Increasing Teachers' Metacognition Develops Students' Higher Learning during Content Area Literacy Instruction: Findings from the Read-Write Cycle Project

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Introduction

Success in the 21st century, for individuals and societies, requires competence in comprehending and communicating in the academic disciplines—the natural sciences, history, geography, and more. The Read-Write Cycle (RWC) Project, a three year longitudinal research study conducted from 2005-2008 in ten public elementary schools in southern California, explored the effectiveness of curriculum and instructional strategies that integrate literacy with disciplinary knowledge with the simultaneous goals of (a) enhancing students' literacy outcomes and (b) broadening and deepening knowledge of the content area. Funded by the U.S. Institute of Education Sciences, the RWC Project concentrated over years one and two on 1,024 students in grades three through six

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and the ongoing professional development of 18 classroom teachers. This documentary account focuses on one aspect of the larger project, specifically the RWC Project's effect on teachers' metacognition about their own practice leading to upper elementary grade students' higher learning by developing students': (1) metacognition and reflection; (2) exploration and depth in content domains; and (3) integration of literacy in content areas.

Theoretical Framework

The Read-Write Cycle Project research and professional development team members represent varied backgrounds in education and psychology and, as such, each contributed a distinct theoretical and/or practical perspective on content area literacy teaching and learning. However, consistent among all team members was a shared belief in and commitment to the following key constructs: constructivistic views of teaching and learning, emphasizing metacognition in instruction, using multiple strategies for reading comprehension, and the role of the teachers as co-learners in the process.

Constructivism and Metacognition

Our views are consistent with long-standing constructivist theories (Anderson, Spiro, & Anderson, 1978; Hayes & Flower, 1980; Scardamalia & Bereiter, 1982; Spiro, Bruce, & Brewer, 1980) and recent constructivist approaches (Afflerbach, Pearson, & Paris, 2008; Duke & Martin, 2008; Kintsch & Kintsch, 2005; Pressley, 2002) supporting the proposition that the effective learner is an active problem solver, one that engages cognitively around the problem at hand and in understanding the thought processes surrounding the solution of the problem. We believe the engaged learner demonstrates deliberateness and conscious decision-making in taking "active control over cognitive processes" (Gama, 2004) and that this level of consciousness in decision-making must be achieved through leading students to be metacognitive during their learning experiences. We use Pressley's (2002) description of metacognition as thinking about thinking or in other words, an awareness of one's thought processes that evaluate the effectiveness of choices made in the present as well as the long range outcomes.

Unlike cognition, which is merely the act of knowing, metacognition is the learner's reflection about what he or she already knows or is in the process of learning (Smith, 2004), which we contend is a missing link in instruction in most classrooms today. Recent research suggests that the further development of cognitive to metacognitive thinking

enhances both retention and comprehension for the learner, and that the ability to think metacognitively is the critical distinction between low and high achieving students (Pogrow, 2004) such as those we serve in the Read-Write Cycle Project. In exploring metacognition's role in comprehension, Pressley asserts it is "knowledge about reading and how reading is accomplished" (2002, p. 304). Although the research supports the enhanced benefits of metacognitive instruction in classrooms, without appropriate teacher professional development, few of these comprehension strategies transfer to or persist in many classroom settings (Boulware-Gooden et al., 2007; Baker, 2008; Block & Duffy, 2008). This project attempts to develop teachers' skills in metacognition instruction in naturalistic ways that are easy for them to implement and effective for students.

Comprehension: A Multiple Strategies Approach

Since the 1990s, comprehension research has explored a range of effective strategies such as think alouds, making predictions, and visualizing techniques in the classroom (Pressley, 2002). Recently, this multiple strategies approach by which individuals coordinate and orchestrate identified effective reading strategies has been promoted by the National Reading Panel (NRP; 2000) report and the RAND Reading Studies Group (2002). According to the NRP report, teaching a *combination* of reading comprehension techniques is more effective for increasing reading comprehension. It also found especially promising the movement from isolated strategies to combination techniques embedded in classroom routines: "The Panel regards this development as *the most important finding* of its review because it moves from the laboratory to the classroom and prepares teachers to teach strategies in ways that are effective and natural [italics added] (NRP, p. 4-52)."

The Panel's report also suggested that teaching comprehension in the context of specific academic areas can be effective and that it might be efficient to teach comprehension as a skill in content areas rather than through stand-alone methods, furthering the idea of instruction in an integrated setting. Duke and Martin (2008) concur stating "contextualized reading comprehension instruction within a strong focus on knowledge building yields considerable benefit" (p. 245). The viability of linking comprehension in content area instruction has been empirically supported in elementary students' science reading through the Concept-Oriented Reading Instruction model (CORI) (Guthrie, Wigfield, & Perencevich, 2004), the Valle Imperial Project in Science (VIPS) and Romance and Vitale's In-Depth Expanded Application of Science (IDEAS) model developed in the early 90s (Vitale, Romance, & Klentschy, 2006).

Similarly, our team views the content areas as the logical place for the majority of literacy instruction to occur at the upper elementary levels and beyond. Also, because neither science nor social studies are "tested" areas at most upper elementary grade levels in California, this Read-Write Cycle project concentrates its efforts on the domains of science and social studies for our activities.

Role of the Teacher

Developing students' metacognition requires teachers who are knowledgeable about varied comprehension strategies and explicit about teaching them. There is widespread agreement on teachers' instrumental role in providing explicit metacognition instruction to students (Baker, 2008; Kintsch & Kintsch, 2005; NRP, 2000; Pressley, 2002; RAND Report, 2002). However, while teachers are aware of students' need for comprehension strategies, they often have not provided direct instruction in how to use them (Pressley, 2002).There remains a need for research into the professional development required to scaffold teachers in developing strategic readers across the curriculum, providing supports for integrating instruction (Duke & Martin, 2008), and cultivating students as "professional thinkers" (Block & Duffy, 2008). The Read-Write Cycle Project addresses this gap in professional development.

In an effort to consolidate our theoretical views into a single cohesive idea, we worked for several days on a summary statement which we could use as our "project compass" to guide the construction of our professional development activities and to aid us in representing our ideas to others. This summary statement (Miller et al., 2005) appears below.

> Teachers and students need a wider and more powerful understanding of language and literacy as fundamental tools for thinking and learning. Language and literacy are embedded in the construction of content area knowledge. Without content, literacy—the two-way communication of an idea or construct—cannot be achieved. Language and literacy are used and manipulated to enable us to make sense of and communicate our ideas, concepts, and bodies of information. We aim to transform inert content facts into dynamic understandings and concepts.
>
> This is achieved through the engagement of teachers and students in parallel developmental activities. As co-constructors of knowledge, together they become comfortable, confident, independent, reflective, informed, and collaborative learners. Sustained learning can only be achieved with deliberate attention to the motivation level of both teacher and student.

Read-Write Cycle as a Conceptual and Practical Framework for Developing Metacognitive Learners

Instructional support for engaging students in significant activities in the content areas of science and social studies confronts several challenges, both practical and conceptual. The most serious practical problems are time and coverage. The school day/week/year is too short for coverage of all the "standards" mandated in various ways by policy makers and administrators. Discussion of deep learning for any content domain can be quickly dismissed when test scores in the basics require insistent attention; we further acknowledge that neither science nor social studies are "tested" areas at most upper elementary grade levels in California. The Read-Write Cycle Project addressed these challenges in several ways. Most importantly, the project design "steals time" by integrating reading with writing, embedding both in content areas. Practically speaking, the argument is that it is possible to teach reading comprehension techniques while studying science and social studies, not as ancillary study skills, but in a manner that is true to what is known about enhancing reading comprehension.

Explicit instruction in cognitive processes and strategies supports students as active learners rather than passive consumers. These techniques can particularly benefit students whose out-of-school experiences have not promoted development of an academic language register (Olson & Torrance, 1996), and children for whom English is a second language. A central feature of the Read-Write Cycle Project is an investigation of the impact of this multiple-strategy, content-based approach to reading comprehension instruction. We chose the content areas as the appropriate place for reading comprehension instruction not only because of the NRP recommendations, but because we consider that engagement of students in academic disciplines is essential for individual motivation, life prospects and societal benefit (Block & Mangieri, 1997; Goldman, 1997).

The classroom teacher occupies the crucial role in the design of this study. Our approach to improving student achievement centered on increasing teacher understanding of the role of metacognition in literacy, on moving teachers away from working on comprehension of texts of limited size and scope toward comprehension of content knowledge domains, and on increasing teacher capacity for planning and implementing literacy-based lessons that cut across content areas.

In order to achieve these goals, we worked with 18 teachers over three school years (SY2005-2006 through 2007-2008) in a distributed professional development delivery schedule. Teachers were voluntary participants. Rather than bringing teachers in for intensive week-long

summer institutes or concentrated multi-day trainings, we conducted 18 total days of professional development (PD) spread over the three years with the highest number of days (10 total, averaging one per month of school) conducted during Year 1 (five days were conducted in Year 2; three days in Year 3). This approach allowed teachers the necessary time between PD sessions to fully consider what was taught in each, reflect on them, and to bring to the next session thoughtful questions and examples of materials and artifacts that they wanted to study at the next session. Additionally, because we knew the significance of the amount of material we were teaching the teachers in their first year with us, and the fact that all of the content and strategies we were presenting to teachers was cumulative—meaning, teachers would not be able to come to a professional development session and immediately implement what they learned in their classrooms—we insisted that teachers wait to implement anything they learned in PD during their first year until the next school year (which forms the basis for Year 1 of our assessment plan).

This created intellectual dissonance for many of the teachers who wanted a "make and take" approach to each PD session, and had to be directly addressed by the members of our team. We constantly articulated to the teachers during the first year that they must go through the same metacognitive processes on their learning that their students would undergo, and that completion of the entire first year of PD would be necessary for total understanding of the individual curriculum and instruction components being taught at each session. Fortunately, the teachers were willing to take this necessary time and endure the wait—and expressed to us in the second years' PD sessions that had they not waited to implement all they had learned, that they likely would not have been able to make as significant of a transition in their instruction since they would have been implementing ideas piecemeal instead of in total.

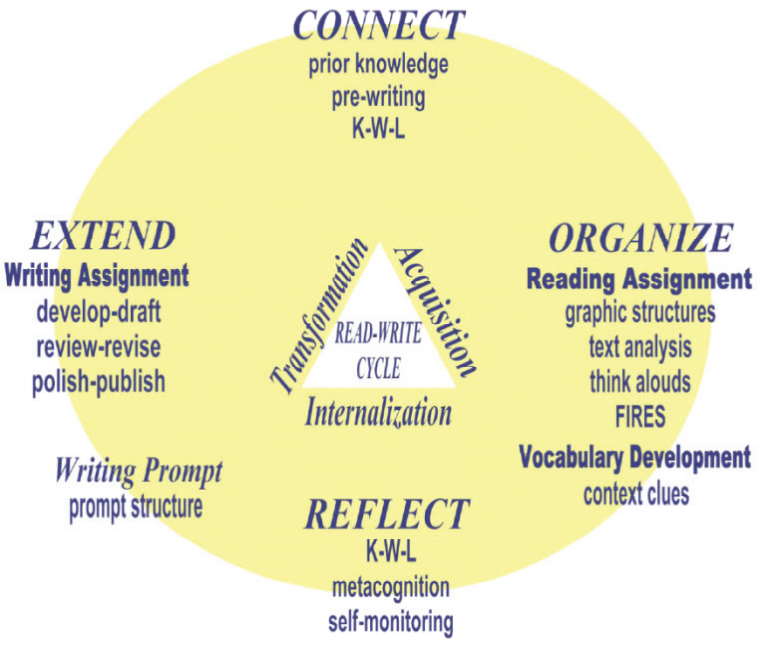
Overall, during their first year of professional development, teachers learned about the role of metacognition, transitioning to concentrating on content domain building, and on how to implement the Read-Write Cycle by creating units of instruction that were based in a particular content domain with their grade-level peers from across the district in which we were working. All teachers created multi-week units; they implemented and reflected on these units during their second year of working with us, and revised the units as necessary. During that final year, teachers again implemented the units and in PD concentrated on analyzing student work and reflecting on how participation in the Read-Write Cycle Project was affecting their approach to teaching and their students' achievement. Initially, teachers exhibited varying levels

of receptiveness to integrated content area reading instruction in a continuum of low to high (White-Smith, Curwen, Miller, & Calfee, 2009). As the project drew to a conclusion, all 18 teachers were interviewed and favorably noted the shifts in their teaching and in student learning.

Developing the RWC Model

We relied on the CORE Model of Instruction (Connect, Organize, Reflect, Extend; Chambliss & Calfee, 1998) as the basis for our instructional design because of its applicability to all subject areas and its emphasis on a consistent cognitive strategy approach to all subject areas. The CORE model incorporates four essential constructivist elements; it *connects* to student knowledge, *organizes* new content for the student, provides opportunity for students to *reflect* strategically, and gives students occasions to *extend* learning. Using the CORE Model in teacher professional development in content area instruction in 2000,

Figure 1
Read-Write Cycle (Miller & Calfee, 2004)



authors Miller and Calfee responded to teachers' requests for a more comprehensive model that directly addressed literacy in the content areas and specified strategies they already knew. The authors used the CORE model from which the Read-Write Cycle was engineered.

The Read-Write Cycle (Figure 1; Miller & Calfee, 2004) employed in this project uses widely known reading comprehension and writing strategies to represent activities that can be implemented during each phase of CORE instruction. Metacognitive reflection is emphasized throughout the model; reading comprehension is assessed continually through both oral and written methods. Instructional strategies represented in the Cycle diagram include pre-writing (Tierney et al., 1989), think-alouds (Davey, 1983), graphic structures/organizers (Calfee & Drum, 1986), text structure (Chambliss & Calfee, 1998), contextual vocabulary clues (Miller & Gildea, 1987), FIRES (Dade County Public Schools Office of Instructional Leadership [DCPS], 1992), and K-W-L (Carr & Ogle, 1987). While these particular strategies appear on the Cycle diagram, they are only representative of the numerous strategies that can be used in each phase. In fact, during the Read-Write Cycle Project, teachers worked collaboratively to identify more than 20 strategies known to them that could be applied in each distinct phase and shared these strategy lists with each other during their professional development sessions (see Appendix A for lists). Consistent technical language was important for teacher collaboration, and also scaffolded student dialogue. Now teachers had a model for instruction that they could use in any subject area, and with any new instructional technique they might learn from our Project team or in their districts' in-services. Using the Read-Write Cycle as the basic format for instruction helped the teachers raise their capacity for successful instructional planning.

Metacognition in the Read-Write Cycle occurs at all stages, but particularly in the Connect, Organize, and Reflect stages. The Extend stage tests the previous three. In the Connect phase, teachers identify for students what they will learn in the read-write lesson. Teachers activate prior background knowledge by having students actively reflect, share with others, and write from their knowledge and experience as it applies to the topic to be studied. Because the subject matter knowledge to be shared with students is supplied in text format, we recognize that meaning does not exclusively reside in text, but rather that it is created as the reader transacts with the text and draws upon his/her knowledge and experiences (Rosenblatt, 1978; Brown, Campione, & Day, 1981). Asking students to share their prior knowledge also aids the teacher in identifying both the academic level of the class as a whole, and any possible scientific misconceptions that students hold and need remedied.

During the Organize phase, students take their post-reading ideas and organize them using graphical structures, such as a web, matrix, linear string, or others. Analysis of text structure must also be completed to carry out this task. As students develop graphic structures to organize the text content matter, they are asked to justify their choice of structure and organizational method. It is of key importance to note that graphic organizers are not given to the students; instead the students, with teacher guidance, actively create them. This active creation of the organizer further strengthens the student's metacognitive and reasoning ability.

In the Reflect phase, students examine their graphic organizer's structure and content, and make revisions as necessary. The teachers in this project were trained by their district to use thinking maps. So the students had some exposure to the purpose of graphic organizers and had seen numerous examples. At this point, the teacher introduces the student to the writing prompt. Students also reflect on the writing task at hand, i.e., prompt. The RWC Project uses a specific system for writing prompt structure, and students reflect on the parts of that prompt structure, as well as on how their content ideas (contained in the graphic organizer) can be applied to answering the prompt.

The Extend phase provides opportunities for students to synthesize their knowledge, organize it in new ways, and transform it for new written applications. The content knowledge gained from multiple reading samples and experiences across the content areas helps shape the knowledge domain; students' individual and group work must be assimilated in an appropriate manner to complete the tasks given by the teacher. In addition, students must work together effectively and cooperatively to achieve success. Appendix A contains examples of types of activities that helped teachers meet this goal.

Research Methodology

The Read-Write Cycle Project is grounded in the conceptual framework of design experiment theory (Collins, 1992) and incorporates formative evaluation, the study of the growth of student skills and knowledge over time, observations of teachers and students on a frequent and recurring basis, and negotiation of curriculum and instruction decisions that reflect the differences among schools, teachers, students, and classroom environment. The idea of the teacher as a "reflective practitioner" (Schön, 1983, 1987) is deeply ingrained in the research design, allowing teachers to refine and adapt their lessons in response to student experience. Goals of the project that relate to metacognition and discourse include improved

student ability to explain reasoning; increased student ability to interact appropriately with peers in small group settings; teacher acquisition and implementation of instruction and assessment strategies that emphasize metacognition and student discourse; and enhanced teacher ability to communicate effectively with colleagues as a result of project participation.

The experimental design employs qualitative and quantitative measures and incorporates longitudinal case studies to answer the research question focused on in this article, *How do classroom teachers implement RWC professional development in developing students' metacognitive learning?* Ten public elementary schools located in a single urban-suburban school district in southern California were selected for project participation through purposive sampling for their potential to provide "information rich" sources (Patton, 1987). Four schools received Title I funds in SY 2004-2005; two of the schools were enrolled in No Child Left Behind Program Improvement (PI) efforts. The district's diverse student population is comprised of 46% Hispanic, 36% Anglo, 12% Asian, and 2% African American students (4% indicated multiple ethnicities or no response).

Eighteen teachers from ten of the district's elementary schools voluntarily participated in the experimental group in the study. The teachers' experience ranged from two years to 25 years with over half of the teachers holding Master's degrees. Qualitative data included audiotaped teacher semi-structured interviews (Appendix B) and videotapes of professional development days that provided rich teacher "talk-back" sessions. Interviews were audiotaped and professionally transcribed, as were selected videotaped PD sessions. Other data sources included classroom observations, videotapes of classroom practice, teacher reflective journals, and document review. While not the focus of this particular article but forthcoming in additional publications, quantitative methods used to capture student academic outcomes include pre- and post-results of the IOWA Test of Basic Skills Reading Subtests, IOWA Writing Assessment, and researcher-developed reading-writing assessments. Researcher created writing rubrics (rating length, coherence, grammar/mechanics, vocabulary, spelling and content knowledge) were used to evaluate changes in student writing. Additionally, ongoing district assessment data were gathered for students in experimental and control classrooms.

While "state standards-based instruction" is mandated throughout the public school district in southern California in which our project is situated—as it is in most public school districts across our state—the California Content Standards provide no guidance for instruction of the standards' content, similar to that of most other states' standards

(Wixson, Fisk, Dutro, & McDaniel, 2002). The challenge to our team was to spell out procedures to guide practicing teachers, whose careers ranged from two to 25 years in the classroom, in the development of instructional units that captured essential features of a content domain, including both curriculum and instructional components, as a basis for studying learning and metacognitive transfer of significant concepts and procedures. In proposing this strategy of promoting acquisition of deeper knowledge rather than simpler facts amongst struggling readers, we flew in the face of the usual approach of building the basics before introducing anything substantive. In insisting on teachers creating their own lessons with our team serving as *guides* rather than providing our project teachers with scripted lessons to follow, we went even further against the norm currently found in struggling schools where scripted and externally paced instruction are required.

Data Analysis

Classroom observations of teacher practice and interviews during professional development days were analyzed through the lens of grounded theory (Strauss & Corbin, 1992) and included a multi-level approach. Individual teacher interviews were conducted at the conclusion of each year of professional development by research team members. The interview protocol included questions about teacher change from participating in the project, changes in their teaching, and effects on students' learning.

Using HyperRESEARCH™ qualitative software in the first level of analysis, the research team worked in pairs to read the transcripts and code for metacognition. Typically, teachers did not use this specific term to describe the effects of the Read-Write Cycle (RWC) on students' cognition. Therefore, in order to capture teachers' awareness of the RWC on students' learning, the coding shifted to include other researcher analytic codes, e.g., "student growth" and participant emic terms, e.g., "transformation." In this analytic stage, a HyperRESEARCH™ report of codes and the accompanying transcript contextual source material was generated. This report totaled 65 single-spaced pages of teacher comments. The next analytic step involved taking these instantiations and through constant comparative methods identifying relevant codes for student reflection and engagement in their language arts, social studies and science lessons. Samples of codes used included: RWC lesson, student growth, student transformation, student progress, CORE focus, effect on low-performer, social dynamic of classroom, and state standards. Based on revised codings, a refined 28-page report was cre-

ated; it is this refined report that provides the teacher evidence results cited in the next section.

Two team members next met with the report for a third analytic step which included further collapsing these codes into a finer analysis to identify patterns in teachers' identification of students' change as a reader and writer. This collapsing of categories yielded three major themes which provide the organization for our presentation of results in this article: (1) evidence of metacognition and/or reflection; (2) creation/exploration of content domains; and, (3) integrated literacy and content instruction. As previously indicated, this study included both quantitative measures of student outcomes in reading, vocabulary acquisition, and writing with positive results of RWC instruction implementation (White-Smith, Curwen, Miller, & Calfee, 2010). This current report outlines one aspect of the qualitative findings on the effects of sustained teacher professional development on student learning.

Results and Discussion

The Read-Write Cycle became, as evidenced by participant teachers' expressed views, a common-sense answer to how they could format instruction and integrate not only literacy and the content areas, but also how they could use all of the myriad instructional techniques given to them during pre-service and in-service professional development in a complementary and effective manner. A common complaint from the participating teachers was that instructional strategies are "thrown" at them constantly—they often referred to such strategies as the "flavor of the month"—and they are never instructed in how to organize the many offerings into a cohesive instructional unit. Using the Read-Write Cycle as the basic format for instruction helped the teachers to directly address this problem and raise their capacity for successful instructional planning.

Teachers' comments indicated their awareness of students' use of multiple strategies as they transacted with text. This section addresses findings from the 18 teacher interviews conducted at the conclusion of the project; the third year of professional development with teachers and Year 2 of implementation with students and assessment.

Overall, teacher comments indicate in general that teachers believe the Read-Write Cycle has helped further students' learning and has brought it into a form of metacognitive learning based largely on reflection and extension practices they have implemented. Participant teachers report an encouraging increase in higher order thinking in their respective classrooms. Teacher reports are based on the level of classroom academic discourse, increased frequency of students' connection from

one content area to another, and vitality of learner engagement. Four excerpted transcript samples that typify each of the three major themes, (1) evidence of metacognition and/or reflection; (2) creation/exploration of content domains; and, (3) integrated literacy and content instruction, previously highlighted are presented below.

Students' Metacognition and Reflection

Metacognition is defined as the ability to differentiate the immediate and long range effects on learning (Pressley, 2002) and as "active control over cognitive processes" (Gama, 2004). Teachers report that students participating in the Read-Write Cycle classrooms provided evidence of deliberate and conscious action as they approached the cognitive demands of content area expository texts. Using explicit comprehension instruction, teachers used multiple strategies such as K-W-L charts and graphic organizers to support students in organizing information, finding key information, and summarizing from their texts. Furthermore, these comprehension strategies, as well as others, were used by students prior to reading, during the reading process itself, and upon conclusion of a text. One teacher noted how students were doing more than learning a series of facts and figures. While involved in a thematic unit of study, students were tackling more substantive universal generalizations as they related conceptual ideas from one text to another. The effect on students' increased engagement in text prompted a teacher to comment:

> They were more analytical about the reading, so that I wasn't relying on those comprehension questions at the end [of the chapter]. It wasn't this mechanical exercise of reading the story. They read it for enjoyment. They read it for meaning.

The transition from students actively thinking about a text while they read was contrasted with the teacher's previous practice of waiting until completion of a prescribed textbook chapter before assessing children's understanding. Now teachers and students were understanding that comprehension was an ongoing process and did not only occur after discrete reading of passages. Another teacher similarly described students' ongoing engagement with text. The following quote illustrates how students' use of comprehension strategies during their reading of expository text generated authentic questions and interest for further exploration. A significant aspect of the following quote is the teacher's recognition and willingness to build on students' curiosity as the impetus to more extended study. The teacher explicitly supports the students in their understanding that learning can be broadened beyond a classroom text to incorporate additional textual sources to augment their knowledge gaps. The teacher cited:

> And they also just reflect upon what they read and also what questions they still have . . . you know, "I do have this question" or "What about this?" or "I heard about this and it's not in this article." So, it was like a stepping stone for, "Well, where else can we look? Where else can we find the information?"

The above quote indicates the teacher's awareness that children no longer viewed the conclusion of a textbook chapter as a stopping point. Learning generated further questions and sparked new thinking. The teacher realized how students were willing to explore learning as a continual and evolving process.

Students were described by teachers as active in strategically making decisions about the skills and resources they would use to aid their learning. This finding is consistent with constructive theorists who describe an effective learner as active problem solvers (e.g., Rogoff, 2003; Scardamalia & Bereiter, 1982; Vygotsky 1934/1986). Several teachers commented on student agency as an outcome of implementing the RWC model noting "they're taking ownership" and "the kids now are taking more responsibility of their learning…[the RWC] is a way for the kids to own it." Students became adept and accustomed to having choices regarding specific strategies to employ in comprehending texts (some as seemingly simple as using "sticky notes") as they engaged in reading. As evidenced by student artifacts and work samples shared with the research team at PD sessions, students used a variety of reflective techniques, such as producing different written products, creating charts of conceptual relationships, and using other visual and tactile means to represent learning. When reflecting on student response resulting from the sustained participation in the RWC professional development, one teacher considered how the changes in her teaching impacted student learning:

> I think it did embody a lot of what the Read-Write Cycle is about with the connecting [stage] and the organizing [stage], because they had to stop and organize their writing and think about "What are these facts?" and "How can I describe them?" They just had a lot of . . . good stuff happening. It was fun.

Increased reflection on the choices made in their learning contributed to student responsibility and ownership. This ownership may have contributed to what another teacher commented as a marked change in student attitude toward social studies. She contrasted her previous teaching experience in starting a lesson met with student passivity and lack of interest. Now after extended time using the dynamic RWC instructional model and scaffolding student learning with multiple

comprehension strategies she seemed energized by the change in her students, "For the first time they are actually excited about it."

Teachers in these participating classrooms noted not only students' renewed enthusiasm in content area instruction but also an increase in higher order thinking. Students were approaching an integrated social studies and science unit and found novel ways to make the content relevant, and their questions were based on their wider reading of related texts. Students were continually being pushed and nudged to think more fully about explaining the "what" and "how" of their learning process. This finding is consistent with comprehension research that the transition from cognitive to metacognitive thinking enhances both retention and comprehension for learners (Pogrow, 2004) and that multiple-strategy instruction is more effective than single- strategy approaches (Duke & Pearson, 2002; NRP, 2000; RAND Reading Report, 2002).

In one instance during a science lesson, students were exploring the periodic table of elements and their properties. The teacher decided to use a strategy of making connections (Keene & Zimmermann, 2007) and soon students were engaged in thinking of connections to themselves by imagining elements that could be named after their own personal characteristics. The ensuring discussion was described by their teacher as "joyful" and the interaction cemented their understanding of the properties and relationships of elements to one another. These types of discussions provided the social interaction promoted by educational constructivists who have noted as critical to the development of reflective thought. By sharing their learning with others through peer collaboration and presentations, students were exemplifying the vibrancy of their social interactions in the learning environment (e.g., Bakhtin, 1981; Scribner & Cole, 1978, Rogoff, 2003). Another teacher succinctly summarized students' academic growth as outcomes from their classroom environment which had shifted more purposively in integrating the Connect, Observe, Reflect, and Extend components of the RWC and its role in developing students' ability to reconstruct and publicly present their learning:

> . . . That's the reflective piece, I mean, that's the extensions that we have, and the reflection is just [the students] being able to communicate their thoughts and their ideas towards other people. And that's learning.

Creating and Exploring Content Domains

A contribution of the Read-Write Cycle as an instructional model centers on a view of comprehension that emphasizes the acquisition of a content domain; in our case, in either science or social studies. This deep understanding of a conceptual domain contrasts with the general

instructional processes in most schools today in which quick facts within a domain are acquired without connections and related information from one source to another. With content area standards commonly used as outcomes to evaluate student learning, teaching can sometimes focus on these discrete elements in preparing and planning instruction. While one aspect of thematic lesson planning used standards as a basis for instruction, teachers using the RWC instructional model found that they were able to connect content area standards in meaningful ways. In reflecting on the change of students' engagement, one participating teacher commented, "So I feel my kids are getting a richer understanding of what the whole subject area is than just teaching the standards. So I feel that the kids are really gaining a lot from this [RWC] and me."

Content domain acquisition is furthermore characterized by students being able to think broadly about a subject and able to make broad understandings and generalizations based on key concepts of the domain. Teachers repeatedly provided instances of children actively engaged in pursuing further areas of interest and not as passive receptacles of school provided knowledge. One teacher commented on students' learning during an integrated language arts and social studies unit and their inclination to push their own learning from basic knowledge acquisition to higher levels of Bloom's Taxonomy (1956):

> My students notice that . . . this is different than anything they've had before. Their parents know it. We don't just cover material, we – I don't even know what the word is. We explore. I mean my kids explore content now and they have all these questions . . . I think my kids are really becoming thinkers, and I think that one of the big differences is that they don't just know stuff at the knowledge or even comprehension level. They're into synthesizing and analyzing and going all the way up the hierarchy…

In the following representative quote, the teacher describes the multi-faceted changes in students' potential as learners in today's classrooms—critical thinkers in their respective home and school communities—and in their projected future trajectory as global citizens to think, analyze problems, and communicate (Norris & Phillips, 2003):

> And this project has just put me so in touch with what kids are capable of and what they need to develop so they can become adults. They can become thinking adults who read from multiple sources. Whether they're deciding which kind of car to buy or who to elect, for [example], you know, [who to elect for] as our next president, or whatever the decisions, these are the processes that adults need to use in making good decisions. And they are very capable at 3rd and 4th and 5th and 6th grade to start learning that kind of thinking, and

> to realize that it's not just about the facts because you can always jump online and get facts. It's what do you do with those facts and how do you weigh what you already know against what you just read.

Furthermore, from teachers' comments, it becomes evident that students' thinking shifted from acquiring discrete items of content information or reading short passages to having a deeper understanding of the content domain. Students were reconstructing their knowledge gained from their textbooks in qualitatively different ways then merely recitation of facts. This finding is consistent with Bereiter's assertion that disciplinary knowledge is a construction that can only be understood through reconstruction (2002; cf. Calfee & Miller, 2005). By including classroom discourse as thinking routine (Perkins, 2004), students' reveal different ways of reorganizing and expressing their knowledge. In the following example, a teacher observed how frequently incorporating scaffolded classroom discussions supported the transformation of formerly struggling students to more capable actors in their knowledge building. No longer was knowledge solely subjected to answering questions at end-of-the-chapter tests, but they were able to include their personal responses and understanding of texts. A teacher reflected:

> I just was thinking about a student who is kind of a struggling learner. She's bright and she's a good thinker but she has trouble with reading comprehension. She has trouble finding the main idea. …She's confident [now] because she's been validated as a thinker, whereas before her grades were based on those end of the chapter tests, and if she didn't remember all the facts she wouldn't do well, then she thought of herself as not much of a student. Now she can make comments in a discussion and other students will say, "Oh, yeah, I never thought about that." And so I see that her confidence level as a student has improved greatly. Actually, now I'm thinking of another one too, who never said a word in class the first quarter. She's very, very shy, not a native English speaker. And she has blossomed as well. I marveled just before break that she raised her hand like three times in one day, which was a big difference for her. Because [now] they're not valued just for how many facts they have.

Integration of Literacy and Content

The third strand of the findings was related to the integration of research-based reading and writing tools in students' content based learning. Through instructional practices such as making connections, literature response, and writing to learn, literacy is essential for acquisition and application of disciplinary knowledge (Norris & Phillips, 2003). Using multiple instructional practices, teachers reported that students were increasingly able to read and comprehend texts at a deeper level, they were able to access different textual resources beyond the

school's content area text, and wrote in increasingly quantitatively and qualitatively ways about a topic. Through the additional text resources provided by the Read-Write Cycle project team, the teachers were able to provide students with enrichment texts that complemented their classroom textbooks. Students' insistence on learning seemingly awed one teacher. She shared the following observation,

> . . . [My] students have been transformed. I've now seen it two years in a row now, where they demand understanding. They don't just want facts. They want to know how the facts connect to each other and what happened next, what would've happened if this hadn't happened. And they really are so into truly understanding. Facts to them are just a vehicle for gaining some understanding. They're not the end.

Students were reading texts and actively using varied comprehension strategies such as making intertextual and personal connections that enabled teachers to use formative measures to assess learning. The students were imagining cause-and-effect and toying with possibilities and alternative causes and outcomes. One teacher noted an increase in deep reading comprehension strategies and language framing devices appearing in student talk and written response:

> And there were times where they found they made connections with different things. And I can't think of a specific story but there were stories where I mean inferences are really higher level, and the metaphors, and that was a harder skill. Usually, I only have a few kids that can find that. And that's kind of interesting because even some of my lower kids were finding inferences, which blew me away.

Students used literacy activities to formulate their learning. They mined and synthesized information from various text sources and produced original material. Another teacher was intrigued by students' newly found engagement in the social studies topics and their readiness and eagerness to compose essays sharing their knowledge:

> And this year we did the Statue of Liberty as one of the national monuments. And my kids, I mean, they could not wait to write. I could not believe it. They went and the stuff they gave me it was so meaty. It was exciting.

Through reading and writing activities as a unifying thread across their classroom's content areas, students experienced learning as a whole and not demarcated by allotted segments of content area instruction. Another teacher noted how students began to unite learning together from across the curriculum:

> But they did start doing that [integrating across content areas] as the

> year went on and we talked about big themes and they connected things across the literature. And they started connecting things also with science and with social studies. Oh, look at that, we saw that land form in social studies. Oh look at that. Yes, so that was very cool to find that.

In evaluating the overall three-year involvement with the RWC professional development and lesson implementation, one teacher contemplated teachers' abilities to be aware of strategically drawing upon a variety of comprehension instructional approaches. More importantly, this teacher noted the resulting transformation in how students were able to develop metacognitive thinking and transfer into other parts of the school curriculum:

> I think that teachers who have really used this [RWC] have that skill now to do all of those [metacognitive] things. And I think they, hopefully, will be able to still continue to integrate, reweave things in an order they feel makes sense to the kids or supports whatever they're doing with the other content areas and that they can back it up with [the evidence], "I've been doing it for three years. This works with the kids."

Conclusion

Teachers consistently report that the Read-Write Cycle provides an effective model of teacher professional development that supports teachers in developing their own metacognition; that is, an awareness of a range of pedagogical practices to be strategically used in their instruction and to reflect on the effects of their pedagogy on students' learning from cognitive to metacognitive. The results from the three years of RWC Project's professional development program and two years of instructional implementation of a comprehension multiple strategies approach to content area instruction helps to bridge a gap in the research on effective teacher professional development (Baker, 2008; Duke & Martin, 2008; Pressley, 2002). This study pointed to three key areas in which teachers' metacognition about their own practice lead to upper elementary grade students' metacognitive learning, scaffolded students' deeper understandings in content domains, and guided students in integrating literacy in content areas.

Because teachers applied varied instructional techniques and used them explicitly and purposefully, teachers' pedagogy across the participant cohort was cohesive. By engaging in reflective practices themselves, teachers revised and adjusted their teaching and noted how students were taking greater ownership over their learning. Students were now expecting their learning to continue outside the boundaries of the pages of the classroom textbooks. As active agents, students were

weighing alternatives to history and science pursuing comprehensive domain knowledge and not passive recipients of facts, figures, and dates. Teachers were energized by students' deliberateness in using multiple comprehension approaches and routines to draw connections across the curriculum and represent their learning. Through the sustained professional development that provided opportunities for teachers to connect with their own established knowledge, as well as for them to become knowledgeable in content material through additional resources, and the flexibility and adaptability of the RWC model, teachers created constructivist and collaborative instruction to scaffold students into "professional thinkers" (Block & Duffy, 2008) capable of taking on challenging learning situations inside and outside the walls of the classroom.

Implications for Teacher Education

As developers of both pre-service and experienced educators, we consider it is now more critical than ever to provide the teachers with whom we work strong experiences with collaborative, reflective, and metacognitive strategies and instruction, and to demonstrate success in these techniques that often represent deviation from today's standardized, scripted, and paced instructional practices.

The Read-Write Cycle Project has been able to contribute to this charge by demonstrating significant gains in the expression of reading comprehension through writing in the content area via implementation of such metacognition and discourse building techniques. Both teachers and students demonstrated improved ability to effectively use metacognitive strategies in their teaching and learning. For all students, including those of disadvantaged educational background and diverse language experiences, the Read-Write Cycle is indicated to be a format that strengthens students' metacognitive skills, helps shift instruction from mastery of facts to exploration of content domains, and increases literacy instruction in the content areas. The results of this project demonstrate the potential value of these strategies for increasing student reading and writing achievement, and thus providing a doubled benefit – students who not only perform better on small and large scale assessments, but also those who can think more deeply and genuinely about themselves, the content, and the process of learning.

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References

Anderson, R. C., Spiro, R., J., & Anderson, M. C. (1978). Schemata as scaffolding for the representation of information in connected discourse. American *Educational Research Journal, 15*, 433-440.

Baker, L. (2008). Metacognition in comprehension instruction: What we've learned since NRP. In C. Block & S. Parris (Eds.). *Comprehension instruction: Research-based best practices* (pp. 65-79). New York: The Guilford Press.

Bakhtin, M. (1981). *The dialogic imagination*. Austin, TX: University of Texas Press.

Bereiter, C. (2002). *Education and mind in the knowledge age*. Mahwah, NJ: Lawrence Erlbaum Associates.

Block, C., & Duffy, G. (2008). Research on teaching comprehension: Where we've been and where we are going. In C. Block & S. Parris (Eds.), *Comprehension instruction: Research-based best practices* (pp. 19-37). New York: The Guilford Press.

Block, C. C., & Mangieri, J. (1997). *Reason to read: Thinking strategies for life through literature*. Vol. 1. Reading, MA: Addison-Wesley.

Bloom, B.., & Krathwohl, D.. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook 1: Cognitive domain*. New York: Longman.

Boulware-Gooden, R., Carreker, S., Thornhill, A., & Joshi, R. (2007). Instruction of metacognitive strategies enhances reading comprehension and vocabulary achievement of third-grade students. *The Reading Teacher, 61*(1), 70-77.

Brown, A. L., Campione, J., & Day. (1981) Learning to learn: On training students to learn from text. *Educational Researcher, 10*, 14-21.

Calfee, R. C., & Miller, R. G. (2005). Comprehending through composition: Reflections on reading assessment strategies. In S. G. Paris (Ed.), *Current issues in reading comprehension and assessment* (pp. 215-233). Mahwah, NJ: Lawrence Erlbaum Associates.

Calfee, R. C., & Drum, P. (1986). Research on teaching reading. In M. C. Wittrock (Ed.), *Handbook of research on teaching*. Vol. III (pp. 804-849). New York: MacMillan.

Carr, E., & Ogle, D. (1987). K-W-L Plus: A strategy for comprehension and summarization. *Journal of Reading, 30*, 626-631.

Chambliss, M., & Calfee, R. C. (1998). *Textbooks for learning: Nurturing children's minds*. Malden, MA: Blackwell.

Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New directions in education technology* (pp. 15-22). New York: Springer-Verlag.

Dade County Public Schools Office of Instructional Leadership. (1992) *Developing support in writing using FIRES! Middle school POW/R pack: Improving writing skills, 9-10*. Miami, FL: Author.

Davey, B. (1983). Think-aloud modeling cognitive process of reading comprehension. *Journal of Reading, 27*, 44-47.

Duke, N. K., & Martin, N. (2008). Comprehension instruction in action. In C. Block & S. Parris (Eds.), *Comprehension instruction: Research based best*

practices (pp. 241-257). New York: The Guilford Press.
Duke, N. K., & Pearson, D. (2002). Effective practices for developing reading comprehension. In A. Farstrup, & S. J. Samuels (Eds.), *What research has to say about reading comprehension* (pp. 93-104). Newark, DE: International Reading Association.
Gama, C. (2004). Metacognition in interactive learning environments: The reflection assistant model. In F. Paraguu, J. Lester, & R. Vicari (Eds.), *Intelligent tutoring systems: Proceedings of the 6th international conference* (pp. 668-677). New York: Intelligent Tutoring Systems.
Goldman, S. R. (1997). Learning from text: Reflections on the past and suggestions for the future. *Discourse Processes, 23*, 357-398.
Hayes, J. R., & Flower, L. S. (1980). Writing as problem solving. *Visible Language, 14*, 388-399.
Kintsch, W., & Kintsch, E. (2005). Comprehension. In S. Paris & S. Stahl (Eds.), *Children's reading comprehension and assessment* (pp. 71-92). Mahwah, NJ: Lawrence Erlbaum Associates.
Keene, E., & Zimmermann, S. (2007). *Mosaic of thought*. 2nd ed. Portsmouth, NH: Heinemann.
Miller, G. A., & Gildea, P. (1987). How children learn words. *Scientific American, 257*, 94-99.
Miller, R. G., & Calfee, R. C. (2004). Building a better reading-writing assessment: Bridging cognitive theory, instruction, and assessment. *English Leadership Quarterly, 26*(3), 6-13.
Miller, R. G., Calfee, R. C., White-Smith, K., & Thomas, S. (2005). Untitled work. Unpublished manuscript.
National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Washington, D.C.: National Institute of Child Health and Human Development.
Norris, S. P., & Phillips, I. M. (2003). How literacy in its fundamental sense is central to scientific literacy. *Science Education, 87*, 224-240.
Olson, D. R., & Torrance, N. (1996). *Modes of thought: Explorations in culture and cognition*. New York: Cambridge University Press.
Patton, M .Q. (1987). *How to use qualitative methods in evaluation*. Newbury Park, CA: Sage.
Perkins, D. (2004). Knowledge alive. *Educational Leadership, 62*, 14-18.
Pogrow, S. (2004). The missing element in reducing the learning gap: Eliminating the blank stare. *Teachers College Record*, ID Number 11381. Retrieved October 26, 2004, from http://www.tcrecord.org/Content.asp?ContentID=11381
Pressley, M. (2002). Metacognition and self-regulated comprehension. In A. E. Farstrup & S. J. Samuels (Eds.), *What research has to say about reading instruction* (pp. 291-309). Newark, DE: International Reading Association.
RAND Reading Study Group. (2002). *Reading for understanding: Towards an R& D program in reading comprehension*. Retrieved October 16, 2009 from www.rand.org/multi/achievementforall/reading/readreport.html.
Rogoff, B. (2003). *The cultural nature of human development*. New York: Oxford University Press.

Rosenblatt, L. M. (1978). *The reader, the text, the poem: The transactional theory of the written word*. Carbondale, IL: Southern Illinois University Press.

Scardamalia, M., & Bereiter, C. (1982). Assimilative processes in composition planning. *Educational Psychologist, 17*, 165-171.

Schön, D. A. (1983). *The reflective practitioner*. New York: Basic Books.

Schön, D. A. (1987). *Educating the reflective practitioner*. San Francisco: Jossey-Bass.

Scribner, S., & Cole, M. (1978). Literacy without schooling: Testing for intellectual effects. *Harvard Educational Review, 48*, 448-461.

Smith, F. (2004). *Understanding reading: A psycholinguistic analysis of reading and learning to read* (6th ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Spiro, R. J., Bruce, B. C., & Brewer, W. F. (1980). *Theoretical issues in reading comprehension: Perspectives from cognitive psychology, linguistics, artificial intelligence and education*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Strauss, A., & Corbin, J. (1992). *Basics of qualitative research*. Thousand Oaks, CA: Sage.

Tierney, R. J., Soter, A., O'Flahavan, J. F., & McGinley, W. (1989). The effects of reading and writing upon thinking critically. *Reading Research Quarterly, 24*, 134-173.

Vitale, M., Romance, N. & Klentschy, M. (April, 2006). Improving school reform by changing curriculum policy toward content-area instruction in elementary schools: A research-based model. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA. Retrieved May 29, 2010 http://scienceideas.org/pubs-pres/articles-learrning-literacy/Improving-School-Reform.pdf

Vygotsky, L. S. (1986). *Thought and language* (A. Kozalin, Trans.) Cambridge, MA: Harvard University Press. (Original work published 1934.)

White-Smith, K., Curwen, M. S., Miller, R. G., & Calfee, R. (February, 2009). Decisions, decisions: Addressing the erosion of teacher decision-making through literacy professional development. Presented at the International Reading Association Conference West, Phoenix, AZ.

White-Smith, K., Curwen, M. S., Miller, R. G., & Calfee, R. (May, 2010). Finding success in upper elementary content areas: Results from the Read-Write Cycle Project. Paper presented at the annual conference of the American Educational Research Association, Denver, CO.

Wixson, K. K., Fisk, M. C., Dutro, E., & McDaniel, J. (2002). *The alignment of state standards and assessments in elementary reading* (CIERA Rep. No. CIERA-R-3-024). Ann Arbor, MI: Center for the Improvement of Early Reading Achievement.

Appendix A

Teacher Generated List of CORE Strategies

CONNECT STRATEGIES	***ORGANIZE STRATEGIES***
K-W-L	GRAPHIC ORGANIZERS
QUICK WRITES OR SKETCH	STUDY GUIDE

VISUALS
REALIA
TOTAL PHYSICAL RESPONSE
THINK-PAIR-SHARE
HEADS TOGETHER
TEACHER READ-ALOUD
TYING TO SHARED EXPERIENCE
MOVIE/VIDEO
FIELD TRIP
ALPHABOXES
BRAINSTORM
SONG
CHANTS
PREDICTION
BOOK PREVIEW
PICTURE WALK
REVIEW PREVIOUS LESSON
BOOK SCAVENGER HUNT
ROLE PLAY
GLAD TECHNIQUES
ORAL QUESTIONING
HANDS-ON
GUEST SPEAKER
SCIENCE EXPERIMENT
ART MASTERS
INTERNET WORD SEARCH
ART MASTERS
LIBRARY VISITS
TEACHER EXPERIENCES
KID SHARE
MODELING
DISCOVERY
SQ3R (SURVEY, QUESTION)
SIMULATION
MATH MANIPULATIVES
CURRENT EVENTS
READ ALOUD
PRETEACH VOCABULARY
WHIP
WORD SPLASH

REFLECT STRATEGIES
RESPONSE JOURNALS
THINK-PARE-SHARE
HEADS TOGETHER
GALLERY WALK
PERSONAL GLOSSARY
2-COLUMN NOTES
OUTLINES
TEXT ANALYSIS
SONGS
MNEUMONIC DEVICES
MIND MAPPING
SEMANTIC MAPPING
VENN DIAGRAM
ORDER OF EVENTS
SEQUENCING
TIMELINES
KEY WORD CHART
GLAD DICTIONARY CHART
GRAPHING
PAIR-SHARE
CREATING TAXONOMY OF VOCABULARY/WORD SORTS & RLATIONAL VOCAB EXERCISES
WHOLE CLASS ORGANIZING
ANALOGIES
PORTFOLIOS/COLLECTIONS
TOPIC BOOKS (PUTTING DOCUMENTS TOGETHER INTO A THEMED COLLECTION)
SUMMARIZING
VOCAB JOURNALS
VOCAB PICTURE LISTS
LABELED DIAGRAMS
JOURNALING
COLOR CODING—IN GRAPHIC ORGANIZERS, STEP UP TO WRITING COLORS, GLAD
JIGSAWS
CATEGORIZING
TOTAL PHYSICAL RESPONSE
INSPIRATION/KIDSPIRATION COMPUTER PROGRAM

EXTEND ACTIVITIES
FIELD TRIPS
RESEARCH PROJECTS
JOURNALS
DRAMA PRESENTATIONS

QUICK WRITE
SUMMARIES
DAILY NEWS
K-W-L
LITERATURE CIRCLES
RE-TELLING
LEARNING LOG
SHORT ANSWER/CONSTRUCTED RESPONSE
PICTORIAL INPUT
CLOZE ACTIVITY
POPCORN SHARE
I WONDER . . .
EXPLAIN HOW . . .
RECIPROCAL TEACHING
PEER EDITING
"HOT SEAT" (ROLE PLAY)
"SKETCH TO STRETCH"
DEBRIEFS
TIMELINES
GROUP PROJECTS
LITERATURE CIRCLES
BOOK REPORTS
ROLE PLAY/SCENARIO
THEME DAYS
SCIENCE FAIR
READERS THEATER
WRITING ASSIGNMENT
SONGS/CHANTS
GALLERY WALK
ART PROJECT/MODELS ESSAY
POWER POINT PRESENTATION
PICTURE-WORD-MODEL
JIGSAW TEACHING
BE THE TEACHERS
FILMS
GUEST SPEAKER
POSTCARDS (DESIGN)
NEWCASTS
PEN PALS
DEBATES
SHOW BOXES, MINI MUSEUMS
PHOTO ESSAYS
BOOKLETS, PAMPHLETS
SPEECHES
MUSIC
PROBLEM SOLVING/SCENARIO
POETRY

Appendix B

Read-Write Cycle Project

Teacher Interview Protocol

1. Have there been any changes in grade level assignment from last year?

2. How has your understanding of the RWC Project changed from last year (and last year's interview)?

3. How did the third year of professional development shape your teaching?

4. Describe how the last classroom observation lesson exemplified the RWC. Please indicate specific examples.

5. What accomplishments are you most proud of?

6. How have you developed as a professional over the three years of participation in the project?