped a coin ten times in a row, what is the chance that half of your flips will be heads? Using probability, you might predict a heads-to-tails ratio of 5:5. However, while the 5:5 ratio is the most probable outcome, any outcome is possible. Probabilities are predictions; they do not guarantee outcomes. Your coin flips could result in ten heads in a row.

**Punnett Squares and Predicting Genetic Outcomes**

With enough data, Mendel was able to predict the outcome of a monohybrid cross. A cross between two individuals that are hybrids for one trait is a **monohybrid cross**. Mendel predicted a 3:1 ratio of the dominant phenotype to the recessive phenotype. When Mendel crossed many sets of heterozygous plants that produced green pods, 428 of the offspring produced green pods, and 152 produced yellow pods. The results were close to the 3:1 ratio he predicted. Mendel knew that the probability of getting green pods was three-quarters, or 75 percent.

A **Punnett square** shows the probability of all possible genotypes and phenotypes of offspring. Figure 8 shows a Punnett square for a monohybrid cross between pea plants with green pods. The Punnett square predicts that 75 percent of the offspring will express the dominant phenotype of green pods.

**Key Concept Check** How does a Punnett square help scientists predict genetic outcomes?

**Review**



Phenotypes—3 green, 1 yellow  
Genotypes—1 GG, 2 Gg, 1 gg

**Figure 8** The Punnett square shows the predicted outcome of the cross between two heterozygous green-pod pea plants.

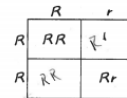
**Visual Check** What percentage of the offspring will be heterozygous?

**MiniLab** 10 minutes

**How can you predict outcomes using a Punnett square?**

The Punnett square, right, shows a cross between two plants and their alleles for flower color. The dominant allele *R* indicates purple flowers, and the recessive allele *r* indicates white flowers.

- Copy and complete the Punnett square in your Science Journal.
- Create a second Punnett square using the two offspring you filled in from the first cross.



**Analyze and Conclude**

- Describe** What color were the flowers of the parent plants, crossed in the first Punnett square? What was the ratio of offspring with purple flowers to offspring with white flowers?
- Analyze** What was the ratio of purple flowers to white flowers in the offspring of the second Punnett square you completed?
- Key Concept** Evaluate what the results of the Punnett square mean in terms of what you could expect in real life.

Figure D

Week 5 Session 2 Coded Text and Reading Comprehension Questions

**Natural Selection**

The process by which individuals with variations that help them survive in their environment live longer, compete better, and reproduce more than those individuals without these variations is called **natural selection**. For the finches, there was variation among individual birds for the trait of beak size. Some of the birds had small beaks, and some of them had larger beaks. When a change in the environment—a drought—occurred, the birds with larger beaks were better able to survive than birds with smaller beaks. The surviving individuals then passed on the favorable trait to their offspring. Over the two-year span of natural selection and reproduction, the average beak size of the birds in the population increased. The birds with larger beaks were naturally selected by environmental conditions and survived. An example of natural selection in plants is shown in Figure 15.

**Figure 15** In this example, due to natural selection, the average height of the sunflowers in a population decreases.

**Visual Check** What happened when individual sunflowers competed for limited resources?

**Key Concept Check** How does natural selection occur?

**Natural Selection** Review Personal Tutor

**Variation** Individuals in a population differ from one another. In this population, some sunflowers are taller than others.

**Inheritance** Traits are inherited from parents. Tall sunflowers produce tall sunflowers. Short sunflowers produce short sunflowers.

**Competition** Due to limited resources, not all offspring will survive. Individuals with a trait that better suits the environment are more likely to survive and reproduce. In this environment, short sunflowers are more successful.

**Natural Selection** Over time, the average height of the sunflower population is short if the short sunflowers continue to reproduce successfully.

Chapter 22

**Launch Lab** 10 minutes

**How does variation help survival?**

Mutations cause differences, or variations, in traits. How can variations help or hinder an organism's survival?

1. Read and complete a lab safety form.
2. Examine various cell phones or pictures of cell phones. Note the different features that each cell phone offers. For example, some might have a full keyboard, some might have a camera, and some might have a hands-free option.
3. Make a data table in your Science Journal, and record your observations about the characteristics of each phone.

**Think About This**

1. What are some of the variations among the phones?
2. If each variation represents a mutation in the population of phones, how might each mutation have a positive or a negative impact on the population?
3. **Key Concept** How do you think the development of new characteristics might help a population of organisms survive?

**Mutations, Variation, and Natural Selection**

Recall that mutations can lead to changes in traits. Therefore, mutations can produce differences among individuals. Slight differences in inherited traits among individuals in a population are called **variations**. For example, birds in a population might have variations in feather color or nest-building skills.

In 1976, scientists measured several traits in a population of medium ground finches on one of the Galápagos Islands. They discovered that the birds had variations in beak size. Most had smaller beaks, but all of the birds of this species, such as the one in Figure 14, preferred to eat small, soft seeds.

The next year, it never rained on the island. None of the plants reproduced, so no new seeds formed. After the finches ate all of the small, soft seeds, many could no longer survive. The few seeds left were relatively large and hard, so the birds that survived were those that could crack and eat these seeds. These tended to be the finches with relatively large beaks.

In 1978, the scientists measured the beaks of the surviving birds' offspring to that of birds hatched in 1976. In just two years, the average beak size of birds in the population had increased. How did this happen?

**Figure 14** Medium ground finches eat seeds and live on the Galápagos Islands.

Concepts in Motion Animation

Directions: Base answers of questions 1-5 on information from pages 811-812.

- 1.) Slight differences in inherited traits among individuals in a population are called
  - a. Mutations
  - b. Adaptations
  - c. Natural Selection
  - d. Variations
- 2.) Natural selection can be defined as
  - a. The process of passing of traits from parent to offspring.
  - b. The process by which individuals with variations that help them survive in their environment live longer, compete better, and reproduce more than individuals without variations.
  - c. The process by which organisms will survive due to being better equipped to fight for food.
  - d. The process of migrating to the Galapagos Islands to study finches.
- 3.) Limited resources causes
  - a. Competition
  - b. Variations
  - c. Inheritance
  - d. Offspring

1/2 If you live longer you pass on traits to your children.

Yes, but give more detail, use next evidence.

- 5.) What will happen to a population of sunflowers, over time, if short flowers continue to grow successfully? Will there be tall sunflowers?

There will be both short and tall sunflowers.

If short flowers grow successfully they will continue to grow, there will be less and less tall flowers over time.



Figure E

Week 6 Text Coding and Reading Comprehension Questions

**Evolution of Populations— Why Traits Change**

Once an inherited trait has become more frequent in a population, the population has adapted and evolved. Evolution is change over time. Evolution by natural selection is a way that populations change over time. When populations evolve, species can look and behave differently than their ancestors. This happens because the frequency of genetic traits changes over time. As the environment changes, different inherited traits might enable survival, and the population can evolve again.

**Key Concept Check** Why do traits change over time?

**A Modern Example of Change Over Time**

You already might know that bacteria can cause infections in your body, such as strep throat or pneumonia. Sometimes a doctor might prescribe an antibiotic to help you fight an infection. Antibiotics, first used in the 1940s, are drugs that kill bacteria. Although, in many cases, antibiotics effectively kill bacteria, variation exists within a population of bacteria. As shown in Figure 19, some bacteria in a population already might have a mutation that enables them to survive when exposed to an antibiotic. When the surviving bacteria reproduce, that trait passes to their offspring. Soon, most individuals in the population survive when exposed to the antibiotic. Bacteria that survive when exposed to an antibiotic are called antibiotic-resistant. Antibiotic-resistant bacteria have caused deadly infections and are of great concern to scientists.

**Figure 19** A population of bacteria can evolve antibiotic resistance.

**OLDABLES**  
Make a vertical three-tab book with a tab-top. Label it as shown. Use it to organize your notes on the different types of adaptations.

Structural
Functional
Behavioral

**ACADEMIC VOCABULARY**  
survive (verb) to remain alive.

**Science Use vs. Common Use**  
introduce Science Use to bring a substance or organism into a habitat or a population. Common Use to make someone known to others.

**WORD ORIGIN**  
extinction from Latin *extinctus*, means "wipe out"

Lesson 3 815 EXPLAIN

**Extinction and Conservation Biology**

You already have read that for evolution by natural selection to occur, variation within a population is needed. A population with diversity can survive changes in its environment and persist through time. What happens when a population lacks variation among its individuals, and the environment changes? The population might lose its ability to reproduce successfully and fall to survive. When the last individual of a species dies, the species has undergone extinction.

Today, many species are threatened with extinction. A species' habitat might have been altered or destroyed. Some species have been hunted to extinction. For others, new species introduced into many habitats make it difficult for some native species to survive and reproduce.

Some species can be saved with a relatively new field of science. Conservation biology is a branch of biology that studies why many species are in trouble and what can be done to save them. Sometimes scientists' knowledge of genetics helps species that are in danger of extinction. For example, by 1995, the population of Florida panthers, such as the one shown in Figure 20, was between 20 and 30 individuals. The population had lost much of its natural variation and was struggling to survive. Scientists' understanding of genetics and heredity saved the population from extinction. Scientists introduced into the Florida population several female panthers from a population in Texas. This was done to increase genetic diversity in the Florida population. By 2003, the Florida panther population had increased to 80 individuals, and the effort was considered a success.

**Figure 20** An understanding of genetics and heredity has helped restore the Florida panther population.

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Direction: Base answers of 1-5 on information from pages 815-816.

- Change over time is the process of \_\_\_\_\_.
  - Natural Selection
  - Survival of the Fittest
  - Evolution
  - Extinction
- When the last individual of a species dies, the species has undergone \_\_\_\_\_.
  - Extinction
  - Conservation Biology
  - Variation
  - Mutation
- Conservation Biology is \_\_\_\_\_.
  - When new species are introduced to a new habitat.
  - When antibiotics are used to kill bacteria and prolong a species life.
  - The study of species competition.
  - A branch of biology that studies why many species are in trouble and what can be done to save them.

4) Why do traits change over time?  
Yes but why? Because sometimes they can change from generation to the next.

5) Why do new species being introduced to a habitat make it difficult for some species to survive and reproduce?  
Because new species may cause competition of food or things needed for survival.

Figure F

Kenny's Personalized Text Codes

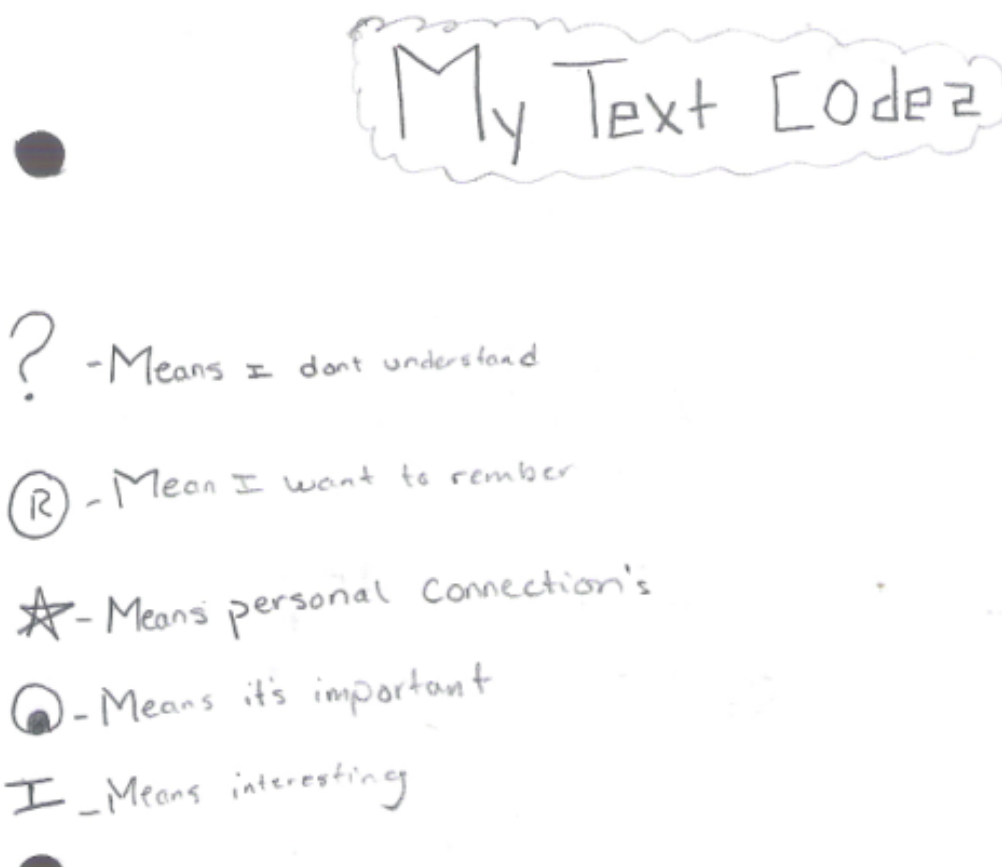


Figure G

Text Coding of Text and Pictures

**Mendel's Principles of Inheritance**

Earlier in this lesson, you read that an allele is one form of a gene. Mendel did not know about genes or alleles. Mendel did suspect, however, that a physical factor was responsible for the traits of his pea plants. Mendel was right. The factors Mendel proposed now are called genes. Which alleles are present on a pair of chromosomes determines whether an individual has the dominant or the recessive trait. *The alleles of all the genes on an organism's chromosomes make up the organism's genotype* (JEE nuh tipe). *How the traits appear, or are expressed, is the organism's phenotype* (FEE nuh tipe).

Mendel's hybrid pea plants had genotypes of one allele for green pods and one allele for yellow pods. The phenotypes of these plants were green pods. *When an organism's genotype has two different alleles for a trait, it is called heterozygous* (he tuh roh ZI gus). The hybrid plants were heterozygous for pod color. *When an organism's genotype has two identical alleles for a trait, it is called homozygous* (hoh muh ZI gus). Mendel's true-breeding plants were homozygous for pod color. Homozygous and heterozygous genotypes also affect the phenotypes of other organisms, such as the gerbils shown in Figure 7.

Next, you will read about the rediscovery of Mendel's work. Scientists have confirmed and built upon Mendel's ideas as they learned more about genetics and heredity.

**WORD ORIGIN**  
phenotype  
from Greek phaino, means "to show"; and typos, means "type"

**Figure 7** Agouti is a dominant trait (A) and produces a phenotype of hairs with alternating bands of color and no color. The recessive trait (a) produces hairs of all one color.

**Visual Check** What is the genotype of the agouti gerbil?

**Key Concept Check** What did Mendel investigate and discover about heredity?

The phenotype of this gerbil is agouti. Its genotype could be AA or Aa. AA is homozygous dominant. Aa is heterozygous and has the dominant phenotype.

The phenotype of this gerbil is black. Its genotype can only be aa, which is homozygous recessive.

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EXPLAIN

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