

Fall 10-19-2012

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## Recommended Citation

Queenan, Margaret Lally, "Multidisciplinary Research: Science and Reading Instruction in Third Grade" (2012). *NERA Conference Proceedings 2012*. 2.  
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Multidisciplinary Research: Science and Reading Instruction in Third Grade

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## Multidisciplinary Research: Science and Reading Instruction in Third Grade

### Abstract

This participant observer research study focused on the reading comprehension strategies third grade readers used when reading downloaded texts about cheetahs and online texts about tigers. State standards and the district's curriculum called for third grade students to identify the structures and behaviors that help animals survive in different environments. Using participant observation; that is, teaching the third grade classes and analyzing the artifacts produced as a result, including student products such as online and offline notes and researcher products such as lesson plans and field notes, the researcher asked and answered: What are the challenges and benefits of applying comprehension strategies online and offline.

Keywords: Comprehension Strategies, Reading Online, Motivation, Elaboration, Standards

This study sought to determine whether the use of comprehension strategies helped third grade students take productive notes and write chapter books as and after they read downloaded texts versus their ability to take productive notes and write poems as and after they read online. The study also sought to determine the challenges and benefits of applying comprehension strategies to writing about survival or extinction. The study asked whether limited resources would impact the participant observer researcher's ability to teach "with fidelity and intentionality" (Dougherty, 2012, p. 147). The researcher was particularly concerned about the English Language Learners in the five third grade classes with whom she worked in Striving Elementary School (a pseudonym) in a large northeastern city. Of the over 805 students in the school, 20.4 percent were English Language Learners, and 22.5 percent did not speak English at home. Of the total population, 84.5 percent received free and reduced lunch. Nevertheless, 60 percent of Striving School's third grade population scored proficient or above on the state mastery test in 2010-11, an increase of 5.4 percent from the 54.7 percent of Striving's third graders who had scored at or above proficient the year before. This gain compares positively to an increase of only 1.8 percent made by third graders in the state, from 72.2 percent to 74 percent who scored proficient or above the previous year (Connecticut Department of Education, 2012). Even though Ladson-Billings (2012) decries "race as a worldview" that conceives of part of the population as "inherently unequal," (p. 117), No Child Left Behind legislation requires that students' test scores be segregated by race (NCLB, 2002). Black students comprised 25.7 percent of Striving Elementary School's population. Their gain on the state mastery test was 2.8 percent as they moved from 54.3 percent to 57.1 percent of Black students scoring at or above proficient. Hispanic students, who comprise 44.8 percent of the total school population, moved

from 44.9 percent to 53.7 percent of students scoring at or above proficient, a gain of 8.8 percent. However, only 22.9 percent of the third grade ELL students in Striving Elementary School scored at or above proficient (Connecticut State Department of Education, CeDAR, 2012). To address the special problems confronting newly immigrated students, Echevarria, Vogt, and Short (2000) advocated the use of supplementary materials, including manipulatives, realia, pictures, visuals, multimedia, demonstrations, related literature, adapted text, and graphic organizers (pp. 27-28). While the online texts the students would read in this research project would contain pictures and multimedia and while the researcher could provide graphic organizers for student note taking, it would be difficult in the 30 minutes she had available each week in a tiny computer lab in the basement, where several students had to share a computer, to address all the requirements of an effective Sheltered English lesson (Echevarria, et. al., 2000). These concerns and statistics formed the background for the researcher's work with Striving Elementary School's third grade population.

### **Theoretical Framework**

Contrasting with the accountability testing of the No Child Left Behind Act (NCLB, 2002), Van Meter and Schuder (1996) called for comprehension to be "negotiated among text and readers" (p. 396). Similarly, constructivism "suggests a greater emphasis on cognitive processing" (Zane, 2009, p. 82). In the constructivist vein, metacognitive thinking skills have been promoted as the processes proficient readers use to make meaning of complex texts (Pressley, Mohan, Raphael, & Fingeret, 2007). Therefore, and particularly because the Common Core State Standards Initiative (CCSSI, 2010) called for students to master complex texts, with the second/third grade reading Lexile raised from 725 to 790 (CCSSI, 2010, Appendix A, p. 8), this study focused on metacognitive thinking skills, among them visualizing, inferring,

synthesizing, monitoring comprehension, determining importance, and self-questioning that would enable students to read more complex texts (Almasi, 2003; Keene & Zimmerman, 2007; Lanning, 2009; Pressley, 2000). At the same time, cognizant of the fact that technology should not be used for its own sake but because “it enhances the quality of student work” (Dougherty, p. 77) and mindful that many urban boys live up to a code that does not display “unmanly” behaviors such as intelligence, articulateness, emotional sensitivity, or reading and writing (Cleveland, 2011, p. 40) and do not always stay on task, the study asked whether reading online would motivate students to read with diligence and take productive notes as they negotiated the meaning of the texts (Van Meter & Schuder, 1996, p. 396). The researcher wondered if reading online would engage students as learners (Cleveland, 2011, p. 175) in a way that reading downloaded texts did not and if it would count as a “compelling situation” that students would find relevant and worthy of their time (Cleveland, 2011, p. 176). Would students be as engaged as the ones Clyde, Barber, Hogue, and Wasz described (2006): “Instead of being bystanders, they had become participants in the story” (p. 11). In Clyde, et. al.’s study (2006), students imagined what the characters in *Ruby the Copycat* (Rathman, 1991) were feeling. The difference between Clyde, et. al.’s (2006) study and the current one, however, was that students would be reading nonfiction texts online rather than fiction texts in class. Smith and Wilhelm (2002) used a sociocultural model of learning that provided the means for students to move “from being a novice to being an expert” (p. 38) in pursuit of Csikszentmihalyi’s (1990) flow experience where, in Smith and Wilhelm’s (2002) words, “people are so focused on what they are doing they lose awareness of anything outside the activity” (p. 41). Smith and Wilhelm (2002) warned that this state of flow rarely happens in a classroom where teachers “think of education only as preparation for the future” (p. 69), when “school leaps from topic to topic,” and texts don’t

provide the deep understanding that helps students develop “a sense of competence and control” (p, 107). However, Smith and Wilhelm’s (2002) data showed that resistant students become engaged learners if teachers “tap in to existing student interests, tap the conditions of flow to develop and sustain new ones, and show students the connection of learning to their lives” (p. 113). These theorists, then, offered the theoretical framework that supported this research project.

### **Methodology**

Croninger and Valli (2009) described high quality teaching as a “multidimensional phenomenon best studied through a variety of overlapping, complementary strategies” linked to “rich descriptions of classroom practice” (p. 101). Such a description, also called for by Geertz (1973), was strived for in this study. Rizvi (2012) described multidisciplinary research as an “exploration of problems across subject boundaries, to gain a deeper insight into the studied topics” (p. 2). This study explored problems across science and reading to account for third graders’ low reading achievement and the challenge of teaching science in an accountability culture when science is not a state-selected NCLB (2000) assessment in third grade. The study used participant observation where “the researcher...becomes to some extent a member of the community which she is studying” (Boody, 2009, p. 49). The researcher taught reading comprehension strategies (Coiro, 2011; Pressley, 2001) as part of science instruction (Wiley, Goldman, Graesser, Sanchez, Ash, & Hemmerich, 2009) in Striving Elementary School in a high poverty district where the researcher had been conducting action research for six years. Agar (1980) warned of “interference” when a researcher “eats with the group, works with them, relaxes with them, and hopefully comes to understand them” (p. 6). Ethical issues, therefore, particularly “protecting the confidentiality of participants,” were a concern (Nolen & Vander

Putten, 2007, pp. 403-404). As a consequence, the study was shared with the participating teachers and administrators not only to triangulate the data (Glaser & Strauss, 1967; Spradley, 1979) but to ensure that student, teacher, administrator, school, and district confidentiality was protected (Kamberelis & Dimitriadis, 2005).

Data included student artifacts (notes, poems, and selected websites), researcher artifacts (lesson plans, downloaded texts and online websites, and field notes), and transcribed interviews. For example, four students in Miss Rhodora's class (Teachers' names are pseudonyms) told the researcher that to help students become good readers, she should have them read a lot and that good readers have to get used to reading all the time. The students suggested telling teachers to practice "five finger words," by which they meant those words that would cause students to put a finger down each time they did not know a word as they were reading. A typical lesson plan noted that given a demonstration by the teacher/researcher on pretending to be a tiger, students would be able to pretend they were tigers and guess (infer) what it would be like to have forests as far as they could roam and then watch the trees fall, find the forest gone, and be cast away. Perhaps the students might think, as the researcher modeled while thinking aloud, "I am the tiger, and I am being killed for my bones to make medicine" or "killed for my beautiful striped coat, even though I am nine feet long and weigh 400 pounds." In the lesson plan, students would then "become" tigers and write poems individually or with partners, as they preferred, using notes taken during previous readings of articles about tigers on websites. The researcher would model the use of metaphors; for example: "I am the tiger. I am stronger than an earth mover, faster than a cheetah, oranger than a pumpkin."

Analysis included constant comparison of coded data (Glaser & Strauss, 1967), assisted by NVivo9 software (2010) and a graduate of our School of Education who had learned the

comprehension strategies and recognized them in use. She assisted with coding and discovered such uses as “determining importance” (for example: “Cheetahs are meat eaters.” And “Cheetahs have sharp teeth. They hunt guzls [gazelles].” And “What I know about cheetahs is that they are not faster than sonic and they are pretister [predators].” The graduate noted “copying” as a code, and the researcher agreed with her; however, when students transformed those notes into chapter books when they read downloaded texts and poems when they read online texts or into pictures to show what they visualized, students used original ideas. For example, Student A drew a picture of a lion and cheetah, entitled, “I drew a lion trying to kill a cheetah.” In addition, theme writing (Spradley, 1979) and triangulating the data by discussing teachers’ perceptions distilled the findings of this study to answer its central questions:

1. What benefits accrue when students apply comprehension strategies to downloaded texts?
2. What problems arise in the applying of comprehension strategies to downloaded texts?
3. What benefits accrue when students apply comprehension strategies to online texts? For example, Dalton, Proctor, Uccelli, Mo, & Snow (2011) indicated that “scaffolded digital reading” provides “supports not available in offline environments” (p. 70) and incorporates “universal design” by providing extensive support for diverse learners (p. 71). This study sought to find if that were so for the third graders of Striving Elementary School when the boundaries between reading instruction in reading and reading instruction in science were “porous,” that is, when reading instruction crossed over into science instruction (Croninger & Valley, 2009, p. 105).
4. What problems arise? For example, Croninger and Valli’s (2009) five year study discovered that teachers were successful in eliciting work of “high cognitive demand”

(p. 101) when they focused on “managing instructional activities more than on student behaviors” (p. 103). The study sought to avoid focusing on student behaviors.

### **Results**

Both benefits and challenges surfaced during the school year in which this research project took place. Benefits included student engagement in their reading online and outweighed challenges which included the difficulty of finding science texts online at third graders’ reading level.

#### **Benefits**

Benefits to applying comprehension strategies to downloaded and online texts included the fact that applying comprehension strategies provided a purpose for reading (Vacca, Vacca, Gove, Burkey, Lenhart, & McKeon, 2009). For example, when Students B and C took notes on the computer as they read about tigers on the *Panthera Tigris website on the Yahoo! search engine* [[http://animaldiversity.ummz.umich.edu/site/accounts/information/Panthera\\_tigris.html](http://animaldiversity.ummz.umich.edu/site/accounts/information/Panthera_tigris.html)], it was apparent that they were interested in the information they could visualize (*Tigers have a reddish orange coat with vertical black stripes along the flanks and shoulders that are big in size length . Some tigers have pale fur .*), the information they determined was of importance (*Some tigers weigh 423 kg.*), and the information that answered their questions (*The dangers of the tigers are the humans that try to kill them. The reasons tigers survive is because of their claws and their camouflage*), all important comprehension strategies. Benefits also included the fact that these students liked animals and could easily put themselves into the position of “being” the animal, as Kucan (2007) advocated and as can be seen in the following poem by Students B and C:

I Am the Tiger!

I am the Tiger!

The jungle is getting destroyed.

I will fight with might to the death and void.

They try to kill me because they like my fur, my meat, my bone medicine.

They like our fur because it is soft.

They like my meat because it is tasty.

They want our jungle for houses.

Applying comprehension strategies enabled students to understand complex ideas (Coiro, 2011).

For example, in order to apply the determining importance comprehension strategy, Student D took the following notes from the *Panthera Tigris* website

[[http://animaldiversity.ummz.umich.edu/site/accounts/information/Panthera\\_tigris.html](http://animaldiversity.ummz.umich.edu/site/accounts/information/Panthera_tigris.html)]. In

taking the notes, Student C realized the tiger's power when, even though the tiger only weighed 423 kg, it could carry a gaur bull weighing 700 kg:

1. Tigers are powerful because they carried a 700 kg gaur bull.
2. Some tigers weigh 423 kg.

For another example, visualizing enabled students to grasp the relative position of animals to their prey and the importance to survival. They applied their visualizing strategy to all their senses:

I saw: a group of cheetahs (male, brothers) running around (833 square kilometers  
322 square miles)

I heard: roaring, tumbling, and chirping birds.

*I smelled: the grass.*

*I learned: that cheetahs (male, brothers) barely live alone and that cheetahs run a lot.*

**And:**

*I saw cheetahs with their cubs.*

*I heard the wind blowing.*

*I smelled the meat that the cheetah was eating and the field they were running in.*

*I tasted the meat that I found.*

*I touched the grass below me.*

*I learned that a cheetah runs faster than one mile, and they hunt food for their cubs and themselves.*

Benefits to applying comprehension strategies to online texts were many. Students were excited to use the computer lab and motivated to read online. Students learned to navigate a safe site (Yahooligans) recommended by Leu, et. al. (2004) as one of the safe sites it is important to provide for younger children (p. 305).

Utilizing another comprehension strategy, self-questioning, students were able to ask their own questions related to state science standards that call for students to understand “Organisms can survive and reproduce only in environments that meet their basic needs” (Connecticut Department of Education, 2010, p. 35) after the researcher used guided release of responsibility to model self-questioning (“What has helped the tiger survive?”) then thinking aloud to determine the answer before guiding students in the same process (Pearson and Gallagher, 1983; Brown, 2008; Lanning, 2009).

Students selected their own articles to read to find answers to self-questions.

Students learned key concept words, such as *adaptation*, *advantage*, *camouflage*, *hibernation*, and *migration*, as apparent in the “I” passage Student E wrote when making an inference about the way she would feel if she were a tiger: *I am a tiger and I eat flesh. People destroyed my habitat. They kill us because they use us for meat, fur, and medicine. Tigers like me live in Africa. It's very hot in Africa. We search for flesh out in Africa too. The food we like to hunt is antelopes and other animals.*

Students learned standards that applied to the animals. An important state standard for Grade 3 was “Plants and animals have physical and behavioral adaptations that allow them to survive in certain environments” (Connecticut State Department of Education, 2010, p. 35). Student F first wrote an “All About” book about cheetahs and later revised his ideas to produce a chapter book about cheetahs. Because the chapter book was intended for first graders, each chapter had one idea with room left for pictures of cheetahs. Student F applied his inferring comprehension strategy to determine what first graders would like to know about cheetahs. His one page ideas included the following: *Cubs only live with their mom for a year and a half...Cheetahs climb on hills to find their food...Cheetahs don't roar like lions. They hiss and chirp...Cheetahs live about 6.9 years in the wild...*

Students responded both online and to downloaded texts to “requests for complex forms of thinking” (Croninger & Valli, 2009, p. 101), as is shown in the empathy for the tiger in Student G’s reflection:

*I am the TIGER. I am sad because hunters are destroying my habitat just because they want my fur. People should stop killing tigers just for fur. The tiger does not like that. Hunters should be ashamed of themselves. GOOD LUCK, TIGERS*

Student H's reflection was equally empathetic, but with the understanding that what endangered the tiger's habitat also endangered the human habitat, a very complex form of thinking for third grade:

*I am a tiger in the forest. I am sad and lonely because people are cutting down trees with chainsaws, and now because of that we have a harder life because we are not getting enough oxygen. Please help us tell people that we need trees, but it's not just bad for us in the environment. It's bad for you, too! And they sometimes eat us! That is even worse!*

### **Problems**

Problems included the finite number of texts available to be downloaded or read online at the reading level of third graders, particularly struggling readers. Even though experts in the field recommended websites where valuable texts are available (Leu, Leu, & Coiro, 2004), frequently those websites are no longer funded, as is the case of the Eisenhower National Clearinghouse for Mathematics and Science Education (<http://www.enc.org/>), or difficult for students to navigate, as in the case of Frank Potter's Science Gems ([www.sciencegems.com/](http://www.sciencegems.com/)), or established to sell publications on the topic students are searching, as in the case of [www.nsta.org/main/sciencesites/](http://www.nsta.org/main/sciencesites/)). However, when students did find a website they liked [<http://animaldiversity.ummz.umich.edu>], they found important information to answer their classmates' questions about tigers. What follows is a compilation of student's answers the researcher recorded on the white board to the question: *What helps tigers survive?*

*Food, water, a big area to live...tall grass.*

Tigers survive because their claws can help them climb trees and when the hunters come, they may not see them.

Tigers can live in lots of habitats. Tigers' stripes can match the tall grass. Tigers' eyes can see in the dark if any predators are close by.

The tiger can survive by blending in and they can hide.

The tiger hunts at night time, and tigers use their night vision, so that their prey will not see them in the night.

Tigers survive by using sight and hearing to catch prey.

I think their strength because the article says it dragged a bull, and that means they're strong.

**On the other hand, a problem occurred when students were not fluent and volunteered to read aloud from websites, downloaded texts, or their own notes which they sometimes transferred literally from the website without fully understanding, as in the case of Student I:**

*Tigers have reddish and orange coats with vertical black stripes along the flanks and shoulders that vary in size, length, and spacing. Some subspecies have paler fur and some are almost fully white.*

The student's lack of comprehension came, no doubt, from his having been encouraged to select the article he would like to read (Smith & Wilhelm, 2002), and he selected one with words like "vertical," "flanks," and "subspecies" that were beyond his understanding.

Other problems resulting from applying comprehension strategies to texts read online included the difficulty of providing feedback in a timely manner. "Elaborated feedback" makes the difference in students' online achievement, according to Meyer, Wijekumar, Middlemiss,

Higley, Lei, Meier, & Spielvogel (2010, p. 86). However, it was impossible to reach 24 students in a timely fashion, even when several were working in pairs, and, as always, the classroom teacher was helping. Further, reading online was ephemeral. Once the website disappeared, so did the students' interest, or so this study found.

### **Conclusions and educational implications**

According to Marsh (2011), both offline and online worlds offer the opportunity to engage in authentic activities that develop the skills to navigate a digital world. This study found that students easily learned comprehension strategies and just as easily applied them, online and offline. However, students navigated texts more enthusiastically online. In fact, the five struggling readers in Miss Camellia's class who were disengaged in the classroom when asked to read downloaded texts actually ran to reach the basement computer room, logged on immediately to the Yahoo!igans website, and continued their work from the week before, saving their notes into "their" space. Coiro (2011) discussed the way "skilled readers" approached the task of reading online by planning in advance to avoid distractions of the Internet; "negotiating" online texts by applying strategies for "determining important ideas...investigating author credentials...and corroborating questionable claims." (p. 109). Coiro explained that students must monitor comprehension and "apply fix-up strategies" such as rereading, adjusting speed, clarifying understanding; read, write, and reflect reciprocally by "summing up..., making connections, looking deeper, asking questions, and contributing their own ideas..." (p. 109). Only through applying the steps Coiro recommended did students in this study master the process of reading complex texts online or offline. For example, students in Miss Camellia's class asked the question: "What adaptations help tigers survive?" They shared orally after reading, "It's large, 267 kg or 587 lbs, which makes it stronger than its prey." "It eats monkeys,

buffalo, African young elephants.” “It can blend in the tall grass because its body markings give it camouflage.” Students were also able to monitor their own comprehension by identifying points of confusion: “I was confused by the word ‘originated.’ I don’t know what it means.” “I was confused by some cheetah history. It didn’t make sense.” “I was confused by the word ‘genetics’ and the word ‘climatic.’” I was confused by the word ‘inbreeding.’”

Croninger and Valli (2009) identified three forms of shared responsibility for reading instruction: 1) supplemental shared instruction where classroom instruction is supplemented outside the classroom with tutorials, intervention programs, and reading tutorials; 2) simultaneous shared instruction where teaching responsibility is shared by another adult in the same classroom, and 3) sequential shared instruction, where a teacher is given responsibility for students previously assigned to another teacher (p. 104). This study of the five third grades in one northeastern urban elementary school found a different pattern: Of the five third grade classrooms that moved students from their heterogeneous homerooms to homogeneous groups for a two and a half hour literacy block, four classes had no additional support for students, while one classroom had four teachers in attendance simultaneously: the classroom teacher and three additional teachers, including the ELL support teacher, the special education support teacher, and the reading support teacher.

Anderson & Shattuck (2012) described keynote addresses in which they asked audiences to remember research projects that, like medical research, had made a difference. Rarely, did educators think of any but “trivial outputs” (p. 18). This researcher agreed with the authors that the results were “depressing” (p. 18). For this researcher, though, the research reported here was significant in that it engaged students fully in online, more than offline, reading; enlisted the full cooperation and full participation of the third grade teachers of the students described—for all

but the one teacher who was not free to accompany her five students to the computer lab; and close to full compliance with “Design-based Research,” as described by Anderson and Shattuck (2012) that can only occur when teachers and researchers become partners because it is “situated in a real educational context,” focuses on a “significant intervention,” uses a “variety of research tools and techniques,” leaves “room for improvements in the design,” involves a “collaborative partnership between researchers and practitioners,” and is not designed to create “grand theories” (pp. 16-27). In addition, with Gladson-Billings (2012), this project asked, “What is right with African American students and what happens in those classrooms where teachers are successful with them?” (p. 117). What happened in this study was that teachers respected all students for their personal and intellectual strengths and valued their contributions to the classroom community and intellectual store of information. Rather than organizing their perceptions around “failure,” or seeing students as “culturally deprived” or “culturally deficient,” each third grade teacher, administrator, and this researcher believed “deeply in the intellectual capability of the student and his or her own efficacious abilities” (Ladson-Billings, p. 117). It made the difference.

One feature of Design Based Research (Anderson & Shattuck, 2012) is that it is never finished. Next time the researcher would propose to the teachers that we start, right from the beginning, to plan for students to submit their data to one the projects listed on Global SchoolNet’s Internet Projects Registry at <http://www.gsn.org/pr/index.html> (Leu, Karchmer, & Leu, 2003, p. 463), perhaps the “Global Virtual Classroom Web Design Contest” where students work with students of other countries to design an “educationally productive” website that shares the content they have learned (Retrieved from <http://www.gsh.org/GSH/pr/search.cfm>). In this way students can experience the “fundamental change in the nature of classroom literacy”

because “the Internet breaks down traditional classroom walls” and makes all that students do inside the classroom accessible to other students in other classrooms (Leu, et. al., 2003, p. 467).

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