ANALYSIS OF READING COMPREHENSION AND THINKING PROCESS

ACHIEVEMENT BASED ON NEUROCOGNITIVE RESEARCH

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ANALYSIS OF READING COMPREHENSION AND THINKING PROCESS
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Abstract

According to the U.S. Department of Education, middle school literacy research in four areas is currently mandated: neurocognitive elements, instructional processes, instructional materials, and professional development. This study presents appropriate statistical analysis of fifth grade student gains in reading comprehension and thinking processes. The results suggest reading programs based on findings from the four key areas of research produce significantly greater student achievement in reading comprehension and thought processes than programs not based on findings from the key research areas. The study includes a Research-Based Rubric for Reading Comprehension Components, detailing findings from the four research areas. This rubric serves as a tool in comparing middle school reading programs with research findings.
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Chapter I
Introduction to the Study

The United States Congress passed the *No Child Left Behind* (NCLB) *Act* in 2002, prompting significant changes in primary grade reading instruction (Learning Point Associates, 2005). NCLB virtually ignores the literacy needs of middle school students (grades 4-8), though being prepared for high school and beyond requires more than third grade reading abilities (Learning Points Associates, 2005). The narrowly focused view of current educational policy prompts Wise (2005) to proclaim adolescent literacy the “orphaned responsibility” (p. 1).

Recently, policy makers began publicly acknowledging that literacy requires more than NCLB’s K-3 focus. In February 2004, the President requested nearly $25 million to launch the *Striving Readers Program*, a middle school literacy intervention program. Senators Murray, Clinton, Durbin, and Kennedy reintroduced *The Pathways for All Students to Succeed Act*, which would authorize $1 billion for middle school literacy coaches. Similar legislation, the *Graduation for All Act*, proposes financing a literacy coach in every high-need middle school (Alliance for Excellent Education, 2005; National Council of Teachers of English, 2005). Additionally, the U. S. Department of Education and the National Institute of Child Health and Development targeted adolescent literacy as the subject of research over the next several years (North Central Regional Educational Laboratory, 2005).

Middle school educators welcome this renewed interest in adolescent literacy. The National Assessment of Educational Progress (2005) reveals a mere one-third of eighth grade students perform at or above proficient reading levels, and fewer than 5% of middle school students can elaborate an understanding of written materials (Moore, Bean,
Birdyshaw, & Rycik, 2000). Wise (2005) realistically portrays the meaning of these results:

On any given school day, millions of American adolescents get out of bed, put on their clothes, and spend the next several hours trying to fight off confusion and despair. In their history classes, they struggle to make sense of their textbooks; in science, they stumble over the laboratory instructions; in math, they are baffled by word problems; and in every class, they find themselves defeated by the simplest writing assignment (p. 1).

Such realities prompt a “sense of urgency to improve our nation’s middle and high schools,” especially in reading instruction (Alliance for Excellent Education, 2005, p. 3).

According to research (Learning Points Associates, 2005; Wise, 2005), only 10-15% of middle school struggling readers lack sufficient decoding skills. Middle school students who experience difficulties in reading overwhelmingly possess comprehension deficiencies. In fact, claims Wise (2005), these same students may pass No Child Left Behind’s required standardized testing, which focuses largely on reading mechanics and low-level comprehension of simple passages, but fail to obtain the comprehension abilities requisite for academic success. Middle school students need to a) understand complex texts, b) recognize meanings of obscure, unfamiliar, and technical terms, c) use critical thinking to analyze a wide variety of text structures and to synthesize ideas to obtain full meaning, and d) accurately express a thorough understanding of text (Learning Point Associates, 2005).
The focus on middle school reading instruction highlights a need for research-based reading programs and practices at this level (Alliance for Excellent Education, 2005). Middle school teachers must understand and implement research-based instructional practices to develop the comprehension abilities of students (North Central Regional Educational Laboratory, 2005). Current practices must be evaluated in light of current research findings (Biancarosa, 2005).

However, confusion exists about the nature and characteristics of research-based programs. Gersten (2005) claims the confusion results from differing educational implications based on three different research types. Descriptive research highlights current educational practice in light of current research findings, but does not provide sufficient evidence to evaluate effectiveness. Experimental and quasi-experimental research feature high internal validity and provide data useful in curriculum and professional development. Large-scale field studies feature multiple sites and longitudinal perspectives, resulting in high external validity and greater confidence in the findings. Of these, Gersten (2005) recommends educators focus on experimental/quasi-experimental and large-scale field study results when evaluating a program’s research base.

The Access Center (2005) suggests a twofold evaluation of the research base for middle school reading programs:

1. Establish expectations for program implementation results. The program should be driven by research rather than ideology.

2. Identify the contextual conditions research reveals as necessary for effective program implementation.
Similarly, Kemp (2005) suggests careful evaluation of a program’s research-based rationale for its instructional practices. The rationale should explicitly state the outcome such instructional practice has had on student achievement and identify specific studies in which such outcomes resulted.

In evaluating middle school reading programs, educators must attend to the distinct nature of middle school reading instruction. Instead of learning to read, middle school reading instruction shifts to reading to learn: to comprehension. Instructional practices must effectively address this shift (Wise, 2005). The National Reading Panel (2000) describes reading comprehension as a “complex cognitive process” that “requires an intentional and thoughtful interaction between the reader and the text” (p. 6). Middle school instruction must teach students the cognitive processes that promote successful text-reader interaction. Effective comprehension instruction characterizes effective middle school reading instruction.

Intimate links exist between student reading comprehension achievement and the training of teachers to “better equip students to develop and apply reading comprehension strategies to enhance understanding” (National Reading Panel, 2000, p. 16). The Access Center (2005) claims effective teachers create effective reading comprehension instruction, and extensive professional development provides the knowledge base and pragmatic skills teachers need to develop effectiveness. Moore, Bean, Birdyshaw, and Rycik (2000) agree, claiming that expert teachers, who are developed through comprehensive professional development, teach students strategies to effectively explore and understand written text. Research supports the fundamental claim: effective teaching depends on effective teachers.
This first chapter presents this study’s research background, specifies the problems the study addresses, describes the study’s professional significance, and outlines the methodology used. Delimitations of the study conclude the chapter.

Research Findings

Various offices within the U. S. Department of Education have cosponsored calls for an increased middle school literacy research base. Several nonprofit organizations have issued the same call (Biancarosa, 2005). A knowledge base that includes research on neurocognitive elements, instructional processes, instructional materials, and professional development components provides the foundation for the development and implementation of effective middle school reading instruction.

Neurocognitive Elements

Neurocognitive research focuses on the human brain’s inner workings, on its structures and functions, and on significant concepts from cognitive psychology. Research related to working memory and hippocampal processing provides a neurocognitive basis for the thinking that reading comprehension requires and the instructional processes that foster it.

Working memory. Research identifies the content and methods of engaging working memory processes. For example, analogies activate working memory processes and illustrate working memory’s content and functioning. Working memory processes new data by organizing it, recognizing patterns within it, and using the patterns as a link to understood concepts. Working memory constructs meaning as new data merges with understood concepts. An analogy relates something new with something known, mirroring working memory processes. Using analogies engages students’ working
memory processes, establishing a foundation of understood concepts upon which new concept understanding may be constructed (Ruef, 1998).

Zull (2002) equates analogizing with learning: “We cannot understand anything unless we create internal neuronal networks that reflect some set of physical relationships that accurately map the relationships in the concept” (p. 128). The connections between the neuronal networks enable understanding, and analogies engage the recognition of those connections. Ruef (1998) succinctly describes the benefit of including analogies in the learning process: “The analogy habit networks the mind…” (p. 4)

Metacognition. Metacognition, a neurocognitive process, directs attention to understanding and evaluating one’s own thinking. Students who engage in frequent metacognition while reading update their understanding based on new text information and comprehend better than students who rarely metacogitate while reading. Instruction characterized by frequent pauses for teacher-guided or self-initiated metacognition results in greater student reading comprehension (Collins, Dickson, Simmons, & Kameenui, 2005).

The hippocampus. The human hippocampus, a structure deep in the brain’s medial region, plays critical roles in encoding, networking, and retrieving memory. By encoding memory in distinct bits, the hippocampus allows for flexibility in networking memories and enables idea construction through reorganizing and synthesizing related memory bits. The hippocampus contributes to meaning construction by establishing and retrieving associated memory networks. It locates understood concepts and organizes new concepts. Both roles enable working memory processes (Eichenbaum & Cohen, 2004).
The human hippocampus possesses a bias for spatial processing. Research findings reveal that the greatest hippocampal engagement and most efficient processing occur when spatial entities are present in data processing. Complex ideas processed through spatial pathways possess a greater likelihood of being understood than complex ideas processed through non-spatial means (Kumaran & Maguire, 2005). Reading instruction that engages students in spatial processing taps hippocampal strengths, increasing and deepening reading comprehension.

Hyerle (2000) states that systematic instruction, in which visual tools and reading instruction are fully integrated, engages spatial processing and produces dramatic results. Four schools involved in Hyerle’s research achieved a mean gain of 22% in reading during the first year of such instruction. In one school, reading scores increased 40%. Hyerle attributes the success to a match between visual tool constructs and the workings of the brain, claiming that visual tools, such as flow charts and Venn diagrams, and the brain construct meaning through patterning.

Thinking. Roe, Smith, and Burns (2005) define reading comprehension as understanding and identify four different types of comprehension: literal (acquiring directly stated information), interpretive (deriving implied ideas in the text), critical (comparing ideas from the text with known standards), and creative (going beyond the text to develop new ideas). Three of these types—interpretive, critical, and creative—are considered “higher-order comprehension” and require analysis, interpretation, and synthesis. Reading beyond the literal level requires cognition.

Despite the research support for thought-based comprehension, the National Reading Panel (2000) reports teacher post-reading questioning to assess comprehension
as the most common activity of classroom reading instruction. Such instruction fails to equip students for independent comprehension because it neglects instruction in and engagement of the neurocognitive processes that construct comprehension (Pressley, Wharton-McDonald, Mistretta-Hampston, & Echevarria, 1998).

**Instructional Processes**

A program’s instructional processes further illustrate its alignment with research findings. Research validates explicit instruction, teacher modeling, student practice with instructive feedback, and small group interaction as effective instructional processes.

*Explicit instruction.* Snow (2002) claims that explicit instruction in the thought processes involved in constructing meaning increases comprehension. Explicit instruction breaks a task into manageable steps, enables systematic practice, and provides teacher feedback at each step. Explicit instruction begins with the systematic presentation of a comprehension-related thinking skill, such as identifying a sequence of events, recognizing cause and effect, or drawing conclusions. The skill is presented in a systematic manner, using a series of interrogative prompts to guide students. For example, thinking about cause and effect relationships can be directed by asking the following questions:

1. What happened?
2. Why did this happen?
3. What did this cause to happen?

Snow (2002) cites a study in which students learned to ask themselves similar questions focused specifically on story structure. Following explicit instruction, the
students gained improved abilities to identify relationships within the text, to successfully retell the story, and to respond correctly to comprehension questions.

*Teacher modeling.* Duke and Pearson (2002) claim that extensive teacher modeling improves student reading comprehension skills. Teacher modeling is most effective when, like skill instruction, it is explicit, demonstrating thought processes and visual tool development so that students see how the process and visual tool work and interrelate. While reading a selection to the students, the teacher thinks aloud, clearly using the thought process steps to identify ideas from a text and the visual tool to record, organize, and explore relationships between the ideas.

*Student practice.* Duke and Pearson (2002) recommend independent reading and collaborative, guided, and independent comprehension skill practice following explicit instruction. Because of its compelling results, Duke and Pearson suggest frequent student think-aloud activity at this stage of comprehension instruction. Students regularly engaged in thinking aloud develop greater reading comprehension ability and are better able to summarize text than students who practice little or no thinking aloud. This achievement is due to three instructional benefits of student think-aloud activity:

1. Thinking aloud helps control impulsiveness, preventing students from drawing unsupportable conclusions while reading.
2. Thinking aloud provides an opportunity for feedback as the teacher can prompt or redirect the students during the thinking process.
3. Thinking aloud promotes self-monitoring of comprehension.

*Instructive feedback.* Student thinking aloud creates opportunities for instructive feedback, the instructional process with the greatest impact on student achievement.
Instructive feedback engages teachers and students in discussing current proficiency levels in reference to clearly defined achievement levels, and results in a plan for increasing achievement. The process provides teachers with necessary information to plan instruction and provides students with an understanding of a) expectations, b) current levels of proficiency, and c) techniques to increase proficiency (Marzano, 2003).

**Small groups.** Block and Pressley (2002) claim prolonged small group participation leads individuals to “internalize the comprehension strategies” and transfer them to independent reading (p. 386). Small group interactions validate students’ thinking about texts, create a structure for instructive feedback, and provide the pauses necessary for metacognition and the updating of understanding.

**Instructional Materials**

Instructional materials often illustrate the instructional processes and research-base or ideology of a reading program. These concrete elements of instruction augment the program’s alignment with research findings, contradict the program’s stated basis, or illustrate ignorance/disregard of research findings.

**Literature.** Reading instruction requires text for students to read. The greater the quality of a literary work, the greater the thought that it engenders (Bustard, 2000). With the engagement of neurocognitive processes essential to reading comprehension, high quality literature provides a sound textual basis for instruction.

The literature included in a reading program provides opportunity for practice of targeted skills. The selected literature and the instruction combine in such a way that students practice the targeted skills while reading. For example, during instruction on
understanding plot, literature selected for student practice should feature well-developed, recognizable plot elements (Washburn & Blackmon, 2003).

The literature must represent appropriate levels of text complexity. Literature characterized by readability levels lower than current student capacities fails to promote development in several comprehension-related abilities, such as vocabulary and fluency. Literature beyond the student’s readability level prevents the application of comprehension skills. Literature should fall into a student’s zone of proximal development, challenging but not frustrating the student (Peterson, 2001).

**Other materials.** In addition to text for students to read, effective reading programs utilize other materials that enable practice of comprehension skills. The practice materials should allow for independent application of comprehension skills, and provide a basis for instructive feedback (Pressley & Block, 2002).

Students who make the greatest number of significant connections between ideas while reading achieve the highest levels of reading comprehension. The instructional materials of effective reading programs allow and foster the connection of ideas gained during reading (Wolfe & Goldman, 2005).

**Professional Development**

Several studies reveal teacher effectiveness as a major factor in student achievement (Glickman, 2002; Snow, Burns, & Griffin, 1998). Researchers advocate professional development as the most effective means of increasing teacher effectiveness. Specific factors characterize effective professional development (Joyce & Showers, 2002).
First, the professional development component of an effective reading program comprehensively addresses topics related to reading instruction. These include, but are not limited to, beginning reading processes, reading comprehension instruction, small group leadership, vocabulary instruction, assessment, content area reading and effective instructional design (Washburn & Blackmon, 2003).

Second, knowledge of the theoretical basis of effective instruction increases teacher intentionality. Therefore, a sound professional development component includes training in the theoretical support for a reading program’s instructional processes and materials (National Staff Development Council, 2001).

Third, teachers gain increased understandings of instructional processes through modeling of proficient practitioners. A sound professional development component of an effective reading program includes extensive modeling of the instructional processes that compose the program (National Staff Development Council, 2001).

Fourth, teachers gain proficiency in instructional processes when practice of the processes combines with instructive feedback from proficient practitioners. Effective professional development components include multiple opportunities for the practice of instructional processes combined with instructive feedback (National Staff Development Council, 2001).

Finally, effective professional development components include opportunities for teachers to collaborate in instructional design. Through collaboration, teachers gain confidence, increasing the likelihood that newly learned instructional processes will be implemented in the classroom (Joyce & Showers, 2002).
Problem Statements

Based on observations of reading instruction in fifth grade classrooms, Pressley, Wharton-McDonald, Mistretta-Hampston, and Echevarria (1998) claim that a dearth of comprehension instruction exists. In their observational study, Pressley et al. sought to identify the regularly occurring elements of reading instruction and the elements of reading instruction that varied from teacher to teacher. Teacher-directed discussions occurred regularly in all classrooms. Pressley et al. describe the content of these interactions:

The focus of these discussions was on understanding the story or passage that had been read. Given this emphasis on understanding, we were struck by the almost complete absence of direct instruction about comprehension strategies. Yes, teachers occasionally mentioned a comprehension strategy that students could use (e.g., prediction, mental imagery, summarization), and several teachers modeled such strategies, but there was no evidence that teachers instructed or encouraged students to coordinate the various comprehension strategies in order to understand text. Rather, we observed that teachers would sometimes stimulate such processing after reading was completed or by oral questions…or by analogous questions that required written responses after a student had finished a text (p. 172).

In general, students are asked to practice comprehension strategies without instruction in the strategies or application of the strategies. Pressley et al. express concern over “the almost complete absence of direct instruction about comprehension strategies” although teachers claim that reading comprehension skill instruction is a critical
component of their instruction (p. 186). Pressley et al. recommend training that helps teachers “bridge the gap between knowing that comprehension is important and knowing how to teach strategies to accomplish it” (p.186). Many teachers appear to believe that comprehension instruction benefits students, but they lack knowledge of how to design effective comprehension instruction.

With the attention of educators and policy makers shifting from preschool and primary grades to middle school literacy, awareness of the need for effective, research-based reading programs grows. Confusion about the characteristics of “research-based” programs prevents the identification of potentially effective programs. As a result, a substandard knowledge base of middle school reading exists (Alvermann, 2000). This realization has prompted policy makers and interested nonprofit organizations to call for additional research on middle school reading in four key areas: neurocognitive elements (Office of Vocational and Adult Education, 2004), instructional processes (Adolescent Literacy Research Network, 2006; Alvermann, 2000), instructional materials (Adolescent Literacy Research Network, 2006; Alvermann, 2000), and professional development (Alvermann, 2000; National Reading Panel, 2000).

Do programs that closely align with research findings in the four key areas currently exist? Do reading programs featuring greater alignment with research findings in the identified areas yield greater student achievement? While individual instructional practices possess an established research base, few complete reading programs have been examined for effectiveness and compared with research findings.

Addressing this lack of research requires a twofold research process. First, a program with demonstrated effectiveness in developing middle school students’ reading
comprehension and critical thinking skills must be identified. Second, a means of comparing the various elements of a reading program with research findings must be developed. The objectives of this study include identifying a middle school reading program with demonstrated effectiveness in developing student reading comprehension and critical thinking skills and developing a tool for use in comparing reading comprehension components of reading programs with research findings.

**Professional Significance**

Research should build on previous research with the results “accumulated, reviewed, and analyzed” to establish a basis for instructional changes (Snow, 2002, p. 65). Snow states, “Changes in practice should not depend on the results of a single study or an attractive new idea; they should be based on well-replicated findings consistent with broader theoretical understandings.” Methods of improving reading comprehension instruction are “insufficiently represented” in professional literature (Snow, p. 65). This study presents research findings in four key areas that feature implications for reading comprehension instruction.

Sadoski (2004) states, “Reading at its fullest includes reflecting on what is read, evaluating it, comparing it with what is already known from other reading or from direct experience, trying it on for size to see how it fits” (p. 67). Reading involves thinking, and according to Washburn and Blackmon (2003), thinking is the basis of comprehension. This study examines the neurocognitive processes active in developing reading comprehension and the instructional processes and materials that foster engagement in those processes.
The study begins with causal-comparative research of student achievement in reading comprehension and critical thinking resulting from instruction in two different reading programs. These programs are illustrative of current instructional practice in middle school literacy.

**Research Project Hypotheses**

The hypotheses for this research project, stated in null form, are as follows:

1. There is no significant difference between the reading comprehension gains as measured by pre- and posttesting with the *Gates-MacGinitie Reading Tests, 4th Edition*, Forms S and T, of fifth grade students who experience nine months of reading instruction in the *Spotlight on Literacy* reading program and students who experience nine months of reading instruction in the *Foundations and Frameworks* reading program.

2. There is no significant difference between the critical thinking gains as measured by pre- and posttesting with the *Cornell Critical Thinking Skills Test, Form X*, of fifth grade students who experience nine months of reading instruction in the *Spotlight on Literacy* reading program and students who experience nine months of reading instruction in the *Foundations and Frameworks* reading program.

**Methodology**

This study presents the findings of a twofold research project focused on middle school reading comprehension instruction. First, the study examines the quantitative results of two reading programs on fifth grade reading comprehension and critical thinking achievement of students in rural Wisconsin. Second, it presents, in Chapter 4, a
rubric to use in considering the following: 1) neurocognitive elements, 2) instructional processes, 3) instructional materials, and 4) professional development components of middle school reading programs.

Research Design

Procedure: Hypothesis 1


Procedure: Hypothesis 2

Testing the second hypothesis requires statistical data. In September 2004, teachers within the research site school system administered the Cornell Critical Thinking Skills Test, Form X, to the fifth grade population. In May 2005, teachers administered the Cornell Critical Thinking Skills Test, Form X, to the fifth grade population.

Statistical Treatment of the Data

According to Gay and Airasian (2003) and Green and Salkind (2003), the independent-sample $t$-test provides the best analysis of gain. Rumsey (2003) states the independent-sample $t$-test provides the best information on means for the sample size used in this study. The $t$-test evaluates the significance in the difference of a test variable between two groups.

Independent-sample $t$-tests provide measures of mean gain for both groups and the significance of the difference between the mean gains. Statistics exist for both the
reading comprehension results as measured by the *Gates-MacGinitie Reading Tests, 4th Edition* and the critical thinking results as measured by the *Cornell Critical Thinking Skills Test*.

**Summary**

Reading comprehension and critical thinking skills gain importance in a world of increasing information and technological advances (Barell, 2003; Paul & Elder, 2001; Ruggiero, 2004). A growing awareness of the need for quality reading instruction beyond *No Child Left Behind Act*’s defined focus reveals the necessity of research-based middle school reading instruction. Research in neurocognitive elements, instructional processes, instructional materials, and professional development provides direction for program development and existing program evaluation.

Reading programs currently used in actual instructional settings must produce evidence of student achievement. Do programs that produce greater student achievement feature greater alignment with research findings? Chapter 2 presents an in-depth examination of the four key research areas: neurocognitive elements, instructional processes, instructional materials, and professional development.
Chapter II  
Review of the Literature

Policy makers and educators recently began shifting attention from the early childhood emphasis dictated by the No Child Left Behind Act to the instructional reading needs of middle school students. Efforts, such as the Striving Readers Program, and proposed legislation, including the Graduation Act for All and The Pathways for All Students to Succeed, attempt to financially support improved middle school literacy (Alliance for Excellent Education, 2005). Simultaneously, the U. S. Department of Education and various nonprofit organizations are extending calls for increased research on middle school literacy (Biancarosa, 2005).

Research Areas

Adolescent or middle school literacy encompasses more than traditional junior high grade levels. The Adolescent Literacy Research Network (2006), a division of the U. S. Department of Education, defines adolescent literacy as “the after nine group,” typically students in grades 4-8 (p. 1). The National Institute of Child Health and Human Development, the Office of Vocational and Adult Education, and the Office of Special Education and Rehabilitative Services advocate research that will improve results in middle school reading instruction (Adolescent Literacy Research Network, 2006).

These calls for research focus on four key areas. First, policy makers seek research in the “cognitive mechanisms that influence the development of reading abilities during adolescence” (Office of Vocational and Adult Education, 2004, p. 2). The Adolescent Literacy Network (2006) claims that neurocognitive research findings advance understanding of reading comprehension as a process and aid in identifying the critical cognitive processes necessary for reading comprehension.
Second, policy makers seek research in a) the instructional processes, and b) the instructional materials that yield results for middle school students. Alvermann (2000) describes this as “research on translating the knowledge base into practice,” and claims such research is “virtually absent from the literature” (p. 4). The Adolescent Literacy Research Network (2006) agrees, claiming a “clear need” exists for research on the instructional processes and materials that develop “higher-level literacy” during adolescence (p. 1). McCardle (2005) specifically calls for research on “how best to conduct comprehension strategy instruction” (p. 1).

Finally, policy makers seek research on effective professional development for middle school teachers. In its exhaustive review of scientific research on reading instruction, the National Reading Panel found only four studies that met their criteria and addressed teacher effectiveness in comprehension instruction (Alvermann, 2000). Overall, claims Alvermann, an uneven knowledge base and limited classroom implementation exist at the middle school level. Based on the lack of research, Alvermann concludes that teachers lack the knowledge of research findings and the abilities to translate those findings into effective instructional practice. Effective professional development cultivates such understandings.

The research base policy makers desire comprises four areas: 1) neurocognitive elements, 2) instructional processes, 3) instructional materials, and 4) professional development components. Each area features research findings with implications for reading instruction.
**Neurocognitive Elements**

Neurocognitive research provides insights into the cognitive processes that reading comprehension requires and the instructional processes that foster them. Scientific findings on the human brain frequently have significant implications for teachers (Bransford, Brown, & Cocking, 1999). These implications extend to current reading theory and practice (Wolfe & Nevills, 2004).

Are reading educators paying attention to neurocognitive research? A review of workshop titles and descriptions of the International Reading Association’s 51st Annual Convention to be held April–May 2006 indicates that reading educators may be focused elsewhere. Of the 638 sessions reviewed, only nine feature definable connections to neurocognitive research. Of these nine, two feature overviews of commercially produced products and two focus on “tips and tricks” for teachers. The five remaining sessions include in-depth theoretical and pragmatic information based on neurocognitive findings (International Reading Association, 2005). Five of 638 sessions represents a mere 1% of the sessions to be presented.

This perceived lack of attention is unfortunate. Neurocognitive research reveals the cognitive interactions of reader and text that construct comprehension. Comprehension suffers if these interactions fail to occur constantly throughout the reading process (McEwan, 2004). Though neurocognitive research is an emerging field, research findings already exist due to the efforts of numerous researchers, including: Bunge, Klingberg, Jacobsen, and Gabrieli (2000); Carretti, Cornoldi, De Beni, and Palladino (2004); Carretti, Cornoldi, De Beni, and Romano (2005); Eichenbaum (2002),
Ratey (2001); Smith and Jonides (1998); Snow (2002); Sylwester (2000); and Young (2000).

By combining understanding of brain structures and cognitive processes, neurocognitive research establishes the neurological basis for reading comprehension. Research areas with implications for reading teachers include working memory processes, hippocampal bias and processing, and cognition’s role in reading comprehension.

Working Memory

The concept of working memory developed as research and technology provided neuroscientists with understandings of the human brain’s inner functions. McEwan (2004), Snow (2002), and Young (2000) claim that neurocognitive research supplies convincing evidence of working memory’s role in reading comprehension.

Bunge, Klingberg, Jacobsen, and Gabrieli (2000); Eichenbaum (2002); and Smith and Jonides (1998) define working memory as the conscious merging of new data and previously processed related data held in consciousness as long as the information or unfolding meaning seems relevant. When functioning effectively, working memory updates frequently, dropping or suppressing irrelevant information and adding new, relevant data. Working memory constructs understanding by merging related information stored in long-term memory with new data gained through the senses and through directing sustained attention, enabling an individual to focus on task-relevant information.
Sylwester (2000) aptly describes working memory’s nature and function:

It is a fragile, limited-capacity buffer that allows us to briefly attend to and hold a few units of information while we use it…or determine its importance…It is about things that are important right now, but not so important that we want to remember them for the rest of our lives. The limited capacity of working memory is useful because it forces us to combine related bits of information into larger units by identifying similarities, differences, and patterns that can simplify and consolidate an otherwise large and confusing sensory field (p. 31).

**Analogy as a Reference Point**

Analogies engage working memory processes by bringing together new ideas and known concepts. They establish a reference point for new learning and a compass for skill transfer (Bransford, Brown & Cocking, 1999).

Egan (1998) claims that understanding “seems often to ride on the kind of generative grasp one finds” in analogies (p. 55). Analogies, claim Egan, establish relationships “between heterogeneous ideas in a way that adds something to, or throws new light on, the thing talked about” (p. 55). Halpern (2003) concurs, claiming an analogy provides clues about an idea’s relevance and relationship to other ideas. Analogies enlarge ideas, making even complex ideas understandable (Ruef, 1998) and invisible processes comprehensible (Egan 1986).

Bransford, Brown, & Cocking (1999) claim analogies provide opportunities to observe the similarities and differences between the new and the known used to construct meaning. Wormeli (2005) claims analogies enable students to isolate the critical attributes of ideas, resulting in greater understanding and retention. The increased
retention may arise from the flexibility embedded in analogies. According to McDaniel and Donnelly (1996), analogies provide the brain with flexibility in encoding memories. Analogies increase the likelihood students will transfer learning to new contexts. Through analogies, students recognize and identify underlying structures and general principles, the critical attributes that enable students to generate additional examples and apply processes in new contexts (Bransford, Brown, & Cocking, 1999). Transferring learning to new contexts requires an act of inference, identifying similarities between what is known and a new situation. Such thinking depends on analogy (Halpern, 2003).

Not all analogies work equally well. Inadequate analogies, for example, create imprecision and a lack of understanding (Egan, 1986). Bransford, Brown and Cocking (1999) and Halpern (2003) stress that analogies used for instruction should feature structural similarities with the new idea being presented. Structural similarity provides insight even when peripheral elements differ significantly. Browne and Keeley (2004) agree, stressing that the structural similarities must be relevant to the underlying principles of the ideas represented in the analogy. The underlying patterns engage deeper consideration of critical attributes, resulting in greater understanding of the new ideas (Pedone, Hummel, & Holyoak, 2001).

**Constructing Meaning**

Working memory’s role in reading comprehension includes more than establishing a reference point for new learning. Working memory processes ideas gained from text by merging them with the reader’s long-term memories. According to Ratey (2001), the interaction of incoming data from text and memory retrieval from long-term storage “resembles a freeway system during rush hour,” but through this interaction
working memory systems construct meaning (p. 188). Morgan (2004) describes such interaction as information integration. Understanding, claims Morgan, “starts with experience and ends with working memory” (p. 72). As the frequency and quality of this interaction improves, reading comprehension improves (Young, 2000).

McEwan (2004) and Young (2000) delineate three interacting steps of working memory’s role in reading comprehension:

1. Data gained through reading enters working memory.
2. Related information is retrieved from long-term storage.
3. Meaning is constructed as thought processes are applied, engaging working memory processes that merge the data gained through reading with related data from long-term storage.

Working memory’s intimate role in reading comprehension suggests effective comprehension instruction engages working memory processes.

*Data Discrimination and Metacognition*

Reading comprehension requires attention to relevant details. Working memory functions, in part, by suppressing irrelevant information (De Beni, Palladino, Pazzaglia, & Cornoldi, 1998). Reading comprehension necessitates the disregard of irrelevant information, especially when new information presented later in a text replaces previously stated but currently irrelevant information.

De Beni, Palladino, Pazzaglia, and Cornoldi (1998) claim working memory’s ability or inability to inhibit irrelevant information affects reading comprehension. Subjects with low reading comprehension abilities struggle to inhibit irrelevant information as evidenced by erroneous responses to comprehension questions. Poor
comprehenders provide irrelevant information rather than correct, more relevant information. Though poor comprehenders experience no difficulty in forming memories, their working memory systems do not update as well as those of good comprehenders, causing resistance to the processing of newly relevant ideas.

Subjects with good reading comprehension skills suppress irrelevant information and respond with correct, relevant responses to the same comprehension questions. De Beni, Palladino, Pazzaglia, and Cornoldi (1998) conclude that readers with poor comprehension maintain irrelevant information within working memory, especially when the information was initially processed as relevant but later became irrelevant.

Carretti, Cornoldi, De Beni, and Palladino (2004) and Carretti, Cornoldi, De Beni, and Romano (2005) claim subjects with better reading comprehension abilities have better working memory abilities, including the ability to suppress or inhibit irrelevant information but not forget it all together. Both good and poor comprehenders demonstrate memory for details, but poor comprehenders fail to suppress irrelevant details in order to process newly relevant ones. Unsuppressed irrelevant information strains working memory’s limited capacity range of seven to eleven items (Eichenbaum, 2002).

A reader must continually select relevant information and update understanding by merging the newly relevant with the previously relevant, suppressing previously processed but currently irrelevant information. Because of its role in effectively updating working memory, Carretti, Cornoldi, De Beni, and Palladino (2004), Halpern (2003), and Livingston (1996) conclude that children benefit from instruction in the neurocognitive process of metacognition.
Costa and Kallick (2000) define metacognition as knowing one’s knowing. Metacognition involves revising and editing one’s own ideas to change direction, to improve performance, or to gain confidence in previously drawn conclusions. To metacogitate is to engage in an internal conversation with a critic of the content and process of one’s own thoughts (Costa & Kallick, 2000). Through metacognition, students recognize relevant and irrelevant information and can direct attention accordingly (Given, 2002; Halpern, 2003).

According to Baker (in Block & Pressley, 2002), research consistently shows that poor comprehenders lack control and consciousness of their own thought processes. These deficiencies foster a tendency to focus on irrelevant details. McEwan (2004) claims increasing students’ metacognitive abilities capacitates them to monitor and clarify an author’s meaning while reading, to demonstrate cognition through thinking aloud, and to encode more of what is read to long-term memory. Metacognition facilitates greater attention to relevant details by increasing an individual’s ability to self-regulate (Baker in Block & Pressley, 2002; Bransford, Brown, & Cocking, 1999; Halpern, 2003).

Bransford, Brown and Cocking (1999) allege that increased metacognition improves a reader’s ability to generalize themes and processes and to transfer skills from one context to another. Instruction in thought processes, independent application of thought processes with instructive feedback, and small group interactions featuring analysis and discussion of recorded thought processes, such as the construction of visual tools, promotes metacognitive development (Baker in Block & Pressley, 2002; Bransford, Brown & Cocking, 1999).
The Human Hippocampus

Connections between the brain’s prefrontal cortex and hippocampus, a structure in the brain’s center that plays critical roles in working memory and memory formation (see Figure 2.1), enable working memory processes (Degenetais, Thierry, Glowinski, & Gioanni, 2003; Eichenbaum, 2000; Goldberg, 2001). The hippocampus assimilates new information and stored memories for working memory to process, an activity “essential for the creation of meaning” (Sousa, 2001, p. 18).

Figure 2.1. The Human Hippocampus (www.brainconnection.com)

Ratey (2001) describes the hippocampus’s role in encoding memory as the “master regulator, the hub at the center of the wheel” that acts like “an intelligent collating machine,” filtering “new associations,” deciding what “is important and what to ignore or compress,” sorting “the results,” and sending memory bits to other parts of the brain for processing and long-term storage (p. 188). Memory recall requires many of the same processes in reverse (Ranganath, Cohen, Dam, & D’Esposito, 2004).

**Associated Connections**

The human hippocampus establishes a network of overlapping and isolated data as the brain constructs meaning (Eichenbaum, 2002). The hippocampus operates by connecting ideas into integrated wholes, the same process necessary for reading comprehension (Balasubramaniam, 1999).

Eichenbaum (2002) and Eichenbaum and Cohen (2004) claim the hippocampus and its surrounding structures, collectively known as the medial temporal region, activate any time the brain encounters new or complex information. The hippocampus organizes new data into bits that are both independent and related. The bits can stand alone, but frequently overlap, allowing multiple memories to utilize common bits.

For example, an individual driving to work combines several memory bits to reconstruct the desired route and make the correct turns. The individual can make it from Point A (home) to Point F (work) successfully because bit A overlaps with bit B, which overlaps with bit C, and so forth. The same individual navigates to another location that shares parts of the same route without encoding an entirely separate memory for the route to the new location, retrieving and organizing the bits the two routes share. Rather than
using bits A-F, which construct the route from home to work, navigating to the new location requires bits A-D combined and organized with bits G, H, and I (Eichenbaum, 2002).

Because the hippocampus develops and operates on a “network of associated connections,” it plays three critical roles in memory formation and thinking (Eichenbaum, 2002, p. 143). First, the hippocampus encodes individual subsets of episodes and organizes them with appropriate connections. Second, the overlapping subsets combine to create larger memories, such as memories of events that comprise several episodes. For example, an individual’s memory of a wedding day may comprise getting dressed for the ceremony, participating in the ceremony, and having pictures taken. Finally, the hippocampus’s organization of memory allows for inferences by enabling the brain to “step across learned associations” (Eichenbaum, 2002, p. 168). For example, knowing the address of a new location and knowing the layout of the city in which the address is located may allow an individual to navigate to the location, inferring the missing knowledge of the route based on the two bits that are known.

Smith and Squire (2005) claim inference depends on hippocampal activation. Individuals who understand a hierarchical relationship between items show hippocampal engagement during initial processing and can accurately describe the relationship between items not associated in initial presentation. In Smith and Squire’s study, initial presentation focused on one-to-one relationships, such as A is larger than B. The simple associations continued for several pairs, such as B is larger than C, and C is larger than D. When asked to describe the relationship between pairs not originally associated, such as B and D, the individuals with greater hippocampal engagement during initial processing
understood the hierarchical relationship and correctly identified the relationship. Subjects gained abilities of transitive inference through hippocampal engagement.

Diamond and Hopson (1999) and Eriksson, Perfilieva, Bjork-Eriksson, Alborn, Nordborg, Peterson, and Gage (1998) portray the hippocampus as the most important brain structure for learning and memory. Through its connections to the cerebral cortex, the hippocampus influences thinking and working memory processes, memory organization, storage, and retrieval—the major processes involved in constructing meaning. Teaching that fits the hippocampus’s operational modes likely results in greater learning than teaching that ignores the functions of this most important brain structure for learning (Kosik, 2005).

Spatial Processing

Conversion of ideas presented linearly in text to entities able to be spatially manipulated and organized increases thinking and comprehension (Hyerle, 2000). The hippocampus, which is intimately involved in working memory processes, operates most efficiently when engaged in spatial processing (Kumaran & Maguire, 2005). Researchers contributing to a developing understanding of spatial processing include Armbruster, Lehr, and Osborn (2003); Biancarosa (2005); Hsu and Hsieh (2005); Kim, Vaughn, Wanzek, and Wei (2004); Kumaran and Maguire (2005); Nosich (2001); Sayala, Sala, and Courtney (2005); Sousa (2005); and Williams (2005).

Maguire, Frith, Burgess, Donnett, and O’Keefe (1998); Kumaran and Maguire (2005); and Sayala, Sala, and Courtney (2005) claim the hippocampus prefers spatial processing. Based on the results of functional magnetic resonance imaging of the hippocampus as it processes data of differing relational types, Kumaran and Maguire...
conclude the human hippocampus possesses a bias for spatial processing. The hippocampus shows greater engagement in processing spatial relationships than in processing any other relational type. When processing other types of relationships (e.g., social networks), the hippocampus becomes increasingly engaged when spatial elements guide the relational exploration.

Increased levels of hippocampal engagement result in more efficient memory encoding and retrieval. Sayala, Sala, and Courtney (2005) found greater efficiency in working memory when tasks included spatial reasoning, even when the tasks were not originally spatial in nature. For example, when asked to describe the relationship of various family members, subjects who imagined a spatial representation of the hierarchy (e.g., a family tree diagram) showed greater hippocampal activation than subjects who described the relationships without imagining a spatial organization.

Maguire, Valentine, Wilding, and Kapur (2002) claim optimal memory engages hippocampal activity. In a study comparing an experimental group composed of World Memory Championship contestants with a control group, Maguire et al. found greater hippocampal activation in the experimental group correlated with superior memory abilities. In interviews with experimental group members, Maguire et al. found extensive use of a mnemonic known as loci. In using loci, the members of the experimental group created a mental representation of spatial relationships between items to be remembered. As spatial processing increased, so did memory.

Biancarosa (2005); Hyerle (2000); Kim, Vaughn, Wanzek, and Wei (2004); and Williams (2005) claim that instructional methods that assist readers in converting the ideas presented in text to spatial representations or visual tools aid the reader in
comprehending text. Such processing improves comprehension, especially when a text features complexities such as the interweaving of a main plot and subplots, the interactions of multiple characters, or in-depth development of a protagonist. According to Biancarosa, introducing visual tools following modeling of how and where to use a strategy gives students a framework for the thinking process. While reading, the development of visual tools with structures that mirror a thought process provides practice in applying the thought process to text and increases the depth and efficiency of comprehension (Hyerle, 2000).

From a review of twenty studies, Kim, Vaughn, Wanzek, and Wei (2004) claim extended use of multiple visual tools results in significant reading comprehension achievement. Williams (2005) validates this claim. Based on a series of three experimental studies, Williams claims the use of visual tools in reading instruction improves abilities to independently comprehend text meaning and to summarize text passages.

Hsu and Hsieh (2005) further validate the impact of visual tools on student thinking abilities. In a semester-long study, students who developed visual tools exhibited problem solving and critical thinking skills superior to students who processed content through non-spatial methods. Students who developed visual tools organized information and identified relationships between ideas better than their peers.

Armbruster, Lehr, and Osborn (2003); Hyerle (2000); Nosich (2001); and Sousa (2005) claim visual tools are effective because a) they assist students in structuring ideas, b) they help students focus on important ideas within a text, c) they provide a framework
for thought processes, d) they encourage the use of higher-level thinking, and e) they stimulate additional reflection and discussion about a text’s ideas. Hyerle (2000) explains:

Few tools provide a concrete way to transform unprocessed information into useful patterns of knowledge, which are at once usable and easily communicated to others…[Visual tools are] representations of the patterning and networking information that is already going on in the brain…the brain makes sense of the world by constructing patterns from the world…there is no way to measure patterns…we must map patterns (p. 29).

Richardson and Morgan (1997) agree, claiming students gain understanding when ideas from text are arranged into meaningful spatial patterns. Students discover “interrelationships and hierarchies,” as they manipulate and organize ideas, increasing comprehension and clarifying thinking (p. 224).

Zwiers (2004) claims the organizing of text information results in comprehension. As the reader sees and infers connections between text ideas, comprehension develops. Constructing visual tools while reading fosters idea organization, resulting in improved comprehension.

Thinking

Reading represents a form of thinking (Paul & Elder, 2001; Nosich, 2001; Zwiers, 2004). Thinking constructs meaning during reading, producing understandings that foster additional thought and facilitate deeper understanding (Washburn & Blackmon, in press).
Mursell (1951) eloquently argues the same ideas:

There is one key idea which contains, in itself, the very essence of effective reading, and on which the improvement of reading depends: Reading is reasoning. When you read properly, you are not merely assimilating. You are automatically transferring into your head what your eyes pick up on the page. What you see on the page sets your mind at work, collating, criticizing, interpreting, questioning, comprehending, comparing. When this process goes on well, you read well. When it goes ill, you read badly (p. 58).

Critical thinking research reveals the intimate role thinking plays in the construction of meaning. A reader who fails to think while reading fails to read (Bosma & Blok, 1992). Researchers contributing findings on critical thinking’s role in reading comprehension include: Almasi (2003); Balasubramaniam (1999); Connor, Morrison, and Petrella (2004); Ivey and Fisher (2005); Johnson (2000); Kurland (2000); National Reading Panel (2000); Nosich (2001); Paul (1995); Paul and Elder (2001, 2004); Duke and Pearson (2002); Pressley, Wharton-McDonald, Mistretta-Hampston, and Echevarria (1998); Richardson and Morgan (1997); Roe, Smith, and Burns (2005); Sadoski (2004); Snow (2002); Van Keer (2004); Van Keer and Verhaeghe (2005); and Wilhelm (2001).

Paul (1995) contends that even fiction builds upon logic. Story events make sense according to the author’s thinking, and the reader comprehends the author’s thinking through asking and answering questions that promote thought about story element connections. Without logical connections, stories lose coherence and become incomprehensible. Thinking—asking and answering questions focused on connections—enables a reader to understand and thereby possess a story.
Comprehension requires higher-order thinking, claim Kurland (2000) and Roe, Smith, and Burns (2005). Understanding the relationships among events, the motivations of characters, and other factors that are not explicitly stated within a text requires interpreting, analyzing, synthesizing, drawing conclusions, recognizing cause and effect relationships, and determining an author’s purpose. Readers, therefore, must detect and interpret implied information by merging textual ideas with their background experiences and understandings (Langer, 1995; McEwan, 2004; Wolfe & Nevills, 2004).

Kurland (2000) and Sadoski (2004) claim that reading is actually a problem solving process requiring cognition. According to Kurland, “We do not simply read words; we read ideas, thoughts that spring from the relationships of various assertions” (p. 3). Understanding text deeply requires the construction of meaning through connection and interpretation of the author’s ideas. Sadoski states that without some degree of inference on the part of the reader, even basic comprehension fails to occur. To develop inferential abilities, students must be explicitly taught to confidently use rules of logic and combine stated information with sensible unstated information (Paul, 1995).

Paul and Elder (2004) and Snow (2002) contend that students rarely gain deep understandings of texts because deep comprehension requires exertion and intentional thought. Balasubramaniam (1999) defines deep comprehension as the ability to recognize, organize, and articulate the central ideas of a text without conflating them with peripheral details. Knowledge structuring, problem solving, logical thinking, and new understanding application depend on deep comprehension. A reader who fails to comprehend deeply fails to take full advantage of a text’s ideas (Balasubramaniam, 1999).
Summary

Neurocognitive structures and processes provide the means of reading comprehension. Working memory functions by merging new ideas with known concepts from long-term memory (Wolfe & Nevills, 2004; Young, 2000). The use of analogies contributes to efficient working memory processes by revealing the deep structures and critical attributes of new and known ideas (Pedone, Hummel, & Holyoak, 2001). Working memory suppresses irrelevant information, allowing the reader to focus on the elements relevant and necessary for comprehension (De Beni, Palladion, Pazzaglia, & Cornoldi, 1998). The human hippocampus establishes and functions from a network of connected and independent ideas (Eichenbaum, 2000), providing the ability to connect ideas necessary for full comprehension. Reading represents cognition, and cognition makes the author’s intended meaning the reader’s own (Kurland, 2000; Paul & Elder, 2001).

Effective reading programs base instructional processes and materials on an understanding of the brain’s role in reading comprehension (McEwan & Nevills, 2004). Table 2.1 provides a listing of the research-based neurocognitive elements stated as characteristics of effective reading instruction.
Table 2.1. Summary of Neurocognitive Elements Characterizing Effective Reading Programs

<table>
<thead>
<tr>
<th>Neurocognitive Elements</th>
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<tbody>
<tr>
<td>An effective middle school reading program:</td>
</tr>
<tr>
<td>1. engages the construction of meaning through the use of analogy, connecting to student long-term memories via patterns related to cognitive processes involved in comprehension</td>
</tr>
<tr>
<td>2. features instructional activities that aid comprehension through engaging working memory processes, such as merging new content with long-term memories to construct understanding</td>
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<tr>
<td>3. includes multiple metacognitive activities, directing student focus to relevant text details</td>
</tr>
<tr>
<td>4. fosters the development or augmentation of a “network of associated connections” through activities that engage students in identifying and interpreting meaningful connections between text elements (Eichenbaum, 2002, p. 168)</td>
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<tr>
<td>5. engages students in converting text ideas into components that can be manipulated and organized spatially to explore connections and deepen comprehension</td>
</tr>
<tr>
<td>6. views thinking as a means to comprehension and comprehension as a means to content for additional thinking that deepens comprehension as evidenced by the program’s instructional methods and process</td>
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Instructional Methods and Processes

Teachers combine effective instructional methods to create successful comprehension instruction (Biancarosa & Snow, 2004; Duke & Pearson, 2002). An effective teacher creates ongoing instruction, emphasizing thought-based comprehension and focusing student attention on the thought processes that will illuminate a text’s meaning.

Explicit Instruction, Modeling, and Thinking Aloud

A combination of explicit instruction, teacher modeling, and thinking aloud facilitates student learning of reading comprehension’s thought processes (Duke & Pearson, 2002; Wilhelm, 2001). Knowing how to deepen comprehension through intentional application of thought processes differentiates expert readers from novice readers.

Almasi (2003) defines explicit instruction as a clear explanation of the “declarative, procedural, and conditional knowledge associated with a given strategy”
Explicit instruction explains the thought processes composing a strategy, specifies the information provided by applying the thought processes, describes the contexts in which the thought processes are valuable, and demonstrates thought process application. In demonstrating application, the teacher thinks aloud, making unseen thought processes observable.

For example, to demonstrate or model the thought process used to identify a text’s sequence of events, the teacher may read a page of an illustrated book or short story and then pause, saying, “I notice that some things happened already in this story. As I ask myself, ‘What happened first?’ I review the text and see that first Rabbit challenged Turtle to a race.” The teacher continues thinking aloud while sharing the text with the class and constructing the text’s sequence of events through observable application of the thought process. Generally, explicit instruction flows from skill definition to thought process explanation and application demonstration with written text via think-aloud (Almasi, 2003).

Duke and Pearson (2002) and Wilhelm (2001) claim the modeling of thought processes as a component of explicit instruction provides several benefits. Wilhelm states the following: (a) modeling of thought helps readers, especially poor readers, recognize that reading is meaningful—that it makes sense; (b) it helps students move beyond a text’s literal elements to understanding a text’s meaning; (c) it helps students learn how to construct meaning through thinking; (d) it boosts student motivation for reading by giving students greater confidence based on the teacher’s demonstration of how rather than just a definition of what; (e) and it develops an awareness of thinking, helping students recognize that how they are thinking contributes to the content of their thinking.
Duke and Pearson add that teachers who model comprehension strategies by verbalizing thought processes while applying them to text demonstrate how and when to effectively apply the thought processes.

Williams, Hall, Lauer, Stafford, DeSisto, and deCani (2005) claim explicit instruction in thought processes combined with methods and tools focusing student attention on text structure and organization increases student reading comprehension achievement. Students receiving such training develop well-organized mental representations of text meanings and construct comprehension that surpasses the comprehension of peers taught with traditional, post-reading questioning.

Almasi (2003) and Duke and Pearson (2002) claim students in every grade level benefit from explicit instruction in thought processes. From kindergarten to high school, students exposed to thought process instruction improve their comprehension abilities, including retelling, attending to major story structure elements, making and justifying predictions, justifying interpretations of a text, and summarizing. Almasi delineates the benefits of explicit instruction:

1. Explicit instruction in thought processes enables readers to expand, structure, and evaluate information.
2. Explicit instruction in thought processes aids cognitive development in attention, memory, and communication.
3. Explicit instruction in thought processes provides students with a collection of methods to independently acquire learning.
4. Explicit instruction in thought processes promotes achievement in every area of the curriculum.
Connor, Morrison, and Petrella (2004), Van Keer (2004), and Van Keer and Verhaeghe (2005) claim a correlation exists between the amount of explicit instruction a child receives and the child’s reading achievement. In a longitudinal study of 73 students followed from kindergarten or first grade through third grade, Connor et al. found the more time that a child experienced explicit comprehension instruction the greater the child’s gains in reading comprehension. Connor et al. also found that children with low to average comprehension scores at the beginning of a school year made greater gains than their peers in classrooms that did not include explicit comprehension instruction. However, Connor et al. found a daily average of only one minute of explicit instruction in classrooms per day.

Van Keer (2004) claims fifth grade students in experimental groups who received explicit instruction not only had greater gains from the pretests at the beginning of the school year to the posttests at the end of the school year, but also outperformed students in a control group on a third test given midway through the following school year. Students who had received explicit instruction continued to gain comprehension abilities even when placed in sixth grade classrooms that did not include it. Students in the control groups received comprehension instruction, featuring post-reading questioning with little or no explicit instruction in comprehension thought processes.

Van Keer and Verhaeghe (2005) validate these claims. In a study of second and fifth grade students, second grade students who received explicit instruction had a “significant extra learning gain of approximately one-quarter of a standard deviation” over students who received more traditional comprehension instruction (p. 318). Poor second grade readers achieved gains equal to those of accomplished readers. In the fifth
grade groups, students who received explicit comprehension instruction excelled those in the control group by as much as two-fifths of a standard deviation. Again, the gains were as good for the poor readers as for the accomplished readers. Based on the results, Van Keer and Verhaeghe recommend “an alternative model of reading comprehension instruction, in which a set of reading strategies that characterize proficient readers is emphasized, as well as promoting students’ understanding about when and how to use these strategies in a flexible way” (p. 325).

The National Reading Panel (2000) claims explicit instruction in comprehension thought processes aids students in reading comprehension and independent learning. When students are explicitly taught comprehension thought processes, they consistently make “significant gains” over students not given explicit comprehension instruction (p. 3).

Ivey and Fisher (2005), and Richardson and Morgan (1997) claim that despite its benefits, explicit thought process instruction remains rare because teachers often confuse testing comprehension with teaching comprehension. Teachers appear to know the importance of comprehension instruction but lack knowledge of how to provide it (Almasi, 2003; Pressley, Wharton-McDonald, Mistretta-Hampston, & Echevarria, 1998).

Johnson (2000) provides direction. A comprehension skill, claims Johnson, is a thinking skill that can be broken down into individual steps, making explicit reading comprehension instruction possible. Teaching the individual steps enables students to engage in higher-level thinking and to construct a text’s meaning. As an example of the individual steps in a thought process, Johnson explains the breakdown of comparison and contrast. First, analyze the whole: what are the components that make Item A what it is
and Item B what it is? Second, identify the similarities: what do Items A and B share in common? Third, identify the differences: what characteristics are unique to Item A? Item B? Finally, describe both items by explaining how they are and are not alike.

Teachers must provide such instruction to equip students for independent comprehension. To know more than what a text says, to know what a text means, students must be taught higher level thought processes. Reading comprehension instruction should comprise the explicit teaching, teacher modeling, and thinking aloud of thought processes and their application, equipping students to develop a deep understanding of text (Almasi, 2003; Connor, Morrison, & Petrella, 2004; Duke & Pearson, 2002; Van Keer, 2004; Van Keer & Verhaeghe, 2005; Wilhelm, 2001).

**Skill Application Practice and Instructive Feedback**

Practice increases learning. When repeated frequently, complex cognitive processes activate the brain, setting into motion the cognitive processes leading to long-term memory (Bransford, Brown & Cocking, 1999). Anderson, Reder, and Simon (as cited in Marzano, 2003) agree, stating, “In denying the critical role of practice one is denying children the very thing they need to achieve real competence” (p. 115).

Byrnes (2001) and Wong and Wong (2001) claim teachers increase student achievement when they increase the amount of time a student actually works, practicing skill application. Learning, state Wong and Wong, does not result from the teacher’s work. Byrnes (2001) claims the human mind is naturally equipped to retain procedures that are repeatedly processed. Students who engage in practice possess a greater likelihood of retrieving a memory than students who do not engage in practice.
Marzano (2003) views practice as a “necessary ingredient” of mastering procedural knowledge. “Without practice,” claims Marzano, “the chances of reaching requisite levels of learning are small indeed” (p. 115).

However, not all practice results in increased student achievement. According to Bransford, Brown, and Cocking (1999), characteristics of mastery include deep content understanding resulting in the ability to identify and utilize patterns within content, and the ability to independently use knowledge in multiple contexts. Many teachers “stop short of helping students develop the fluency needed to successfully perform cognitive tasks” (p. 32). Because teachers often rely on textbooks for direction in how to “organize subjects and students,” instruction fails to provide the focused and extensive practice necessary for mastery to develop (p. 33).

Murphy and Alexander (2006) emphasize focused practice as the means to automaticity. Focused practice, over time, causes the steps of a process to “fuse” into “action-related sequences” (p. 40). Continued focused practice causes these “action-related sequences” to become second nature to the learner.

Bransford, Brown, and Cocking (1999) warn that covering too many topics too quickly hinders practice. Such instruction results in students who may know isolated sets of facts but cannot organize those facts into the structural principles that represent understanding. Practice suffers and instructive feedback becomes scarce, sacrificing learning (Bransford, Brown, & Cocking, 1999).

Dunning, Heath, and Suls (2005) claim that learning skills differs significantly from learning limited content. In studies of massed training, in which a teacher teaches students in a few, intense sessions, students memorize relevant content quickly. When
skills are taught the same way, student understanding and application knowledge “decay rapidly,” leaving the same result as no instruction (p. 23). According to Dunning et al., “distributed training,” in which instruction and practice are spread over several connected sessions, results in skill mastery (p. 23).

Teachers maximize the influence of practice by combining it with instructive feedback. Instructive feedback identifies a student’s current level of understanding and develops a plan for increasing proficiency. Leahy, Lyon, Thompson, and Wiliam (2005) describe instructive feedback as “assessment for learning rather than assessment of learning” (p. 19). Instructive feedback features a teacher-student interaction in which the comparison of student work with defined levels of proficiency provides the student with direction for future work and increased proficiency.

Turner and Shellard (2004) claim that engaging students in thoughtful qualitative analysis of work in reference to established standards facilitates an understanding of the critical elements composing new concepts. Thoughtful qualitative analysis empowers students to take responsibility for improving learning and its evidence, and clearly defined levels of achievement move students “toward higher levels of performance” (Turner & Shellard, 2004, p. 2).

Marzano (2003) claims that the academic achievement of students who receive instructive feedback on their skill application practice significantly surpasses the academic achievement of students who do not receive instructive feedback. Hattie concurs, calling instructive feedback the “most powerful modification that enhances achievement” (as cited in Marzano, 2003, p. 37).
Bransford, Brown, and Cocking (1999) claim the influence of instructive feedback results from its emphasis on accuracy in skill application. As teachers review evidence of student understanding, students gain opportunities to revise their thinking. Such reprocessing increases the likelihood of skill mastery and transfer to new contexts (Bransford, Brown, & Cocking, 1999).

Instructive feedback accelerates learning. Black and Wiliam (1998) claim students taught by teachers who provide frequent instructive feedback achieve performance levels in only 6–7 months that normally require at least a year to develop, a 30-40% reduction in learning time.

Damon (1996) claims that the final product view of assessment, in which finished products are evaluated and graded, reverses assessment’s correct emphasis. Assessment reflects standards, and since standards represent the “central mission” of schooling, assessment should be an integral, ongoing process of instruction. Instructive feedback based on established standards places assessment in the learning process and a) challenges and inspires students, b) capacitates students to greater achievement levels, and c) builds self-esteem through effort and success in achieving high standards (Damon, 1996).

The combined insights of Bransford, Brown, and Cocking (1999); Chappuis (2005); Damon (1996); Marzano (2003); Mentkowski and Associates (2000); Murphy and Alexander (2006); and Scherer (2005) provide descriptors of effective instructive feedback:

1. Effective instructive feedback is timely. Students receive frequent feedback throughout the learning process.
2. Effective instructive feedback is meaningful. Students gain advice on how to improve without being compared to other students.

3. Effective instructive feedback is specific. Students understand exactly what they have done and how it compares to clearly defined levels of competence.

4. Effective instructive feedback does not interrupt student processing. Students receive instructive feedback at times other than those when they are engaged in actually applying a skill. The instructive feedback does not interfere with student thinking.

5. Effective instructive feedback integrates cognition and context. Students receive feedback on their cognitive activity based on the evidence produced in relation to the material being processed.

6. Effective instructive feedback empowers students to self-evaluate and self-correct. Students receive sufficient feedback to internalize the evaluation and correction process.

Instructive feedback optimizes the benefits of student practice, increasing student achievement (Marzano, 2003; Siegler, 2005). Opportunities for instructive feedback characterize effective instructional processes.

Small Groups

Cognitive activity enables a reader to comprehend a text’s meaning. Small groups provide the best structure for instruction requiring cognitive input (Wiles & Bondi, 2000). Since cognitive activity while reading facilitates comprehension, the instructional process for reading should include small group interactions. R. T. Johnson and D. W. Johnson (1986) state the following:
There may be no other instructional strategy that simultaneously achieves such diverse outcomes as cooperative grouping. The amount, generalizability, breadth, and applicability of the research on cooperative, competitive, and individualistic efforts provides considerable validation of the use of cooperative learning to achieve diverse outcomes, including achievement, time on task, motivation, transfer of learning, and other benefits (p. 31).

Armbruster, Lehr, and Osborn (2003) and Roe, Smith, and Burns (2005) claim that small group interactions foster understanding and comprehension strategy development. The combination of direct explanation, modeling, student think-aloud with teacher feedback, guided practice, and group and individual application that can occur in small groups promotes internalization of comprehension thought processes and independence in comprehending text.

Small groups promote participation and facilitate effective cognitive activity. Pressley and Block (2002) and Tracey and Morrow (2002) claim that small groups provide a structure wherein teachers can scaffold instruction for students, moving from explicit instruction and modeling to guided and supported practice, and ultimately to independent application. Bransford, Brown, and Cocking (1999) describe scaffolded instruction as directing the learner’s interest in a task, demonstrating an ideal application of a process, simplifying a complex process so the learner can manage its individual components, motivating the learner to complete the task, providing feedback on the learner’s results compared with an ideal, and controlling frustration by offering additional instruction and modeling. Bruner (1983) characterizes scaffolded instruction with the following motto: “Where before there was a spectator, let there now be a participant”
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(p. 60). Through extended participation in small groups with scaffolded instruction, students become more mentally active readers, increase in their motivation for reading, and internalize comprehension processes. (Block & Pressley, 2002; Tracey & Morrow, 2002).

Biancarosa and Snow (2004) claim that small group interchanges focused on interesting literature cultivate deeper reading comprehension. In the small group, students share confusions they have about the text and gain strategies and ideas that enable better understanding of it. Reznitskaya and Anderson (2002) describe small group interaction as “collaborative reasoning,” an activity that gives students experience in reflection and dialogical thinking, exposes students to a variety of viewpoints related to the text, and expands their responses to reading (p. 324).

Fawcett and Garton (2005) recommend that teachers actively monitor group interaction and balance the interaction as much as possible, warning that simply placing students into small groups accomplishes little. A study of 125 second grade students reveals that the amount of verbal interaction within the small group correlates with achievement. Students who work in small groups with limited interaction or in groups with interaction dominated by one or two individuals fail to make greater gains than students who work on the same tasks individually. Students in small groups with approximately equal interaction among the members make significantly more progress than students who work independently.

Summary

Exemplary reading teachers structure reading instruction around the use of small collaborative groups characterized by a combination of direct explanation, modeling,
student think-aloud, teacher feedback, guided practice, group and individual application (Armbruster, Lehr, & Osborn, 2003), scaffolded instruction (Pressley & Block, 2002; Tracey & Morrow, 2002), literature-focused discussion (Biancarosa & Snow, 2004), and equal contribution by all members (Fawcett & Garton, 2005). An effective instructional process results when these activities follow focused practice combined with instructive feedback based on established levels of proficiency, explicit instruction, and teacher modeling. Table 2.2 states these conclusions as descriptors of an effective reading program.

**Table 2.2. Summary of Instructional Processes Characterizing Effective Reading Programs**

<table>
<thead>
<tr>
<th>Instructional Processes</th>
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<tbody>
<tr>
<td>An effective middle school reading program:</td>
</tr>
<tr>
<td>1. includes explicit instruction in the thought processes that enable comprehension</td>
</tr>
<tr>
<td>2. includes teacher modeling of thought processes and idea organization that facilitate comprehension</td>
</tr>
<tr>
<td>3. includes scaffolded instruction, in which explicit instruction and modeling leads to guided and supported practice, progressing to independent practice with instructive feedback</td>
</tr>
<tr>
<td>4. includes multiple opportunities for students to practice skill application and receive instructive feedback from the teacher within a targeted time frame (i.e., the initial skill practice occurs repeatedly within the same instructional unit rather than being scattered throughout multiple units throughout the school year)</td>
</tr>
<tr>
<td>5. features an instructional process that provides frequent opportunities for instructive feedback</td>
</tr>
<tr>
<td>6. provides instructive feedback based on an established and understandable standard</td>
</tr>
<tr>
<td>7. includes small groups characterized by literature-focused interaction, comprehension skill application, and collaborative reasoning that facilitates deepening understanding of text</td>
</tr>
</tbody>
</table>

**Instructional Materials**

Instructional reading materials include text for student reading and materials for student use in skill application practice. Characteristics of effectiveness govern the selection of both.

Peterson (2001) claims that three elements must guide selection of texts for use in reading instruction: literature, reader, and text complexity. The literature must be of high
quality, possessing suitable complexity or readability and content that enables comprehension skill practice.

**Quality of Literature**

Langer (1995) claims that great literature actually prompts thoughtfulness by enabling readers to “create new combinations, alternatives, and possibilities, to understand characters and situations in ways not necessarily suggested when we take things as they are…It becomes an essential part of how we reason and understand” (p. 8).

Adler and Van Doren (1972) made the same argument decades earlier:

A good book does reward you for trying to read it. The best books reward you most of all. The reward, of course, is of two kinds. First, there is the improvement in your reading skill that occurs when you successfully tackle a good, difficult work. Second—and this in the long run is much more important—a good book can teach you about the world and about yourself. You learn more than how to read better; you also learn more about life. You become wiser. Not just more knowledgeable—books that provide nothing but information can produce that result. But wiser, in the sense that you are more deeply aware of the great and enduring truths of human life (p. 341).

Edmundson (2004) describes great literature as a “layered experience” (p. 41). The novice reader gains something from reading a great work of literature, but the work holds more for those willing to explore its complexity, its density, and its depths.

Bloom (2000) agrees, admonishing readers to read works that allow them to “read deeply” (p. 29).
Others cite the thoughts literature initiates as an indication of quality. Jacobs and Hjalmarsson (2002) claim that great literature enlarges the context of the reader’s thinking, and Bustard (2000) suggests that great works focus the reader on three “glorious” ideas: creation, redemption, and providence (p. 23).

How can reading educators ensure that reading programs include high quality literature? Horning (1997) suggests that positive reviews by reputable sources provide evidence of literary quality. School librarians and educators frequently review four sources for literary critiques: the American Library Association, the Horn Book, the School Library Journal, and the H. W. Wilson Standard Catalogs (Titlewave, 2005). The American Library Association, the largest library association in the world, reviews and promotes high quality media and presents the prestigious Caldecott and Newbery awards annually (American Library Association, 2005). The Horn Book publishes reviews of notable children’s literature and is considered the “most distinguished journal” in the field of children’s literature (Horn Book, 2005). The School Library Journal reviews more than 4000 works of children’s literature annually and is the most comprehensive review journal of children’s literature (School Library Journal, 2005). The H. W. Wilson Standard Catalogs feature selected works of children’s literature evaluated by librarians using specific criteria. The catalogs provide an educator’s view of literature, identifying works especially useful for instruction and curriculum inclusion (Wilson, 2005). A review by any one of these sources distinguishes a work as noteworthy.
**Relationship to Comprehension Skills**

Researchers suggest a number of considerations when selecting literature for use in instruction. These include (a) genre variety (Harvey & Goudvis, 2000; McEwan, 2004; Roe, Smith, & Burns, 2005), (b) award winners (Roe, Smith, & Burns, 2005), (c) works considered classics (Roe, Smith, & Burns, 2005), (d) social significance such as multiculturalism (Roe, Smith, & Burns, 2005), (e) student interest (Block, Rodgers, & Johnson, 2004; Harvey & Goudvis, 2000; Ivey in Block & Pressley, 2002; Roe, Smith, & Burns, 2005), (f) author variety and quality (Block, Rodgers, & Johnson, 2004; Strickland & Snow, 2002), (g) thematic connection (Blachowicz & Ogle, 2001; Burns, Griffin, & Snow, 1999), (h) student background (Harvey & Goudvis, 2000; McEwan, 2004), and (i) teacher enthusiasm (Harvey & Goudvis, 2000).

Selecting literature based on instructional purpose does not appear in this list of considerations; it is conspicuously absent from the professional literature. Yet this factor above all others seems critical for successful instruction. How can students practice skill application without text that facilitates such practice? For example, the skill of determining main idea and supporting details relates more significantly to nonfiction than it does to fiction. Identifying and understanding sequence of events requires literature that features significant events presented in some order rather than a character-based or “slice of life” narrative.

Harvey and Goudvis (2000) come closest to such a recommendation. They suggest teachers consider instructional purpose as one determinant of literature selection. However, Harvey and Goudvis illustrate this consideration with the following example: “Sometimes a thoughtful picture book may be the best way to launch a discussion about a
pressing issue like racism or an unfamiliar topic like the Great Depression” (p. 52).

Clearly, Harvey and Goudvis allude to establishing background knowledge, not to skill application.

Washburn and Blackmon (2003) suggest instructional purpose be one of three critical determinants of literature selection. Specifically, the selected literature should provide opportunities for deep application of the reading comprehension thought processes. Each comprehension skill requires slightly different literary content. For example, students gain multiple opportunities to practice drawing conclusions with well-developed mysteries. Biographies often offer practice in analyzing character. While it may be argued that every literary work features a theme, certain works feature elements more tightly developed around a central idea. Such works provide practice in identifying theme and identifying the elements that contribute to or support the identified theme. The literature used in reading instruction must provide practice in the skills students are learning. A mismatch of literature and skill hinders the practice necessary for skill mastery.

The other considerations include literature quality, as described previously, and text readability. Every work of literature used in reading programs should be of high quality, should present opportunity for skill application practice, and should represent appropriate reading challenges for students (Washburn & Blackmon, 2003).

*Readability and Pacing of Literature*

While it is true that no mathematical formula takes into account the various experiences of every reader, readability guidelines offer educators a means of organizing and selecting literature appropriate for reading instruction (Peterson, 2001). Readability
guidelines also provide assistance in appropriately sequencing literature for skill
development.

The Advantage-TASA Open Standard (ATOS) Readability Formula provides a
measure of text complexity. The advantages of ATOS Readability include measurement
based on complete texts rather than just a sample and wide availability of ATOS
Readability information. ATOS Readability bases its leveling on a zone of proximal
development, the developmental phase between what a child can do independently and
what a child can potentially do with adult interaction, making the readability levels useful
for instructional placement (Morgan, 2004; Wolfe & Nevills, 2004). An online database
presents the ATOS Readability for thousands of titles (School Renaissance Institute, 2000).

Researchers remain silent on the sequencing of readability throughout a school
year. However, common sense dictates a sequence progressing in difficulty. As students
gain reading skills, the complexity of texts they can manage increases. Maintaining
literature that falls into the zone of proximal development necessitates gradual increases
from unit to unit.

**Practice Materials**

Despite the wealth of research that claims practice increases learning (Anderson,
Reder, & Simon as cited in Marzano, 2003; Bransford, Brown & Cocking, 1999; Byrnes,
2001), the professional literature remains strangely silent on the characteristics of
effective student practice materials. Based on the findings of research in previously
discussed topics, the researcher suggests two critical attributes of effective student
practice materials:
1. Effective student practice materials facilitate independent application of thought processes that aid comprehension.

2. Effective student practice materials facilitate the connection of ideas in constructing comprehension of an author’s message.

**Thought application.** Johnson (2000) claims a comprehension skill represents a thought process that can be divided into steps. These steps form the content of explicit instruction (Almasi, 2003) and teacher modeling of the comprehension skill (National Reading Panel, 2000; Duke & Pearson, 2002; Wilhelm, 2001). Therefore, effective student practice materials facilitate the application of thought processes that aid comprehension.

What characterizes the appearance of such materials? Bransford, Brown, and Cocking (1999) claim learning is optimized when students record their thoughts and teachers provide instructive feedback based on those recorded thoughts. Student practice materials facilitate the application of thought processes by providing ample space for students to record their thoughts. For example, a student processes a text’s sequence of events, in part, by asking, “What happened first?” and “What happened next?” To record the thinking, the student requires space to form a flow chart, showing the results of the skill process application. Bransford, Brown, and Cocking (1999) warn that textbooks often fail to provide such practice, resulting in a lack of skill mastery.

**Idea connection.** The human hippocampus forms and operates based on a network of connected ideas (Eichenbaum, 2002; Eichenbaum & Cohen, 2004), and the human hippocampus prefers spatial processing (Kumaran & Maguire, 2005). Wolfe and Goldman (2005) claim that readers process textual meaning by connecting ideas.
Therefore, readers who recognize connections between the ideas in a text gain a coherent understanding of the author’s message. However, without instruction and practice in connecting textual ideas, students only make such connections about 23% of the time (Wolfe & Goldman, 2005).

Practice of comprehension skills should include the recognition and use of patterns in constructing understanding (Bransford, Brown, & Cocking, 1999). Therefore, effective student practice materials facilitate the connecting of ideas and recognition of patterns as the student constructs understanding.

What characterizes the appearance of such materials? Space for connecting ideas allows the processing necessary for comprehension. For example, as a student processes and identifies a text’s sequence of events, a connection between events may emerge, such as two events that combine to influence a protagonist’s perspective. Space within effective practice materials allows the student to physically connect and label the recognized relationship.

Bransford, Brown, and Cocking (1999) claim effective comprehension requires a coherent understanding of a concept’s organizing principles. By providing students with materials that facilitate application of thought processes and connection of ideas, teachers equip students for the coherent understanding of a text’s significant ideas.

Summary

In general, the professional literature does not address matching literature and instruction nor does it describe effective student practice materials. Based on related research findings, Washburn and Blackmon (2003) suggest that selections (a) feature high literary quality, (b) provide skill application opportunities, and (c) represent
appropriate developmental readability progress throughout the school year. Based on related research findings, Washburn and Blackmon (2003) claim effective student practice materials facilitate (a) independent application of thought processes, and (b) the connection of ideas. Such materials foster the thinking necessary for comprehension and the evidence necessary for instructive feedback. Table 2.3 states these conclusions as characteristics of an effective reading program.

**Table 2.3. Summary of Instructional Materials Characterizing Effective Reading Programs**

<table>
<thead>
<tr>
<th>Instructional Materials</th>
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<tbody>
<tr>
<td>An effective middle school reading program’s:</td>
</tr>
<tr>
<td>1. instructional literature represents a collection of high quality works</td>
</tr>
<tr>
<td>2. instructional literature provides multiple opportunities for the application of targeted comprehension skills</td>
</tr>
<tr>
<td>3. instructional literature represents readability levels appropriate for the student population</td>
</tr>
<tr>
<td>4. instructional literature increases in difficulty at a logical pace and in a logical sequence</td>
</tr>
<tr>
<td>5. materials facilitate independent application of thought processes that aid comprehension</td>
</tr>
<tr>
<td>6. materials facilitate the connection of ideas in understanding an author’s message</td>
</tr>
</tbody>
</table>

**The Effective Reading Teacher**

An effective instructional process requires a knowledgeable and intentional teacher. High quality professional development produces teachers with increased intentionality.

Strickland and Snow (2002) state that effective reading teachers possess three critical abilities. First, they engage in metacognition. They reflect on their thinking while reading, assess its quality, and apply strategies to improve their own comprehension. Second, they bring the unseen thought processes of comprehension into the open for students to observe. They analyze their own effective thinking, identify its component
steps, and explain and model effective thinking for students. Finally, effective teachers help students intentionally manipulate thinking to improve comprehension and internalize the thought processes to gain independence in comprehension.

Trabasso and Bouchard (2002) add that successful reading teachers know the thought processes that lead to greater comprehension, the ways those thought processes can be used by students, and productive means of communicating and demonstrating those processes for students. Effective teachers know how to help students recognize when and where to apply the thought processes.

Sanders and Rivers (1996) and Snow, Burns, and Griffin (1998) validate the impact of a knowledgeable teacher on student achievement. In a multi-year study, Snow et al. found that students described as being “at-risk” who were placed with strong reading teachers for two consecutive years became successful readers. The converse finding holds equal potency. Students not “at risk” but placed with weak reading teachers for two consecutive years experienced difficulties in learning to read. Sanders and Rivers cite similar results. Students placed with high performing teachers for three years in a row scored, on average, at the 96th percentile on state standardized assessments.

Professional Development

Effective reading teachers possess knowledge and know-how. Glickman (2002) claims exemplary teachers “can think about the task at hand, consider alternatives, make a rational choice, and develop and carry out an appropriate plan of action” (p. 89) What produces teachers with such understandings? Wren (2002) eloquently summarizes the answer: “The solution for helping struggling readers to become successful readers is to cultivate a population of teachers who are very knowledgeable about how children learn
to read, and who are adept at applying their understanding of reading instruction to the assessment and instruction of individual children” (p. 12).

Torff and Sessions (2005) identify five areas impacting teacher effectiveness: a lack of content knowledge, a lack of lesson planning abilities, a lack of lesson plan implementation skills, a lack of rapport with students, and a lack of classroom management skills. Surveyed principals identified all these pedagogical areas as having greater influence on teacher effectiveness than a lack of content knowledge. These results, claim Torff and Sessions, stipulate greater attention to teachers’ pedagogical knowledge, such as instructional design and implementation, and classroom management. Relying on teachers’ “natural” teaching abilities is “inadvisable.” Instead, schools should provide teachers with “rigorous training in pedagogical knowledge” (p. 536).

Joyce and Showers (2002) advocate rigorous professional development for teachers, stating, “Student achievement is the product of formal study by educators” (p. 3). Harwell (2003) and Picciano (2002) concur, claiming that student achievement does not change if teacher behaviors do not change.

When given the opportunity for high quality professional development, teachers can and do change their instruction according to Alexander, Heavside, and Farris (1998). Campbell, Hombo, and Mazzeo (2000) provide evidence, claiming teachers who participate in more than 35 hours of professional development related to reading instruction engage students in constructing meaning out of what they read more often than teachers with fewer hours of professional development.

According to Joyce and Showers (2002) and the National Staff Development Council (2001), effective professional development for teachers includes four
components. First, teachers develop improved instructional abilities with theoretical or rationale understanding. Teachers who understand the theories underlying new instructional processes achieve results similar to those obtained in the applied research studies on the theories. Second, teachers develop improved instructional abilities when professional development features modeling of new skills by competent practitioners. When they see theory effectively applied, teachers understand how to apply new methods in their own instruction. Third, teachers gain improved instructional abilities from multiple opportunities to practice new methods with instructive feedback from knowledgeable practitioners. Professional development viewed as an event rather than a process fails to provide the practice necessary for teacher improvement. Fourth, teachers gain improved instructional abilities through professional development featuring collaborative instructional design opportunities. Teachers who work with colleagues to design instruction experience greater success in possessing new skills than those who do not.

Summary

Effective teachers possess theoretical knowledge that forms the basis of their pragmatic knowledge. Teachers gain such knowledge and increase effectiveness through professional development characterized by thorough theoretical content, expert modeling of instructional methods, practice opportunities with instructive feedback, and collaborative instructional design. Table 2.4 states these findings as descriptors of effective professional development components of a reading program.
Table 2.4. Summary of Professional Development Characterizing Effective Reading Programs

<table>
<thead>
<tr>
<th>Professional Development</th>
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<tbody>
<tr>
<td>An effective middle school reading program:</td>
</tr>
<tr>
<td>1. includes all major instructional components, such as cognitive processes related to learning, beginning reading (e.g., phonemic awareness, phonics), reading comprehension instruction, small group leadership, vocabulary instruction, assessment, content area reading, and instructional design</td>
</tr>
<tr>
<td>2. includes the theoretical support for the instructional methods and process</td>
</tr>
<tr>
<td>3. includes the modeling of instructional methods by proficient practitioners</td>
</tr>
<tr>
<td>4. includes opportunities for teachers to practice new instructional methods with instructive feedback from the trainer</td>
</tr>
<tr>
<td>5. includes opportunities for teachers to work collaboratively on the development of instruction</td>
</tr>
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</table>

Summary

Middle school teachers responsible for student learning select instructional reading programs believed to foster student learning. An analysis of such programs requires the establishment of scientific findings in several areas, including neurocognitive structures and processes, instructional methods and processes, instructional materials, and teacher knowledge and professional development. Findings from these research areas establish a base for reading program development and evaluation.

Thinking, Comprehension, & Neurocognitive Research

Working memory functions, in part, by suppressing irrelevant information to create room for newly relevant information. The ability of working memory to update in this way affects reading comprehension (De Beni, Palladino, Pazzaglia, & Cornoldi, 1998; Carretti, Cornoldi, De Beni, & Palladino, 2004; Carretti, Cornoldi, De Beni, & Romano, 2005). Effective reading instruction includes metacognitive activities that engage students in reflecting on their thinking and evaluating the relevance of information.

The human hippocampus, a brain structure essential for organizing, storing, and retrieving memory, organizes data in independent but frequently overlapping bits. It creates a “network of associated connections” (Eichenbaum, 2002, p. 168; Eichenbaum & Cohen, 2004). Effective reading instruction provides structures and processes enabling students to connect a text’s ideas.

The human hippocampus prefers spatial processing (Kumaran & Maguire, 2005; Sayala, Sala, & Courtney, 2005). Instructional methods facilitating conversion of a text’s ideas into spatial representations, known as visual tools, aid reading comprehension (Biancarosa, 2005; Hyerle, 2000; Kim, Vaughn, Wanzek, & Wei, 2004; Williams, 2005).

Comprehending text requires thinking (Kurland, 2000; Roe, Smith, & Burns, 2005; Sadoski, 2004). Thinking enables a reader to understand an author’s ideas, and an author’s ideas provide content for additional thought. Comprehension increases as thought increases (Washburn & Blackmon, in press).

Explicit instruction in thought processes, modeling of thought processes, and thinking aloud improves reading comprehension achievement (Almasi, 2003; Connor, Morrison, & Petrella, 2004; Duke & Pearson, 2002; Van Keer, 2004; Van Keer &
Verhaeghe, 2005; Wilhelm, 2001). This effective combination of instructional activities rarely occurs in classrooms (Almasi, 2003; Pressley, Wharton-McDonald, Mistretta-Hampston, & Echevarria, 1998). Teachers appear to know that comprehension instruction is important but lack the knowledge of how to design or implement effective comprehension instruction.

Students gain greater achievement through increased skill application practice (Wong & Wong, 2001) combined with instructive feedback (Bransford, Brown, & Cocking, 1999). Effective instructive feedback is timely, meaningful, specific, unobtrusive, empowering, and informative. It provides a student with an understanding of current achievement of the requirements for greater achievement.

Small group interactions foster the cognitive activity that improves reading comprehension (Armbruster, Lehr, & Osborn, 2003; Biancarosa & Snow, 2004; Roe, Smith, & Burns, 2005; Wiles & Bondi, 2000). Through “collaborative reasoning,” students increase mental activity, promoting mastery of comprehension thought processes (Reznitskaya & Anderson, 2002).

Research provides limited guidance in the selection of literature and skill practice materials. Washburn and Blackmon (2003) suggest selected literature be (a) of high literary quality, (b) congruent with the instructional purpose, and (c) appropriately progressive in readability throughout a school year. Practice materials should (a) facilitate independent application of comprehension-related thought processes, and (b) facilitate the connection of ideas necessary to comprehend an author’s intended message (Washburn and Blackmon, 2003).
Effective reading teachers know why they do what they do. Such knowledge enables teachers to design and implement effective methods of instruction (Strickland & Snow, 2002; Trabasso & Bouchard, 2002). Effective professional development affects teachers’ practice (Campbell, Hombo, & Mazzeo, 2000).

Ivey and Fisher (2005) claim educators seek instructional methods that improve the reading comprehension skills of middle school students. With information about the effects of neurocognitive elements, instructional processes and materials, and effective professional development components, a knowledge base exists from which to design and implement effective comprehension instruction.
Chapter III
Methodology

This chapter presents the methodology used in consideration of the hypotheses of the causal-comparative study. Background of the methodology, research context, instruments used in data collection, methods of data analysis, post hoc considerations, and a summary of the methodology are detailed in the following sections.

Background of the Methodology

The research site school system in rural Wisconsin pursued improved reading instruction for its students in the summer of 2003. In August of that year, two reading specialists attended a ten-day training program on one of the reading programs used to differentiate the groups generating the data for the study. As the administration witnessed the program’s results on student achievement, they pursued wider implementation of the program within the district. In January 2004, the two reading specialists attended a five-day advanced training session and received the necessary certification to train other teachers in the school system.

Before the limited implementation of this reading program, the school system exclusively used a commercially produced basal series reading program. Standardized test results indicated a lack of student achievement in beginning reading components, such as phonics application, and reading comprehension. Wanting to feel secure in adopting a reading program, the school system’s administrators decided to field test both reading programs during the 2004-2005 school year and compare the results yielded by each program.

Teachers in the school system administered pre- and posttests in reading comprehension and critical thinking to compare student results between the two
programs. The data from the pre- and posttest results provide the data for the quantitative aspect of this research project. The school system requested the researcher’s assistance in analyzing the data (see Appendix A) and provided coded data for the researcher’s use.

Research Context

The town, in which the research site is located, houses a population of almost 4500 (U.S. Census Bureau, 2000). One stoplight in the town’s center controls traffic, while an expressway provides direct access to Madison, the state capital, where many of the town’s residents are employed.

U.S. Census Bureau (2000) data reveals that the majority of family households in the town, nearly 65%, include children under the age of 18. The average family comprises about three individuals. Of the children age 3 and above, 100% are enrolled in school, with approximately 51% of them enrolled in elementary school (grades 1-8).

According to the U.S. Census Bureau (2000), 98% of the residents are white. African Americans compose 0.4%, Native Americans add 0.2%, and individuals of Asian origin make up 0.3%. The rest of the population identifies with races not specified by the Census Bureau or with a combination of races.

Residents participate in a variety of occupations. Sales and office occupations compose the largest percentage (28.7%); followed by management, professional, and related occupations (26.9%); production, transportation, and material moving occupations (23.8%); and service occupations (12.6%). Construction-related occupations and farming make up the remaining 8%.

Finally, the U.S. Census Bureau (2000) lists the median household income as $42,667.00. Individual mean income is about $37,000 for males and about $23,000 for...
females. The majority of families, 79.5%, have incomes ranging from $25,000 to $99,999.

The research site school system comprises three buildings: an elementary building housing grades K-3, a middle school building housing grades 4-8, and a high school housing grades 9-12. The middle school, specifically the fifth grade, produced the quantitative data used in this study.

The fifth grade classes were self-contained and non-departmentalized. Students received instruction in all major content areas from the same teacher. The four classes were equal in size, with 18-20 students each. Slight variations occurred as students moved into and out of the school system throughout the school year.

Two classes used the school system’s adopted basal reading program, *Spotlight on Literacy*, a commercially produced series, The other two classes implemented a different reading program, *Foundations and Frameworks*.

**Instruments Used in Data Collection**

**Hypothesis 1**

The first null hypothesis states the following:

There is no significant difference between the reading comprehension gains as measured by pre- and posttesting with the *Gates-MacGinitie Reading Tests, 4th Edition*, Forms S and T, of fifth grade students who experience nine months of reading instruction in the *Spotlight on Literacy* reading program and students who experience nine months of reading instruction in the *Foundations and Frameworks* reading program.
The *Gates-MacGinitie Reading Tests, 4th Edition*, Forms S and T, Level 5 provide the pre- and posttest data that measures student gain in reading comprehension. 

*The Gates-MacGinitie Reading Tests*

According to MacGinitie, MacGinitie, Maria, and Dreyer (2000), the content of Level 5 includes vocabulary, testing word knowledge with 45 items requiring the matching of terms used in isolation and in context with words or phrases that have the same meaning, and comprehension, featuring 11 passages students read and 48 questions based on the passages. The passages represent a variety of genres, forms, and styles.

The *Gates-MacGinitie Reading Tests, 4th Edition*, Forms S and T have strong reliability with internal consistency levels at .90 or above. According to the *Mental Measurements Yearbook*, the two forms of the test assure strong correlations (consistency levels of .89) and make the instrument ideal for use in a pretest/posttest setting (McCabe, 2005).

The *Gates-MacGinitie Reading Tests* report student achievement with five different scores. A normal curve equivalent score describes a student’s achievement as related to other students in the same grade and is reported on an equal interval scale of 1 to 99. Percentile rank scores indicate a student’s achievement in relation to other students and reveal the percentage of students in the norming group with lower scores. Similarly, stanines describe student performance in relation to other students of the same grade level, but are presented on an equal interval scale of 1 to 9. Grade equivalent scores roughly indicate the year and month of an average student who received the same score on the instrument. For example, a score of 4.5 indicates that an average fourth grade student in the fifth month of the school year would likely score similarly.
Finally, an extended scale score (ESS) relates the student’s achievement to the entire range of achievement throughout the school years. The ESS measures achievement in equal units on a scale from 74 to 714. Differences within a part of the scale equal differences in another part of the scale. For example, an increase of 15 points represents the same amount of gain no matter the starting score. MacGinitie, MacGinitie, Maria, and Dreyer (2000) recommend use of the extended scale score for measuring growth over time because the ESS avoids issues of truncation arising in grade equivalent scores, and the ESS provides a “scale that extends through the grades” and shows a student’s “long-term growth” (p. 3).

Since one aspect of this study focuses on comprehension gains, the extended scale scores for the comprehension section of the instrument provide the data for examining student gains. Though vocabulary scores were collected, they were not included in the data analysis of this study.

**Hypothesis 2**

The second null hypothesis states the following:

There is no significant difference between the critical thinking gains as measured by pre- and posttesting with the *Cornell Critical Thinking Skills Test, Form X*, of fifth grade students who experience nine months of reading instruction in the *Spotlight on Literacy* reading program and students who experience nine months of reading instruction in the *Foundations and Frameworks* reading program.

The *Cornell Critical Thinking Test, 3rd Edition, Level X*, provides the pre- and posttest data that measures student gain in critical thinking.
The Cornell Critical Thinking Tests

The Cornell Critical Thinking Test, 3rd Edition, Level X, features 71 items that measure student ability in several thinking skills: induction, deduction, evaluation, observation, credibility assessment, and assumption identification. These skills are grouped under four headings: judging whether a fact supports a hypothesis, judging the credibility of observation reports, deciding what follows, and judging what is assumed in an argument. The items represent Ennis, Millman, and Tomko’s (1985) definition of critical thinking as “the process of reasonably deciding what to believe and do” (p. 1). Test items feature three choices from which students choose the best answer.

The Cornell Critical Thinking Skills Test, Form X (CCTT-X), selected for its usability with middle school students, measures elements of critical thinking. Though only available in one form, the CCTT-X is commonly used in pre- and posttest studies. Spearman-Brown corrected correlations range from .76 to .90 and vary between norm groups (Ennis, Millman, & Tomko, 1985).

Scoring of The Cornell Critical Thinking Test followed the recommended method of subtracting half the number of wrong responses from the number of correct responses. According to Ennis, Millman, and Tomko (1985), scoring the instrument this way is “consistent with the test instructions cautioning examinees not to make wild guesses,” which is “in turn consistent with attempts to cultivate careful thinking habits” (p. 6). The instrument provides only this score, and it is the basis for measuring gain between the pre- and posttests. Since the instrument is used from fourth grade through college, the recommended score serves as a type of scaled score with equal scores representing equal achievement regardless of the test taker’s age.
The Assessment Resource Center at the University of Missouri-Columbia machine scored the results from the *Gates-MacGinitie Reading Tests*. Independent scorers hand-scored the results from the *Cornell Critical Thinking Tests*. The researcher checked and validated the work of the independent scorers.

**Data Analysis of the Comparisons**

The researcher computed comprehension gain for each student by subtracting pretest scores of the *Gates-MacGinitie Reading Tests*, Form S from the posttest scores of the *Gates-MacGinitie Reading Tests*, Form T. The results provided the data for computing the mean reading comprehension gain for both groups.

The researcher computed comprehension gain for each student by subtracting pretest scores from the posttest scores of the *Cornell Critical Thinking Tests*, Form X. The results provided the data for computing the mean critical thinking gain for both groups.

Shannon and Davenport (2001) claim that *t*-test procedures determine the extent of difference between two groups. Green and Salkind (2003) agree, stating that the *t*-test “evaluates whether the mean value of the test variable for one group differs significantly from the mean value of the test variable for the second group” (p. 151).

Using SPSS software, an independent-sample *t*-test provides data related to the mean gain for each group and the significance of the difference between the two groups. The results include the number of students in each group. Results include the mean gain for each group in reading comprehension as measured by the difference between pretest and posttest scores on The *Gates-MacGinitie Reading Tests* and in critical thinking as measured by the difference between pretest and posttest scores on The *Cornell Critical*
Thinking Tests. Standard deviations for each group in each area reveal the variances in individual scores used to compute the mean.

The results include statistics for Levene’s test for equality of variances. The F values indicate the amount of variance between the two groups, and the related significance values indicate whether equal variances may be assumed or not. A significance value greater than 0.05 ($p>0.05$) indicates a statistically insignificant variance, allowing for the “statistically stronger” equal variance $t$- and related significance values (George & Mallery, 2003, p. 141). A significance value less than 0.05 ($p<0.05$) indicates a statistically significant variance, requiring the use of the $t$- and significance values related to the lack of an equal variance assumption. The statistics resulting from Levene’s test dictate the $t$- and significance values used in the continued analysis.

The 2-tailed significance statistics provide an assessment of the results’ significance. Using the standard measure of significance ($p<0.05$), the study bases its conclusions regarding the hypotheses on these results.

Post Hoc Considerations

Post hoc fallacies occur in causal-comparative research when the researcher wrongly concludes causation based on correlation. To minimize the risk of fallacy in this study, the following factors are explained in reference to the research context:

1. Instructional time. As a causal-comparative study, instructional time represents an uncontrolled factor. Teachers in each fifth grade classroom made decisions about instructional time based on the required time to complete the activities dictated by the reading program in use. It is likely that instructional time varied
between the classrooms, but the decisions about instructional time were based on the independent variable used to define the groups. Any variance developed, in part, because of the independent variable being examined.

2. Teacher experience. Research suggests teacher experience may be a factor in student achievement, but the findings yield conflicting data (Darling-Hammond, 2000). School system administrators assigned students to fifth grade classes before assigning reading programs to teachers (see Item 3). As a causal-comparative study, this represents a factor the researcher did not control. As a result, it cannot be ruled out as a potential influence on the results.

3. Group composition. The school system’s administration randomly placed students in classrooms before selecting the classrooms in which each program would be used. Using coded data, school administrators organized the classes, attempting to maintain gender, academic ability, and special academic/behavioral need balances (M. Sharpee, personal communication, September 16, 2005).

4. Implementation integrity. Teachers in both groups adhered closely to the instructional sequence, methods, and philosophies of the programs. Minor modifications were made only when teachers recognized the need to adjust pacing or instruction based on student needs. These minor modifications were rare and did not affect the implementation integrity of either program (M. Sharpee, personal communication, May 20, 2005).
Summary of the Methodology

The author applied appropriate statistical analytical tools to the data to determine the significance of difference between two reading programs in reading comprehension. Pre- and posttest results collected by the research site school system provide the basis for computing student gains in reading comprehension, as measured by the Gates-MacGinitie Reading Tests.

To determine the significance of difference between student achievement in critical thinking, the author applied appropriate statistical analytical tools. Pre- and posttest results from the Cornell Critical Thinking Tests provide the basis for computing student gains in critical thinking. Using SPSS software, mean gain and related statistics resulting from an independent-sample t-test provide an assessment of the results and related significance. An examination of the findings from this research methodology follows in Chapter 4.
Chapter IV
Results of the Study

More than 8 million students in America’s 4th-12th grade classrooms experience difficulty reading, and 70% of American eighth grade students fail to reach even proficient reading levels (Scherer, 2005). The “great majority of students have not acquired the critical and analytic reading skills required to be fully literate in the 21st century” (Ash, 2005, p. 39). According to Coutant and Perchemlides (2005), middle school teachers contribute to the problem by assuming “that students will comprehend text because they understand the printed words” (p. 42).

This study presents the findings of a twofold research project focused on middle school reading comprehension instruction. First, it examines the quantitative effects of two reading programs on reading comprehension and critical thinking achievement of fifth grade students in rural Wisconsin. Second, the study presents a sample rubric to use in considering the following: 1) neurocognitive elements, 2) instructional processes, 3) instructional materials, and 4) professional development components.

Hypothesis 1 Results: Reading Comprehension Comparison

The first hypothesis of this research project states the following:

There is no significant difference between the reading comprehension gains as measured by pre- and posttesting with the Gates-MacGinitie Reading Tests, 4th Edition, Forms S and T, of fifth grade students who experience nine months of reading instruction in the Spotlight on Literacy reading program and students who experience nine months of reading instruction in the Foundations and Frameworks reading program.
Computed gain from paired pre- and posttest results from the *Gates-MacGinitie Reading Tests, 4th Edition*, Forms S and T, provide the data used in the independent-sample t-test. The group statistics (see Table 4.1) indicate a difference of 10.4809 points between the gains of the two groups, with students in the *Spotlight on Literacy* classrooms achieving a mean gain of 11.8974 and students in the *Foundations and Frameworks* achieving a mean gain of 22.3784.

**Table 4.1. t-test Results, Group Statistics, Mean Reading Comprehension Gain**

<table>
<thead>
<tr>
<th>Group Statistics</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMGAIN Spotlight</td>
<td>39</td>
<td>11.8974</td>
<td>19.04813</td>
<td>3.05014</td>
</tr>
<tr>
<td>F&amp;F</td>
<td>37</td>
<td>22.3784</td>
<td>25.58249</td>
<td>4.20574</td>
</tr>
</tbody>
</table>

Standard deviation statistics indicate a wider spread of mean gain scores among students in the *Foundations and Frameworks* group (25.58249 vs. 19.04813). Individual mean gain scores range from -26 to +52 for the *Spotlight on Literacy* group and range from -8 to +101 for the *Foundations and Frameworks* group.

Levene’s test for equal variances (see Table 4.2) compares within-group deviations from the mean with between group deviations from the mean, indicating whether the two variances are significantly different. The results of this test of heteroscedasticity (F=1.277, p=.262) indicate the differences between the groups are not significant, allowing the results based on the assumption of equal variances to be used.

**Table 4.2. Independent-Sample t-test Results, Mean Comprehension Gain**

<table>
<thead>
<tr>
<th>Independent Samples Test</th>
<th>Levene’s Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>df</td>
</tr>
<tr>
<td>COMGAIN</td>
<td>1.277</td>
<td>.262</td>
<td>74</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>-2.033</td>
<td></td>
<td>74</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>-2.017</td>
<td></td>
<td>66.421</td>
</tr>
</tbody>
</table>
Using $p<0.05$ as the indicator of significance, the $t$-test results indicate the difference in the mean gain of the two groups rises to the level of significance ($p=0.46$).

For this group, students in an actual instructional setting—the fifth grade classrooms of a public school system in central Wisconsin—a correlation exists between the reading program used in instruction and student reading achievement.

**Hypothesis 1 Conclusion**

The results of the independent-sample $t$-test indicate that significant differences exist in the reading comprehension achievement between students taught using two different reading programs, the *Spotlight on Literacy* basal series reading program and *Foundations and Frameworks*. As a result, the researcher rejects the first hypothesis.

**Hypothesis 2 Results: Critical Thinking Comparison**

The second hypothesis of this research project states the following:

There is no significant difference between the critical thinking gains as measured by pre- and posttesting with the *Cornell Critical Thinking Skills Test*, Form X, of fifth grade students who experience nine months of reading instruction in the *Spotlight on Literacy* reading program and students who experience nine months of reading instruction in the *Foundations and Frameworks* reading program.

Computed gain from pre- and posttest results from the *Cornell Critical Thinking Skills Test*, Form X, provide the data used in the independent-sample $t$-test. The group statistics (see Table 4.3) indicate a difference of 4.2138 points between the gains of the two groups, with students in the *Spotlight on Literacy* classrooms achieving a mean gain of 6.2051 and students in the *Foundations and Frameworks* achieving a mean gain of 10.4189.
Table 4.3. *t*-test Results, Group Statistics, Mean Critical Thinking Gain

<table>
<thead>
<tr>
<th>Group Statistics</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Std. Error Mean</td>
</tr>
<tr>
<td>Sol/F&amp;F Spotlight</td>
<td>39</td>
<td>6.2051</td>
<td>7.37324</td>
</tr>
<tr>
<td>Sol/F&amp;F F&amp;F</td>
<td>37</td>
<td>10.4189</td>
<td>6.79104</td>
</tr>
</tbody>
</table>

Standard deviation statistics indicate a wider spread of mean gain scores among students in the *Spotlight on Literacy* group (7.37324 vs. 6.79104). Individual mean gain scores range from -9 to +25 for the *Spotlight on Literacy* group and range from +1 to +24 for the *Foundations and Frameworks* group.

Results of Levene’s test for equal variances (see Table 4.4) (F=.002, p=.966) indicate that the variances between the groups are not significant, allowing the results based on the assumption of equal variances to be used.

Table 4.4. Independent-Sample *t*-test Results, Mean Critical Thinking Gain

<table>
<thead>
<tr>
<th>Independent Samples Test</th>
<th>Levene's Test for Equality of Variances</th>
<th><em>t</em>-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>t</td>
</tr>
<tr>
<td>CTGAIN Equal variances assumed</td>
<td>.002</td>
<td>.966</td>
<td>-2.588</td>
</tr>
<tr>
<td>CTGAIN Equal variances not assumed</td>
<td>-2.593</td>
<td>73.938</td>
<td>.011</td>
</tr>
</tbody>
</table>

Using *p*<0.05 as the indicator of significance, the *t*-test results indicate that the difference in the mean gain of the two groups rises to the level of significance (*p*=0.012). For this group, students in an actual instructional setting—the fifth grade classrooms of a public school system in central Wisconsin—a correlation exists between the reading program used in instruction and student achievement in critical thinking.
Hypothesis 2 Conclusion

The results of the independent-sample *t*-test indicate significant differences exist in the critical thinking achievement between students taught using two different reading program, McGraw-Hill’s *Spotlight on Literacy* basal series reading program and *Foundations and Frameworks*. Therefore the researcher rejects the second hypothesis.

Discussion of Causal-Comparative Research Results and Additional Findings

In both reading comprehension and critical thinking, the mean gain of students in the *Foundations and Frameworks* group was significantly greater than that of the students in the *Spotlight on Literacy* group, negating both of the study’s hypotheses. The results raise an important question in light of the call for research in neurocognitive elements, instructional processes, instructional materials, and professional development: What relationships, if any, exist between findings in the key research areas and student achievement in reading comprehension and critical thinking? Do programs featuring greater alignment with research findings yield greater student achievement?

While several tools for evaluating beginning reading programs currently exist (McEwan, 2002; Burns, Griffin, & Snow, 1999; Wolfe & Nevills, 2004), no such tools exist for evaluating middle school reading comprehension program components related to the four key areas of research. This study’s background research provides data useful in developing a sample tool for educators and researchers.
**A Research-Based Rubric for Reading Comprehension Components, Part 1**

**Figure 4.1. A Research-Based Rubric for Reading Comprehension Components, Part 1**

**Scale Descriptors**

0=No Evidence: The program lacks any evidence of the described element

1=Limited Evidence: The program features limited evidence of the described element, raising questions of its effectiveness

2=Adequate Evidence: The program features adequate evidence of intentional inclusion of described element

3=Consistent Evidence: The program features consistent evidence of the described element, making the program exemplary in the described area

<table>
<thead>
<tr>
<th>Part 1: Neurocognitive Elements</th>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. engages the construction of meaning through the use of analogy, connecting to student long-term memories via patterns related to cognitive processes involved in comprehension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. features instructional activities that aid comprehension through engaging working memory processes, such as merging new content with long-term memories to construct understanding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. includes multiple metacognitive activities, directing student focus to relevant text details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. fosters the development or augmentation of a “network of associated connections” through activities that engage students in identifying and interpreting meaningful connections between text elements (Eichenbaum, 2002, p. 168)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. engages students in converting text ideas into components that can be manipulated and organized spatially to explore connections and deepen comprehension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. views thinking as a means to comprehension and comprehension as a means to content for additional thinking that deepens comprehension as evidenced by the program’s instructional methods and process</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Part 1 Total**

**Part 1 Mean (Total/6)**

_A Research-Based Rubric for Reading Comprehension Components, Part 1_ (R-B2R2C1), states the relevant neurocognitive research findings as criteria to be examined and identifies four levels of quality based on a numeric rating of 0-3 (see Figure 4.1). To use the R-B2R2C1, evaluators attend to the evidence presented in a
reading program as related to each detailed rubric item and assign a quality value based on the evidence. For example, if a program consistently engages the construction of meaning through the use of analogy, connecting to student long-term memories via patterns related to cognitive processes involved in comprehension (Item 1, see Figure 4.1), the evaluator assesses the evidence as being consistent, as opposed to adequate, limited, or no evidence, and assigns a value of 3 for the item. The values for each item in R-B2R2C1 are totaled, and a mean for the section is computed. The resulting score provides an initial assessment of the program’s alignment with neurocognitive research findings based on the same 0-3 numeric scale.
A Research-Based Rubric for Reading Comprehension Components, Part 2

Figure 4.2. A Research-Based Rubric for Reading Comprehension Components, Part 2

Scale Descriptors
0=No Evidence: The program lacks any evidence of the described element
1=Limited Evidence: The program features limited evidence of the described element, raising questions of its effectiveness
2=Adequate Evidence: The program features adequate evidence of intentional inclusion of described element
3=Consistent Evidence: The program features consistent evidence of the described element, making the program exemplary in the described area

<table>
<thead>
<tr>
<th>Part 2: Instructional Processes</th>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. includes explicit instruction in the thought processes that enable comprehension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. includes teacher modeling of thought processes and idea organization that facilitate comprehension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. includes scaffolded instruction, in which explicit instruction and modeling leads to guided and supported practice, progressing to independent practice with instructive feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. includes multiple opportunities for students to practice skill application and receive instructive feedback from the teacher within a targeted time frame (i.e., the initial skill practice occurs repeatedly within the same instructional unit rather than being scattered throughout multiple units throughout the school year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. features an instructional process that provides frequent opportunities for instructive feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. provides instructive feedback based on an established and understandable standard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. includes small groups characterized by literature-focused interaction, comprehension skill application, and collaborative reasoning that facilitates deepening understanding of text</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part 2 Total

Part 2 Mean (Total/7)
examined and identifies four levels of quality based on a numeric rating of 0-3 (see Figure 4.2). The same process used for Part 1 is used in this section: evaluators attend to the evidence presented in a reading program as related to each detailed rubric item and assign a quality value based on the evidence. The values for each item in R-B2R2C2 are totaled and a mean for the section is computed. The resulting score provides an initial assessment of the program’s alignment with instructional processes research findings based on the same 0-3 numeric scale.
A Research-Based Rubric for Reading Comprehension Components, Part 3

Figure 4.3. A Research-Based Rubric for Reading Comprehension Components, Part 3

Scale Descriptors
0=No Evidence: The program lacks any evidence of the described element
1=Limited Evidence: The program features limited evidence of the described element, raising questions of its effectiveness
2=Adequate Evidence: The program features adequate evidence of intentional inclusion of described element
3=Consistent Evidence: The program features consistent evidence of the described element, making the program exemplary in the described area

<table>
<thead>
<tr>
<th>Part 3: Instructional Materials</th>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program’s:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. instructional literature represents a collection of high quality works</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. instructional literature provides multiple opportunities for the application of targeted comprehension skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. instructional literature represents readability levels appropriate for the student population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. instructional literature increases in difficulty at a logical pace and in a logical sequence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. materials facilitate independent application of thought processes that aid comprehension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. materials facilitate the connection of ideas in understanding an author’s message</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Part 3 Total |       |       |
| Part 3 Mean (Total/6) |       |       |

A Research-Based Rubric for Reading Comprehension Components, Part 3 (R-B2R2C3), states the relevant instructional materials research findings as criteria to be examined and identifies four levels of quality based on a numeric rating of 0-3 (see Figure 4.3). The same process used for Parts 1 and 2 is used in this section: evaluators
attend to the evidence presented in a reading program as related to each detailed rubric item and assign a quality value based on the evidence. The values for each item in R-B2R2C3 are totaled, and a mean for the section is computed. The resulting score provides an initial assessment of the program’s alignment with instructional materials research findings based on the same 0-3 numeric scale.

A Research-Based Rubric for Reading Comprehension Components, Part 4

Figure 4.4. A Research-Based Rubric for Reading Comprehension Components, Part 4

<table>
<thead>
<tr>
<th>Scale Descriptors</th>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0=No Evidence: The program lacks any evidence of the described element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1=Limited Evidence: The program features limited evidence of the described element, raising questions of its effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2=Adequate Evidence: The program features adequate evidence of intentional inclusion of described element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3=Consistent Evidence: The program features consistent evidence of the described element, making the program exemplary in the described area</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part 4: Professional Development

The program:

| 1. includes all major instructional components, such as cognitive processes related to learning, beginning reading (e.g., phonemic awareness, phonics), reading comprehension instruction, small group leadership, vocabulary instruction, assessment, content area reading, and instructional design |
|---|---|---|

| 2. includes the theoretical support for the instructional methods and process |
|---|---|---|

| 3. includes the modeling of instructional methods by proficient practitioners |
|---|---|---|

| 4. includes opportunities for teachers to practice new instructional methods with instructive feedback from the trainer |
|---|---|---|

| 5. includes opportunities for teachers to work collaboratively on the development of instruction |
|---|---|---|

| Part 4 Total |

| Part 4 Mean (Total/5) | | |

A Research-Based Rubric for Reading Comprehension Components, Part 4 (R-B2R2C4), states the relevant professional development research findings as criteria to be examined and identifies four levels of quality based on a numeric rating of 0-3 (see Figure 4.4). The same process used for Parts 1-3 is used in this section: evaluators attend to the evidence presented in a reading program as related to each detailed rubric item and assign a quality value based on the evidence. The values for each item in R-B2R2C4 are totaled and a mean for the section is computed. The resulting score provides an initial assessment of the program’s alignment with professional development research findings based on the same 0-3 numeric scale.

A Research-Based Rubric for Reading Comprehension Components, Part 5

Figure 4.5. A Research-Based Rubric for Reading Comprehension Components, Part 5

<table>
<thead>
<tr>
<th>Part: Program’s Evidence of Alignment with Research Findings</th>
<th>Scale Descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>0=No Evidence: The program lacks any evidence of the described element</td>
<td></td>
</tr>
<tr>
<td>1=Limited Evidence: The program features limited evidence of the described element, raising questions of its effectiveness</td>
<td></td>
</tr>
<tr>
<td>2=Adequate Evidence: The program features adequate evidence of intentional inclusion of described element</td>
<td></td>
</tr>
<tr>
<td>3=Consistent Evidence: The program features consistent evidence of the described element, making the program exemplary in the described area</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part 1 Mean</th>
<th>Part 2 Mean</th>
<th>Part 3 Mean</th>
<th>Part 4 Mean</th>
<th>Total</th>
<th>Final Mean (Total/4)</th>
</tr>
</thead>
</table>
A Research-Based Rubric for Reading Comprehension Components, Part 5 (R-B2R2C5), guides the evaluator to an overall assessment of the alignment with the research findings featured in a reading program’s reading comprehension components (see Figure 4.5). The means from Parts 1-4 are transferred to the corresponding cells and totaled. The overall mean is computed, and the resulting score provides an initial assessment of the program’s alignment with research findings in the four key research areas based on the same 0-3 numeric scale.

Instrument Validity and Formative Evaluation Research

Although three reading experts analyzed and endorsed a Research-Based Rubric for Reading Comprehension Components (R-B2R2C) (see Appendix B), the reliability and validity of the instrument have not yet been scientifically validated. Only face validity based on the endorsement of experts has been established. This study’s research background leads logically to the development of the R-B2R2C and moves the study into formative evaluation research.

As defined by Glatthorn and Joyner (2005), evaluation research may 1) provide “an early test of a new approach or model of evaluation” and/or 2) develop “an instrument that can be used in other studies” (p. 103). Evaluation research focuses on the “merit or worth of educational programs, products, and organizations,” and is “usually undertaken to assist administrators in making professional decisions” (Glatthorn & Joyner, 2005, p. 102). The introduction of the R-B2R2C in this study represents 1) a pilot use of the rubric and 2) quantitative formative evaluation research conducted as the rubric is developed, leaving additional validation of the rubric for future research.
A Research-Based Rubric for Reading Comprehension Components, Pilot Use

Based on the findings related to this study’s first two hypotheses, the researcher sought a way to compare the two reading programs, Spotlight on Literacy and Foundations and Frameworks, used to define the student groups with research findings. The study’s background research led to the development of a Research-Based Rubric for Reading Comprehension Components. In its pilot use, this instrument, which only claims face validity at this point, was used by the researcher to evaluate the two reading programs. An overview of the program content used in the analysis can be found in Appendix C. Means for each of the instrument’s four parts were computed, resulting in an overall mean score for each program.

Part 1 Results

Part 1 of a Research-Based Rubric for Reading Comprehension Components (see Figure 4.1) addresses reading-related findings from neurocognitive research, including the following:

1. the use of analogy to engage students’ long-term memories through patterns related to the cognitive processes involved in comprehension,

2. the use of instructional activities that engage working memory processes, such as merging new content with long-term memory,

3. the use of activities engaging students in metacognition to focus attention on relevant text details

4. the connecting of ideas to construct meaning through a “network of associated connections” (Eichenbaum, 2002, p. 168),
5. the conversion of text ideas into spatial components that can be manipulated and organized, and
6. the view of thinking as the means to comprehension as evidenced by the engagement of cognition during reading and after reading.

Within the area of neurocognitive elements, the programs differ in their respective levels of alignment with research findings. *Spotlight on Literacy* presents evidence supporting a mean of 0.83. *Foundations and Frameworks* presents evidence supporting a mean of 3.0. Table D.1 in Appendix D presents the itemized values as analyzed through a *Research-Based Rubric for Reading Comprehension Components*.

**Part 2 Results**

Part 2 of a *Research-Based Rubric for Reading Comprehension Components* (see Figure 4.2) addresses reading-related findings from research on instructional processes, including the following:

1. the use of explicit instruction in comprehension-related thought processes,
2. the use of teacher modeling of thought processes and idea organization,
3. the use of scaffolded instruction in which teacher modeling is followed by guided and supported practice progressing to independent practice,
4. the inclusion of multiple opportunities for independent practice with instructive feedback,
5. the frequent use of instructive feedback,
6. the use of established standards in giving instructive feedback, and
7. the use of small groups characterized by literature-focused interaction, comprehension skill application, and collaborative reasoning.

Within the area of instructional processes, the programs differ in their respective levels of alignment with research findings. *Spotlight on Literacy* presents evidence supporting a mean of 0.86. *Foundations and Frameworks* presents evidence supporting a mean of 3.0. Table D.2 in Appendix D presents the itemized values as analyzed through a *Research-Based Rubric for Reading Comprehension Components*.

**Part 3 Results**

Part 3 of a *Research-Based Rubric for Reading Comprehension Components* (see Figure 4.3) addresses reading-related findings on instructional materials, including the following:

1. instructional literature quality,
2. instructional literature skill applicability,
3. instructional literature readability,
4. instructional literature sequencing and pacing,
5. instructional materials fostering of thought process application, and
6. instructional materials fostering of idea connections in constructing comprehension.

Within the area of instructional materials, the programs differ in their respective levels of alignment with research findings. *Spotlight on Literacy* presents evidence supporting a mean of 1.0. *Foundations and Frameworks* presents evidence supporting a
mean of 3.0. Table D.3 in Appendix D presents the itemized values as analyzed through a
Research-Based Rubric for Reading Comprehension Components.

Part 4 Results

Part 4 of a Research-Based Rubric for Reading Comprehension Components (see
Figure 4.4) addresses reading-related findings on instructional materials, including the
following:

1. the inclusion of all major instructional components,
2. the inclusion of theoretical support for instructional methods and processes,
3. the inclusion of instructional methods modeling by proficient practitioners,
4. the inclusion of opportunities for teachers to practice new methods and
   receive instructive feedback from the trainer, and
5. the inclusion of collaborative instructional design opportunities.

Within the area of professional development, the programs differ in their
respective levels of alignment with research findings. Spotlight on Literacy presents
evidence supporting a mean of 0.4. Foundations and Frameworks presents evidence
supporting a mean of 3.0. Table D.4 in Appendix D presents the itemized values as
analyzed through a Research-Based Rubric for Reading Comprehension Components.

Part 5 Results

Part 5 of a Research-Based Rubric for Reading Comprehension Components
results in an overall mean for the program being evaluated. The means from Parts 1-4 are
totaled, and the overall mean is computed. Spotlight on Literacy presents evidence
supporting an overall mean of 0.77. Rounding the mean indicates the program presents
limited evidence of alignment with research findings. Foundations and Frameworks
presents evidence supporting an overall mean of 3.0, indicating the program presents consistent evidence of alignment with research findings. Table D.5 in Appendix D presents the itemized tabulation as analyzed through a *Research-Based Rubric for Reading Comprehension Components*.

**Conclusions**

The pilot use of a *Research-Based Rubric for Reading Comprehension Components* indicates that differences exist between each reading program analyzed and the research findings in the four key areas. The reading program with consistent research finding alignment, *Foundations and Frameworks*, yielded greater student reading comprehension and critical thinking achievement in the causal-comparative component of the study.

**Discussion Summary**

Results from an independent-sample *t*-test, comparing mean gain reading comprehension scores between students taught via *Spotlight on Literacy* and students taught via *Foundations and Frameworks* indicate significant differences between the groups. Fifth grade students taught reading through *Foundations and Frameworks* made significantly greater gains in reading comprehension than students taught reading through *Spotlight on Literacy*. Significant differences in reading comprehension achievement exist, causing rejection of this research project’s first hypothesis.

Results from an independent-sample *t*-test comparing mean gain critical thinking scores between the students taught via *Spotlight on Literacy* and students taught via *Foundations and Frameworks* indicate significant differences between the groups. Fifth grade students taught reading through *Foundations and Frameworks* made significantly
greater gains in critical thinking than students taught reading through *Spotlight on Literacy*. Significant differences in critical thinking achievement exist, causing rejection of this research project’s second hypothesis.

The results of the causal-comparative component of this study raise questions about the content of each reading program in relation to research findings in four areas: neurocognitive elements, instructional processes, instructional materials, and professional development. To explore these issues, the researcher developed a *Research-Based Rubric for Reading Comprehension Components*. The evaluation research component of this study features the pilot use of this instrument in comparing the two reading programs used in the causal-comparative research element with research findings in the four key areas. As evidenced by the analysis, McGraw-Hill’s *Spotlight on Literacy* presents limited evidence of alignment with research findings, and *Foundations and Frameworks* presents consistent evidence of alignment with research findings.
Chapter V
Summary and Discussion

Seventy percent of America’s children achieve only basic levels of reading achievement, warranting a comparison of current instructional practice with research findings (Lutkus, Rampey, & Donahue, 2005). The present study compares the effects of two reading programs on fifth grade students in an actual instructional setting. This final chapter restates the research problems and reviews the project’s methodology. Major sections of the chapter summarize the results and discuss their implications.

Problems Addressed and Methodology Used

Middle school teachers contribute to the lack of student achievement by frequently failing to provide effective comprehension instruction. According to Almasi (2003), and Pressley, Wharton-McDonald, Mistretta-Hampston, and Echevarria (1998), actual instruction, especially in the thought processes used in constructing meaning, rarely occurs in middle school classrooms. What student reading comprehension and critical thinking achievement results from reading programs illustrative of current instructional practices? Do reading programs with greater alignment with research findings produce greater student achievement?

To explore the issue, an actual instructional setting, the fifth grade classrooms of a public school system in central Wisconsin, was identified. The Gates-MacGinitie Reading Tests, 4th Edition, Forms S and T, provided the data for examining reading comprehension achievement. The Cornell Critical Thinking Skills Test, Form X, provided the data for examining critical thinking achievement. Using an independent-sample t-test, the researcher examined gain, as computed from pre- and posttest results, in both reading comprehension and critical thinking. The results compare reading comprehension and
critical thinking gains of students taught reading through the *Spotlight on Literacy* program and through the *Foundations and Frameworks* reading program.

Educators select reading programs alleged to be research-based and effective. Tools abound for the evaluation and comparison of the beginning reading components of reading programs (McEwan, 2002; Burns, Griffin, & Snow, 1999; Wolfe & Nevills, 2004), but few such tools exist for the comparison of comprehension instruction components of middle school reading programs (Ivey & Fisher, 2005). A rubric used in this research project to compare *Spotlight on Literacy* and *Foundations and Frameworks* provides a sample of such a research-based guide. A *Research-Based Rubric for Reading Comprehension Components* holds endorsements from experts in the field, establishing its content face validity. Its validity and reliability have not yet been scientifically validated.

**Summary of the Research Project’s Results**

In reading comprehension, students in the *Foundations and Frameworks* group achieved a mean gain of 22.39 points on the Gates-MacGinitie extended scale score. Students in the *Spotlight on Literacy* group achieved a mean gain of 11.90 points, a significant difference as indicated by the $p$-value of 0.046.

Students in the *Foundations and Frameworks* group achieved a mean gain of 10.42 points on the *Cornell Critical Thinking Skills Test*, Form X. Students in the *Spotlight on Literacy* group achieved a mean gain of 6.21. The significance of these results, a $p$-value of 0.012, indicates strong correlation between the program used and the resulting gains.
Comparison of McGraw-Hill’s *Spotlight on Literacy* with *Foundations and Frameworks* in student reading comprehension and critical thinking achievement and in comparison with research findings via a *Research-Based Rubric for Reading Comprehension Components* reveals differences between the programs, including the following:

1. *Spotlight on Literacy* views thinking as a post-reading activity, engaging thought about what the teacher assumes students comprehended from a text. The program alludes to this idea, stating that while reading a selection, students will “intuitively pay attention to the character’s traits, motives, and feelings, as well as to the magical setting” (McGraw-Hill, 2000, p. 18B). *Foundations and Frameworks* views thinking as the means to comprehension—the activity through which an author’s intended message is constructed.

2. The relationship between thinking and reading comprehension held by the two programs explains related perspectives, which form the basis for each program’s instructional processes, instructional materials, and professional development components:
   a. If thinking is the means to comprehension, improved thinking results in improved comprehension. Improved thinking results from student application of thought processes while reading and from the recording and organizing of the ideas gained through the application of thought processes. The recorded and organized ideas form the basis for metacognitive activities. Instructive feedback engages students in the
identification of relevant and irrelevant information, focusing attention on important ideas within a text.

b. If thinking is the means to comprehension, thinking must take the linear presentation of ideas from text and convert them to the ideas the author intended to communicate by reconstructing the connections between textual elements. Spatial processing may aid this conversion process and deepen comprehension.

c. If thinking is the means to comprehension, small group structures provide the best setting for skill development. Small group interaction focused on deepening comprehension through additional connections that create a network of meaning results in deepened comprehension.

d. If thinking is the means to comprehension, students should practice application of comprehension skills while reading. A program’s instructional materials should promote frequent pauses for the recording and organizing of thoughts while reading.

3. The programs differ in their effects on fifth grade students in the actual instructional setting of classrooms in a central Wisconsin public school system. The choice between these programs affects student achievement in reading comprehension, as measured by the Gates-MacGinitie Reading Tests, 4th Edition, Forms S and T, and critical thinking, as measured by the Cornell Critical Thinking Skills Test, Form X.
Discussion of the Research Project’s Results

This study represents limited research with a limited population. Exhaustive and definitive conclusions may not and should not be drawn from its outcomes. However, the findings support limited insights.

First, though they command a significant share of the reading education market (Resnick, 2005), not all basal series reading programs are characterized by strong alignment with current research findings. As evidenced by McGraw-Hill’s *Spotlight on Literacy*, dissonance between some programs and research findings exists. Though basal series reading programs offer many perceived benefits for the teachers, such as lessons plans and ready-made materials, their influence on student achievement may be hampered by the instructional processes and materials composing the program’s instructional plan and the frequent lack of an effective professional development component.

Second, *Foundations and Frameworks*, a program characterized by consistent alignment with research findings, appears to positively affect student achievement in reading comprehension. Robertson (2002) and Albee (2004) validate the program’s influence on reading comprehension. This study provides evidence of the program’s effect on critical thinking. In analyzing the program, the researcher notes three characteristics that likely contribute to its success:

1. Implementation of the program follows extensive professional development. Teachers gain theoretical knowledge, organizational knowledge, and practical knowledge prior to implementing the instructional program. As a result,
teachers gain intentionality over the instructional process and develop units addressing student needs.

2. Implementation of the program occurs within a flexible but guiding instructional design. As a result of professional development, teachers know how to sequence effective instructional methods to achieve optimal results. Yet the program features sufficient flexibility for teachers to pace and provide instruction in accordance with student needs. Teachers know the plan, providing confidence in implementation, but also gain awareness of student needs, enabling differentiated instruction as necessary.

3. Implementation occurs under the direction of clearly stated goals and clearly defined levels of proficiency. Teachers know the goal of instruction and have a basis for evaluating student ability and for providing students with beneficial instructive feedback.

Each major characteristic of *Foundations and Frameworks* corresponds with a significant theoretical implication of the study. Snow (2002) states the following: Regardless of the quantity and quality of research-based knowledge about comprehension, students’ reading achievement will not improve unless teachers use that knowledge to improve their instruction. There is good reason to look closely at this issue: Researchers find that most teachers, even those who say they use reform models, still rely primarily on traditional practices. Other researchers point to the importance of teacher quality as a critical variable in student achievement. (p. xviii)
Darling-Hammond (2000) claims that teacher quality and expertise consistently and accurately predicts student reading achievement. Sykes (1999) claims that significant curricular reforms, including improvements in reading instruction, fail without adequate professional development. Ferguson (1991) quantifies the teacher’s contribution to student achievement at 43%, a factor of major significance. Snow (2002) presents the logical conclusion: “Thus, the teacher must be front and center as we discuss how to improve comprehension instruction in schools today” (p. 49).

*Foundations and Frameworks* emphasizes teacher knowledge and instructional processes, and research validates its positive effect on student reading comprehension achievement. The teacher develops successful instruction based on a “deep knowledge about the reading process and reading comprehension” and “knowledge and skills to implement research-based instructional strategies in their teaching” (Snow, 2002, p. 49). This study further validates teacher quality based on theoretical and pragmatic understanding of reading instruction as a significant contributor to student reading achievement.

Third, in evaluating and comparing reading programs, school leaders must analyze the programs’ neurocognitive elements, instructional processes and materials, and professional development components. These elements contribute to student reading comprehension achievement. Reading programs that fail to align with research findings in these key areas likely produce less than optimal results. School leaders responsible for the selection and implementation of curricular programs and materials should compare potential initiatives with research findings and base decisions, in part, on the levels of alignment evident in a thorough analysis.
To aid in this process, this research project provides a *Research-Based Rubric for Reading Comprehension Components*, a sample guide for comparing the reading comprehension components of middle school reading programs with research findings in four key areas: neurocognitive components, instructional processes, instructional materials, and professional development. The sample rubric may also aid the evaluation of current reading instruction in schools. However, it should be remembered that currently the rubric holds only content face validity.

**Relationship of Current Study to Prior Research**

Several researchers present findings of the effects that differing instructional methods have on student reading comprehension achievement (Block & Pressley, 2002; Duke & Pearson, 2002; National Reading Panel, 2000; Pressley, Wharton-McDonald, Mistretta-Hampston, & Echevarria, 1998; Snow, 2002). These studies frequently present isolated instructional practices that influence student achievement in tightly controlled experimental settings.

The present study builds on previous research in three ways:

1. It presents a collection of research-supported methods in an instructional sequence that capitalizes on the strengths of each method. Teachers engage working memory processes through the use of analogy, merging new thought processes with understood concepts. Teachers engage in explicit instruction of thought processes and model their use through thinking aloud. Teachers engage students in guided practice with instructive feedback. Teachers provide excellent and appropriate literature for students to read and independently practice thought process or comprehension skill applications.
Teachers engage students in small group interactions focused on the literature being read and the skill being learned. Teachers provide instructive feedback based on established descriptions of achievement levels. Teachers engage the students in continued reflection about the text through personal journal writing and group synthesis projects. Each method possesses its own research base. This study provides support of their combined and structured use.

2. It merges neurocognitive research with reading research. The brain actively engages in the construction of comprehension. Research findings on the function and role of working memory, the function and processing of the hippocampus, and the critical relationship of cognition and comprehension provide insight into the neurocognitive bases of reading comprehension. By bringing the two fields of research together, the present study strengthens the theoretical knowledge base of effective comprehension instruction.

3. The present study combines findings from reading research and effective professional development. Several researchers claim successful reading instruction results from knowledgeable teachers (Joyce & Showers, 2002). Research also reveals the characteristics of effective professional development (Joyce & Showers, 2002; National Staff Development Council, 2001). The present study combines these, claiming that effective professional development results in effective reading teachers who are capable of providing effective reading instruction.
Theoretical Implications of the Study

Researchers argue that reading represents a form of thinking (Kurland, 2000; Paul, 1995), and researchers allege certain levels of reading comprehension require acts of cognition, such as analysis, synthesis, and interpretation (Roe, Smith, & Burns, 2005). Theoretical connections between cognition and comprehension already exist in the professional literature. The present study presents research supporting this connection. However, the present study also advances the idea that reading comprehension improves when student thinking abilities improve. In other words, improved cognition enables improved comprehension. Other researchers have noted the connection between the processes. This study advocates instruction in thinking as an effective means of improving comprehension.

Implications for Practice

This study presents implications for the content of reading instruction. If reading comprehension improves as a result of improved thinking abilities, reading comprehension instruction should focus on the teaching of thought processes. The instruction should take students deeply into literature by engaging them in effective thinking.

As researchers note, such instruction requires teachers who are metacognitive about their own comprehension thought processes, who are able to explain and model the thought processes that construct comprehension, and who can guide students in the intentional manipulation of thought processes to improve comprehension (Strickland & Snow, 2002; Trabasso & Bouchard, 2002). Teachers develop these skills through comprehensive and effective professional development (Joyce & Showers, 2002).
Therefore, a related implication exists. To develop teachers capable of teaching the thinking necessary for reading comprehension, schools must commit significant time and resources to professional development. According to the National Staff Development Council (2001), a minimum of thirty-five hours of effective professional development may be necessary before instructional changes become evident.

Unanticipated Findings of the Study

The researcher anticipated gains in both reading comprehension and critical thinking experienced by the students in Foundations and Frameworks classrooms. However, the resulting difference in significance levels was unanticipated. The gains in critical thinking present a greater significance ($p=0.012$) than the gains in reading comprehension ($p=0.046$). The researcher expected the gains and the significance to be similar and has no explanation for the difference. It appears that in this study with its limited population, Foundations and Frameworks affected student critical thinking skills more significantly than it affected student reading comprehension skills, though significant gains developed in both areas.

Recommendations for Further Research

This study represents the first exploration of the Foundations and Frameworks program’s influence on student critical thinking skills. Additional research focused on this correlation holds several potential benefits:

1. It may validate the findings of this study, giving the program added research support for its impact on student thinking.

2. It may validate or contradict the theoretical implications of this study. Does reading comprehension truly improve as student critical thinking skills
improve? Does a program focused on critical thinking as the means to reading comprehension influence achievement in both areas?

3. It may examine the same areas with another population. In addition to a demographically different population, populations from different grade levels would provide insight into this study’s theoretical implications. Does affecting the critical thinking skills of students in early elementary grades influence student achievement in reading comprehension? Does providing instruction in thought processes influence the achievement of high school students?

4. It may provide additional direction for school leaders in the evaluation and selection of instructional reading programs. A *Research-Based Rubric for Reading Comprehension Components* holds endorsements as an effective tool in the comparison of reading programs with research findings, establishing the rubric’s content face validity. If schools select reading programs or adjust current instructional practice based on its guidance, will they experience improved student reading comprehension achievement?

Other areas of recommended research include the following:

1. A *Research-Based Rubric for Reading Comprehension Components* has established face value. Additional research may scientifically validate the rubric.

2. Additional research using a *Research-Based Rubric for Reading Comprehension Components* may reveal results similar to or different from the present study. Other basal series and non-basal series programs should be analyzed, including other reading series published by McGraw-Hill.
Limitations

The following qualifications apply to this research project:

1. The research population represents one grade level in one school district in the state of Wisconsin. The diversity of the research population is limited in both ethnic and economic factors.

2. The students in classrooms using one reading program had limited opportunity for instruction in critical thinking because of the instructional content and methods of the program. The students in classrooms using the other program had extensive opportunity to develop critical thinking skills because of the instructional content and methods of the program.

3. The *Cornell Critical Thinking Skills Test*, Form X, provides both the pre- and the posttest data. The amount of time that passed between the pre- and posttests, approximately 8 months, likely minimized instrument familiarity issues.

4. As a co-author of one of the reading programs examined, the researcher could have a subconscious interest in the study’s results.

Conclusion

Neurocognitive research provides daily discoveries, many of which possess significant implications for educators. This study establishes preliminary links between neuroscientific findings and reading comprehension processes. Educators possess an initial blueprint of the neurological bases for reading comprehension.
Some educators claim teaching is an art. Good teachers instinctively know what to teach, when to teach it, and how to teach it effectively. They possess an artistic sense of effective instruction.

Conversely, some educators claim teaching is a science. Good teachers know specific means of communicating specific content to students. They possess encyclopedic knowledge of instructional methods that they can apply at will.

Both arguments claim similar details as evidence. Educators gain greater intention in instructional design and implementation by pursuing the knowledge of the brain and learning that neurocognitive research adds to the collective research base. Knowing why certain methods work enables better decision-making and improves instruction.

Increased intentionality raises teaching to both an art and a science. Intentional teachers create instruction that is both imaginative and supported by findings from scientific research. The researcher hopes this study represents one example of fusion of these two perspectives on teaching. With 70% of American students not achieving proficiency in reading (Scherer, 2005), reading instruction appears to need the strengths of both the artist and the scientist.
References


Appendix A

June 27, 2005

To Whom It May Concern:

This is to confirm that the Columbus School District has requested the assistance of Kevin Washburn in selecting assessment instruments and interpreting assessment results as part of a program evaluation of our implementation of the Foundations and Frameworks program.

Since the data collection followed our district policies and we are supplying Mr. Washburn with only coded data to protect student identities, no additional permissions were required.

If you have any questions, please contact David DeGaire, our Director of Instruction, who is overseeing this project. He can be reached at david.degaire@columbus.k12.wi.us or 920-623-5950.

Sincerely,

Ken Bates
Superintendent

KB:pmz
Appendix B

From: jalbee@hlg.edu
Subject: Factorial Analysis of Reading Comprehension Program Components
Date: December 16, 2005 3:40:15 PM CST
To: kdwashburn@mac.com

Kevin,

I think the Protocol for Program Evaluation looks great. It seems to go beyond the evaluation of the comprehension instruction provided by other instruments.

I think it might be helpful to add one or two examples after each item to help clarify what is meant, if teachers (educators) will be using this to compare reading programs. Reading researchers would understand them, but I'm not sure that most teachers would. You did this for the last item on the first page.

You might consider adding a rating, rather than "yes/no" to help researchers quantify/compare programs. (i.e., 3 - significant evidence, 2 - some evidence, 1 - slight evidence, 0 - no evidence).

I think this could be a very useful tool! Nice work!

Julie

Short Bio -
Julie Jackson Albee, Ph.D., is an associate professor of reading in the Education Department at Hannibal-LaGrange College. She earned an Interdisciplinary Ph.D. in Higher Order Literacy and Urban and Policy Studies in Higher Education from the University of Missouri – Kansas City in 2000 and is the co-author of a textbook entitled Reading Assessment for Diagnostic-Prescriptive Teaching.

Julie Jackson Albee, Ph.D.
Associate Professor, Hannibal-LaGrange College

From: RobertsonD@sjcs.k12.mo.us
Subject: Factorial Analysis of Reading Comprehension Program Components
Date: December 12, 2005 9:04:42 AM CST
To: kdwashburn@mac.com

Kevin,
I'm probably too late. Just back to school this morning.

In evaluating the reading program itself (aside from the essential professional development), I would personally be looking for phonemic awareness and phonics components in the program as well as strategies to promote fluency - in addition to the comprehension. Fluency is a big word in the reading arena today. As far as comprehension instruction is concerned, the instrument is thorough and fits with research findings.

Bio...
Mrs. Debbie Robertson holds an M.S.Ed in Reading. She has served as a reading specialist (K-12) for her district since 2002.
From: gsokolove@dccs.org
Subject: Factorial Analysis of Reading Comprehension Program Components
Date: December 19, 2005 6:44:34 AM CST
To: kdwashburn@mac.com

Kevin,

I had a great time reading over the protocol! You are amazing! I certainly think this an extremely useful tool and absolutely necessary!

A couple of things come to mind. First, are the people who will be conducting the review aware of current research enough to be able to get the most out of the protocol? I suppose if they are not they will need to go back to the drawing board and do some research! Is there a way to incorporate some of the research information in the protocol? Certainly a reading program needs to reflect current and confirmed research and could there be an introductory section summarizing this research. Just a thought!

Is this instrument to be used to evaluate a comprehensive reading program? There was some mention of phonics in the section on professional development but I didn't notice it anywhere else. Should there be something regarding a scope and sequence so that one could evaluate to see if the instructional design effectively moves children through the 'learning to read' stage to the 'reading to learn stage.' If the focus is reading comprehension only, the protocol works well and is thorough.

Certainly schools looking to adopt an effective, researched-based core reading program is critical. The investment in identifying a core program that aligns with research and fits the needs of learners will reap long-term benefits for children's reading acquisition and development!!!

Gail
Appendix C

An analysis of instructional units focused on the comprehension skill of identifying theme illustrates the differences between Spotlight on Literacy and Foundations and Frameworks. Details from these units provide a basis for comparison and illustrate each program’s defining characteristics.

Spotlight on Literacy: Initial Instruction on Identifying Theme

Spotlight on Literacy presents the initial instruction on theme in a unit based on Chris Van Allsburg’s The Wreck of the Zephyr as its text. Five days of instructional activity appear in this and every Spotlight on Literacy unit.

The first day’s activities appear under the heading “Focus on Reading.” The initial activity, “Preview the Selection,” directs students to two pages in the basal featuring information about the selection’s author. The teacher asks the students to describe the author in one or two words. After receiving a few responses, the teacher asks the students if the basal selection is realistic or fantasy. The students scan the selection and reply to the teacher’s question based on the content of the selection’s illustrations.

Spotlight on Literacy’s second activity, “Evaluate Prior Knowledge,” directs students to an illustration of a sailboat featured in the selection. The students imagine how it feels to be on the boat, what they hear while on the boat, and what makes a sailor a good sailor.

In Spotlight on Literacy’s third activity, “Activities for Building Background,” the teacher provides craft supplies from which the students “make sailboats using styrofoam or sponges, straws, and triangle-shaped pieces of construction paper” (McGraw-Hill,
The teacher follows this activity by reading “The Flight of Icarus” to the students from a supplemental text included in Spotlight on Literacy’s materials.

The fourth activity on the first day of instruction, “Oral Language Activities,” addresses the idea of theme for the first time. Spotlight on Literacy directs the teacher as follows:

To preview the selection theme of pride and ambition, work with the students to create a web of words and ideas about being “the best.” Have students bring in photos of famous athletes, singers, actors and actresses. To encourage discussion, ask students questions about how these people became the best in their fields. Encourage them also to talk about areas they like best. Have them suggest skills they will need and ways to develop those skills. Students can pantomime what they would like to be, as well as demonstrate how they can acquire skills to make them the best. Students may be able to understand your questions even if they can’t respond orally. (McGraw-Hill, 2000, p. 18F)

Vocabulary activities follow and conclude the first day’s activities.

*Foundations and Frameworks: Initial Instruction on Identifying Theme*

During training in Foundations and Frameworks, teachers receive The Foundations and Frameworks Toolbox, a publication that identifies objectives, thought processes, and visual tools for every comprehension skill. Teachers also receive the Foundations and Frameworks Literature Guide, a series of charts that identify the children’s literature used in each unit. Beyond the listing of objectives, thought processes, visual tools, and literature selections, the teacher develops the instruction for each unit.
For identifying theme, *The Foundations and Frameworks Toolbox* (Washburn & Blackmon, 2003) states the following objective:

Given a teacher-selected text, each student: identifies the story’s significant ideas, develops a general statement for each idea by combining the idea with insights on the impact of the idea on the story’s characters, states an antithesis for each statement and examines how the antithesis, if accepted, would impact the story’s characters, selects the statement that best conveys the story’s theme, supports the selection with evidence from the text, identifies the theme as being explicit (actually stated in the text) or implicit (not stated but inferred by the reader), and evaluates the theme according to Biblical/personal values and experience. (p. 84)

For the skill of identifying theme and in every other unit, the *Foundations and Frameworks Literature Guide* lists a read-aloud title for use in modeling the skill (*A Regular Flood of Mishap* by Tom Birdseye) and lists titles representing four levels of readability for use in small groups. The four levels with possible titles for this unit include Basic (*Moriah’s Pond* by Ethel F. Smothers or *Runaway to Freedom* by Barbara Smucker), Grade Level (*People of Sparks* by Jeanne DuPrau), Advanced (*Journey to America* by Sonya Levitin), and Advanced Plus (*Guns for General Washington* by Seymour Reit, *A Ride Into Morning* by Ann Rinaldi, or *Terpin* by Tor Seidler). Schools implementing *Foundations and Frameworks* generally select three of the four readability levels for classroom use, depending on the abilities represented in their student populations.

The *Foundations and Frameworks* unit begins with the teacher distributing a listening guide for the first activity (see Figure C.1). The teacher plays a dramatic piece
of music, such as Nathan Di Gesare’s “Jericho.” Following the directions on the listening guide, the students first record any ideas they think the music communicates. In the second step, the students develop each of the ideas from the first step into statements. For example, if “footsteps” is recorded as an idea, the student might write, “Footsteps take you somewhere,” or “To get somewhere you have to take steps.” The teacher then plays the piece of music again, and the students record details about the music that support their idea statements. For example, a student may write that the music sounds like people walking to get somewhere or, more specifically, that the drums sound like footsteps. The fourth step requires the students to develop statements that are the opposite of their idea statements. For example, a student may write, “Footsteps can take you nowhere.” The teacher then asks the students to describe how the music would sound different if it were trying to communicate their opposite idea statement. Students then examine their original idea statements and select the one they think the music best represents. The teacher then directs the students to apply personal values to the selected statement, evaluating the moral implications of it.
Figure C.1. Listening Guide for *Foundations and Frameworks* Theme Instruction

<table>
<thead>
<tr>
<th>Directions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Record any ideas that come to mind as you listen to “Jericho.”</td>
<td></td>
</tr>
<tr>
<td>2. Expand your ideas in statements by developing a complete sentence for each.</td>
<td></td>
</tr>
<tr>
<td>3. Listen to “Jericho” again. What in the music matches/supports each of your idea statements?</td>
<td></td>
</tr>
<tr>
<td>4. Write an opposite statement for each of your statements in Step #2.</td>
<td></td>
</tr>
<tr>
<td>5. If “Jericho” communicated/supported one of your opposite statements, how would the music sound different? Give specific examples.</td>
<td></td>
</tr>
<tr>
<td>6. Evaluate your original idea statements (#2) and select the one that is best represented by “Jericho.”</td>
<td></td>
</tr>
<tr>
<td>7. Compare your selected idea statement with what you know to be true. Is your statement supportable morally/ethically/biblically?</td>
<td></td>
</tr>
</tbody>
</table>

*Foundations and Frameworks* continues establishing the analogy as a reference point by engaging the students in identifying the pattern of activity experienced. The teacher directs the students into small groups, gives each group a sheet of chart paper and a marker, and states the following directions:

1. Share your selected idea statement with the group and add it to your group’s paper chart.

2. Discuss the idea statements as a group and select one or two that the group thinks the music best represents.

3. Reflect on the experience. What did we do? Identify and record the major steps on your group’s chart paper.
The students complete the activity, and the teacher leads the class in a discussion, allowing groups to share their selected statements and the rationale for them. The teacher then directs the students’ attention to the experience and guides students in identifying the steps in the pattern it exemplifies. For example, the students completed the following steps:

1. List ideas the work communicates.
2. Expand the ideas into statements the work communicates.
3. Identify elements of the work that support each statement.
4. Write an opposite statement for each idea statement.
5. Describe how the work might be different if it were communicating the opposite statement.
6. Evaluate the original idea statements and select the one(s) that the work best or most strongly communicates.
7. Evaluate your selected idea statement(s) to determine if it is true and supportable apart from the work.

The teacher records the pattern on the chalkboard or chart paper as each step is identified, carefully guiding the students to recognize the separate steps and how they interrelate. The teacher directs student attention to the pattern and leads them in brainstorming other activities that feature similar patterns. For example, selecting an ice cream flavor may involve seeing the list of flavors, thinking about how each flavor might taste, narrowing the list down to three favorites, selecting the one that is the most mouth-watering, and evaluating the choice once the ice cream is tasted. In so doing, the teacher merges the learning of the *Foundations and Frameworks* thought process that follows.
with the students’ recent and long-term memories, providing the students’ working memories with a reference point for identifying theme (Wolfe, 2001; Wormeli, 2005).

Explicit instruction follows. The teacher directs student attention to the pattern developed during the initial activity and explains that the same pattern guides a reader to identifying the theme of a work of literature. The teacher explains each step in detail and rephrases the steps as guiding questions, such as the following:

1. What ideas are demonstrated by the story’s plot?
2. What messages about these ideas does the story communicate?
3. Where and how is this message communicated in the story?
4. What is an opposite message for each message communicated in the story?
5. If the author were trying to communicate the opposite message, how would the characters and plot of the story change?
6. Which message(s) is/are most strongly communicated by the story?
7. What personal values relate to the theme? When considering those personal values, how acceptable is the theme?

The teacher explains that sometimes an author will actually state the theme of a story (explicit) but usually leaves the identification of the theme up to the reader to think about and identify (implicit).

The explicit instruction leads into teacher modeling of the thought process. The teacher reads Tom Birdseye’s *A Regular Flood Mishap* aloud, pausing frequently to think-aloud and demonstrate the thought process. For example, the teacher might think-aloud as follows:
I notice that Ima Bean is constantly trying to help other members of her family.

What ideas are demonstrated in the story’s plot? Well, I think the idea of helping others is obvious. I’m going to start a list of the ideas that I see in this book. (The teacher writes “helping others” on the chalkboard or chart paper.) What messages about these ideas does the story communicate? Ima Bean seems like a nice girl, and since she is trying to be helpful, I think the story communicates that trying to help others is a good thing to do. Where and how is this message communicated in the story? Well, I think Ima Bean communicates this message by the way she thinks and acts. I’m going to organize my thoughts. I’m going to write the message inside the triangle, as if it were the roof of a house. I’m going to add pillars to my visual tool, and inside the pillars I’m going to write how the message is communicated. That way I can keep track of the messages and how well each one is supported by the story.

The teacher continues until the reading is complete; the process has been fully, and possibly repeatedly, modeled; and the visual tool, in this case the idea framework (see Figure C.2), has been introduced and developed.
In *Foundations and Frameworks*, scaffolded practice follows. The teacher directs the students to work with a partner, explaining the process to each other by one partner addressing the odd numbered steps and one partner addressing the even numbered steps. During the pair explanations, the teacher moves throughout the room, listening to explanations, redirecting and guiding as necessary, and answering questions. The teacher instructs the students to develop a blank idea framework visual tool and explain how it organizes information and how it represents certain steps in the process. Again, the teacher engages in formative assessment with instructive feedback and encouragement as necessary.

The teacher reminds the students of the experience they had with the piece of music and asks the students to think about how the *Foundations and Frameworks* thought process of identifying theme is similar to the thinking they did with “Jericho.” The teacher uses questioning as necessary to help the students recognize the parallels.
The teacher selects a short story and reads it to the students. The students independently apply the thought process and develop the visual tool to identify the theme(s) of the story. The teacher informally reviews each student’s work and offers redirection and encouragement as necessary.

**Spotlight on Literacy: Reading and Practice of Identifying Theme**

The second and third days of *Spotlight on Literacy*’s instructional activity combine under the heading “Read the Literature.” The teacher decides where to end instruction on one day and begin on the next day.

The teacher directs the students to share a reason for reading the selection, *The Wreck of the Zephyr*. *Spotlight on Literacy* suggests the purposes of reading to find out how or why the sailboats fly or to find out how a sailboat ended up on top of a cliff. The teacher then introduces the cause-and-effect chart (see Figure C.3). The students cut out sailboats from cardboard and color them to match the boats shown in the illustrations for use in a later activity.
Spotlight on Literacy presents four options for actually reading the selection: 1) student independent reading, 2) read-aloud by the teacher or from a recording included with the program, 3) partner reading in which students alternate reading aloud with a classmate, or 4) “read and teach” in which the reading of the text is intermingled with skill instruction and practice. The continued description represents the fourth option because it most closely resembles the instructional process of Foundations and Frameworks, allowing for the greatest comparison.

Spotlight on Literacy directs the teacher to suggest that students focus on details of cause and effect, character, and setting, and to explain that as the students read, comprehension strategies will be modeled followed by opportunities for them to apply
the strategies. Students read the first page of text. The teacher discusses the setting through a brief think-aloud and begins completing the cause and effect chart on the overhead transparency (see Figure C.3).

The students read aloud another page of text as the teacher notes “how well they decode difficult words” (McGraw-Hill, 2001, p. 22). The teacher engages the students in discussion by posing questions: What are the boy’s motives? What does he want? What dreams drive him? Do you know how it feels to want something so badly that you would take such a big risk for it? During reading, Spotlight on Literacy frequently directs the teacher to question students in order to promote the consideration of prior experiences to aid understanding. For example, in guiding student comprehension of a character’s motivations, the teacher asks, “Do you know how it feels to want something so badly that you would take such a big risk for it?” (McGraw-Hill, 2001, p. 22).

Spotlight on Literacy directs the teacher to model “how gauging mood can help readers make predictions” through a brief, two-sentence think-aloud (McGraw-Hill, 2001, p. 23). Discussion follows, focusing on identifying the clues in the text and in the illustrations that help the students determine the mood and focusing on how determining the mood helps students predict future text events. The students then “write their own descriptive passages with a similar, ominous mood” (McGraw-Hill, 2001, p. 23). A practice book exercise, “Feeling Your Way Through a Story,” and an optional black line master provide additional practice in determining mood. (The skill of identifying theme is the skill initially presented in this unit.)

The teacher assigns a student to read the next page aloud and another student to make sound effects for “blustery wind and the ocean” (McGraw-Hill, 2001, p. 24). The
rest of the students use their cardboard sailboats “to show what the narrator describes” (McGraw-Hill, 200l, p. 24). A “Teaching Tip” on the page states that students who seem unsure of how to handle their cardboard sailboats may not comprehend the action and suggests the teacher pause and provide “additional support” for those students (McGraw-Hill, 200l, p. 24). Students read another page of text, and the teacher prompts discussion: “Imagine you are the boy [in the selection’s illustration]. Describe the setting for us. Let’s have three volunteers fly their sailboats past the boy so he can describe them as well” (McGraw-Hill, 200l, p. 26).

Students read another page of the Spotlight on Literacy text and the teacher places the students in small groups to discuss the following question: “Many people would feel quite frightened to find themselves on a strange island where boats can fly. Why does the boy react differently?” The students then “compare the character of the boy to that of the old man” (McGraw-Hill, 200l, p. 27). The directions fail to include details of how the comparison should proceed. A practice book exercise, “Who, What, Where, and When” appears at this point in the teacher’s edition.

The students read another page of text and the teacher returns to the cause and effect chart, adding a character’s decision as an effect. The students read another page of text. Spotlight on Literacy suggests the teacher prompt a class discussion: “Imagine you are the sailor. What are you thinking?” (McGraw-Hill, 200l, p. 30).

The teacher engages the students in self-assessment by asking if they agree with the protagonist’s decision and whether they are noticing changes in time and place. If the teacher detects problems, Spotlight on Literacy suggests using a black line master for re-teaching.
Another class discussion follows: “How do you think the boy feels about failing to fly his boat? Do you think he will go along with the sailor’s plan?” (McGraw-Hill, 2001, p. 32). *Spotlight on Literacy* directs the teacher back to the transparency to add another effect, a decision the protagonist makes, and asks the students, “What do you think caused this decision?” (McGraw-Hill, 2001, p. 28). The teacher elicits suggestions until obtaining the desired response: “The boy wants to be the greatest sailor.” This statement appears nowhere in the text, forcing students to reach the conclusion without direct textual support, and without instruction in the thought process for drawing the conclusions. Neither the teacher nor the students document student thinking, preventing metacognition on the response or the thought processes that precede it. The teacher records only the desired response as stated in the teacher’s edition (see Figure C.4). Development of the cause-and-effect chart continues later in the text, with the teacher saying the following:

I think I know why the sailor chose the song about an accident that happened to someone who sailed over land. The sailor knows how much the boy wants to sail in the air, so the song may be a warning about the dangers involved. I want to add the crash of Samuel Blue to the cause-and-effect chart. (McGraw-Hill, 2001, p. 32)
Spotlight on Literacy returns to instruction for understanding theme. The students read another page of the basal selection. The teacher explains that theme “is an idea (often unstated) about what people or life is like” and then asks the students what themes they find in the selection (McGraw-Hill, 2001, p. 33). The teacher then re-reads the myth of Icarus to the students and directs the students into small groups where they discuss the similarities and differences between the stories and their themes.

Spotlight on Literacy’s directions for closing this activity read, “In both stories ambition trips up a character. Ask the students if ambition is always bad, and have them respond in their journals” (McGraw-Hill, 2001, p. 33). No additional instruction or practice in identifying theme occurs within the unit.
Reading of the *Spotlight on Literacy* basal selection, *The Wreck of the Zephyr*, resumes. The teacher directs the students to read the next pages in the selection while using their cardboard sailboats to act out the events. During the reading of these pages, the students also engage in self-reflection, asking themselves if they like the story so far and explaining why or why not.

The teacher reminds the students of the definitions of cause and effect and suggests that considering how an event could have been avoided helps identify causes. The students identify two ways the selection’s protagonist could avoid the story’s climax. The teacher points out the text says that “the boy never amounted to much” (McGraw-Hill, 2001, p. 37) and directs the students to consider how the protagonist could have changed people’s perceptions.

Students read the final page of the basal selection, and the teacher poses some questions for discussion that are focused on character, setting, and cause and effect. Students write in their journals, selecting a topic from three sets of questions. Small groups of students discuss the story. *Spotlight on Literacy* provides four questions for this discussion:

1. “Look through your journal entry for this selection. What thoughts would you like to share?”
2. “Why do you think the old man told the stranger the story of the *Zephyr*?”
3. “What was your favorite part of the selection? Why?”
Spotlight on Literacy divides instruction and basal selections throughout the year into five themes. Following the group discussion, students write about the story and its relationship to the initial program theme of “Scenes of Wonder,” not the theme of the basal selection, The Wreck of the Zephyr.

Students write lyrics to a song about an island where boats fly. The teacher begins a cause and effect story map repeating the previously entered information and adding a column for character motives. Spotlight on Literacy provides no explanation of the relationship between character motives and cause and effect, and no guidance on how to identify character motives. The students complete the chart (see Figure C.5). A formal multiple-choice test of comprehension and vocabulary follows.

**Figure C.5. Cause and Effect Story Map from Spotlight on Literacy**

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character’s Motives</td>
<td>Action</td>
</tr>
<tr>
<td>The boy wants to prove that he is the</td>
<td>He dances to sail in a storm.</td>
</tr>
<tr>
<td>greatest sailor.</td>
<td>He ends up injured, washed up on a strange</td>
</tr>
<tr>
<td></td>
<td>island.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>The boy feels ambitious when he sees ships</td>
<td>He insists that a sailor teach him to fly</td>
</tr>
<tr>
<td>that fly.</td>
<td>a sailboat.</td>
</tr>
<tr>
<td></td>
<td>The sailor reluctantly gives him a lesson.</td>
</tr>
<tr>
<td>The boy is certain he can succeed.</td>
<td>He goes out alone to try again.</td>
</tr>
<tr>
<td></td>
<td>The Zephyr flies.</td>
</tr>
<tr>
<td>The boy wants everyone to see he is the</td>
<td>He tries to sail over the village.</td>
</tr>
<tr>
<td>greatest sailor.</td>
<td>The Zephyr crashes.</td>
</tr>
</tbody>
</table>

**Foundations and Frameworks: Reading and Practice of Identifying Theme**

Following the scaffolded practice and review of student work with instructive feedback, the teacher introduces to the students the three pieces of literature selected for use in Foundations and Frameworks, giving a brief summary and promotion of each. The
students respond by writing down the titles of their first and second choices from the three available titles.

The teacher combines the student choice information with an understanding of the literature’s readability and each student’s reading abilities to make the best possible match between text and student. In this way, instructional small groups form for the remainder of the Foundations and Frameworks unit.

The next ten to twelve days in the Foundations and Frameworks unit feature a repeating cycle of independent reading, independent skill application practice, and small group interaction. The teacher begins by introducing to the students the rubric used for assessment (see Figure C.6), explaining that it will guide the students’ daily work and be used as the basis for the task performance assessment at the unit’s conclusion.

The teacher gives each group a reading assignment and assigns independent skill application practice. Students complete skill application practice in the Foundations and Frameworks SPECS Logs (see Figure C.7). (SPECS is an acronym for SPace for Extending Comprehension Skills.) For this unit, a typical SPECS Log assignment engages students in the development of multiple idea frameworks with the ideas and support students identify from the literature. Additional practice of previously mastered skills related to theme identification, such as character and plot analyses, provides support for the ideas students identify as being potentially theme-related.
Figure C.6. Rubric for Identifying Theme Used in Foundations and Frameworks

<table>
<thead>
<tr>
<th>Exemplary</th>
<th>Proficient</th>
<th>Adequate</th>
<th>Not Yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All proficient descriptors, plus…</td>
<td>• All adequate descriptors, plus…</td>
<td>• Student identifies ideas represented in the text (e.g., kindness, sacrifice, perseverance)</td>
<td>• Anything less than the adequate descriptors</td>
</tr>
<tr>
<td>• Student restates the theme to reflect a personal perspective</td>
<td>• Student cites sufficient relevant support that the theme is inarguably represented in the story</td>
<td>• Student develops a statement on each idea that conveys a potential theme of the story (e.g., kindness overcomes cruelty in the long run)</td>
<td></td>
</tr>
<tr>
<td>Visual Tool: Idea Framework</td>
<td>• Student selects an appropriate (supportable) theme for the story and identifies text elements that support it</td>
<td>• Student creates an antithesis for each potential theme statement</td>
<td></td>
</tr>
<tr>
<td>• All proficient descriptors, plus…</td>
<td>• All adequate descriptors, plus…</td>
<td>• Student identifies a justifiable theme for the story and provides examples from the text that support it</td>
<td>• Anything less than the adequate descriptors</td>
</tr>
<tr>
<td>• Student restates the theme as a personal perspective and explains where/how the theme might be applied or illustrated in his own life</td>
<td>• Student includes thorough and relevant support for the choice of theme</td>
<td>• Student identifies the theme as either being explicit (stated) or implicit (not stated but inferred by the reader)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Student explanation shows how the selected theme is a connecting thread throughout the entire story</td>
<td>• Student compares the identified theme with Biblical truth and/or personal values</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Student explains how the antithesis statement would have impacted the story’s outcome or main character if it had been the story’s theme</td>
<td></td>
</tr>
</tbody>
</table>

Figure C.7. SPECS Log Pages Used for Skill Application Practice in Foundations and Frameworks
The teacher meets with each *Foundations and Frameworks* small group for 20-25 minutes every day. The small groups feature teacher-led, student-dominated interaction focused on the literature and the ideas students gain from it through application of the comprehension skill.

In this unit, the teacher leads the discussion about theme, eliciting a list of ideas students identify from the literature and guiding them in identifying support for those ideas. Group-developed visual tools often focus the interaction and prompt students to refer to their SPECS Log responses to contribute ideas to the discussion. The group discusses other aspects of the literature, such as character development, setting, plot, sequence of events, and character perspectives, but every small group session includes significant time devoted to the comprehension skill being practiced. The teacher requests student think-alouds (e.g., Think out loud for us to show us the thinking you did to include that response in your SPECS Log.) and provides additional instruction, modeling, and instructive feedback as necessary.

When dismissing the small group, the teacher checks the *Foundations and Frameworks* SPECS Logs of a few students individually and references the rubric in discussing the quality of the work with the student, redirecting, encouraging, and challenging when necessary. The cycle of reading literary selections, SPECS Log skill practice, and small group interaction occurs for ten to twelve days, allowing significant time for skill practice, instructive feedback, small group interaction, and mastery of important, thought-based comprehension skills.
Spotlight on Literacy: Unit Conclusion for Identifying Theme

Days four and five of Spotlight on Literacy’s instructional process appear under the heading “Extend Skills in Context.” Following the reading of The Wreck of the Zephyr, Spotlight on Literacy suggests teachers place students in ability-based groups and use leveled text packaged as separate books to address the skill and strategy needs of students. One small group described as “Average/Challenge” reads Lost!, summarized in Spotlight on Literacy by the following sentence: “Shawna and Missy must defend themselves from a bear while trying to find their way home” (McGraw-Hill, 2001, p. 41F). The instructional plan for this group states the following:

Invite students to collaborate on an aerial picture/map of the setting of Lost! on a large sheet of butcher paper. Students may want to organize into two teams, one of technical artists and one of painters. The technical artists can sketch out the setting, locating such details as the camp, the bear’s den, and the jumble of fallen trees. The painters can complete the picture by painting in the actual details. Students can trace Missy and Shawna’s movements on their setting pictures (McGraw-Hill, 2001, p. 41F).

Vocabulary, composition, grammar, and spelling activities complete the five-day instructional process.

Spotlight on Literacy features two objective, multiple-choice assessments in each unit, one on vocabulary terms and one on comprehension of the text selection. Because they are multiple-choice tests, the two assessments tend to focus on literal information such as word meaning and details of the basal selection, The Wreck of the Zephyr. The
assessments do not require students to provide evidence of comprehension skill application.

*Foundations and Frameworks: Unit Conclusion for Identifying Theme*

The final activities in the *Foundations and Frameworks* instructional process combine personal responses with collaborative synthesis projects. Writing in the SPECS Logs, students record personal thoughts about the literature, the author’s intended message, and the skill they have mastered.

Working with members from their small groups, students develop multiple visual tools on large sheets of butcher paper to convey to others the essence of the literature they read. SPECS Log responses and free-flowing interaction continue to prompt thought about the literature, and because thought continues so does the construction of comprehension.

The teacher assigns some of the visual tools included on these sheets of “intellectual art,” and the students select others from previously mastered skills that prompt additional thought about the literature. The results provide a visual for a group presentation, during which classmates ask questions and provide an interested audience. Because all the students focus on the same *Foundations and Frameworks* comprehension skill during the unit, they communicate across groups even though each group read a different piece of literature.

*Foundations and Frameworks* features three different assessments at the conclusion of each unit. A vocabulary assessment features student writing with vocabulary words used in context. A skill knowledge assessment reveals student mastery of the thought process and visual tool used in the unit. A performance task assessment
features the reading of new text, usually a short story or brief nonfiction work, and the application of the comprehension skill through the development of the same visual tool the students practiced throughout the unit. The rubric previously presented to students and used to evaluate their SPECS Log responses guides the teacher’s evaluation of the results.
Table D.1. Program Comparison Results, A Research-Based Rubric for Reading Comprehension Components, Part 1

Scale Descriptors
0=No Evidence: The program lacks any evidence of the described element
1=Limited Evidence: The program features limited evidence of the described element, raising questions of its effectiveness
2=Adequate Evidence: The program features adequate evidence of intentional inclusion of described element
3=Consistent Evidence: The program features consistent evidence of the described element, making the program exemplary in the described area

<table>
<thead>
<tr>
<th>Part 1: Neurocognitive Elements</th>
<th>Spot.</th>
<th>F&amp;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. engages the construction of meaning through the use of analogy, connecting to student long-term memories via patterns related to cognitive processes involved in comprehension</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2. features instructional activities that aid comprehension through engaging working memory processes, such as merging new content with long-term memories to construct understanding</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3. includes multiple metacognitive activities, directing student focus to relevant text details</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4. fosters the development or augmentation of a “network of associated connections” through activities that engage students in identifying and interpreting meaningful connections between text elements (Eichenbaum, 2002, p. 168)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>5. engages students in converting text ideas into components that can be manipulated and organized spatially to explore connections and deepen comprehension</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6. views thinking as a means to comprehension and comprehension as a means to content for additional thinking that deepens comprehension as evidenced by the program’s instructional methods and process</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Part 1 Total</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>Part 1 Mean (Total/6)</td>
<td>0.83</td>
<td>3</td>
</tr>
</tbody>
</table>
Table D.2. Program Comparison Results, A Research-Based Rubric for Reading Comprehension Components, Part 2

<table>
<thead>
<tr>
<th>Part 2: Instructional Processes</th>
<th>Spot</th>
<th>F&amp;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. includes explicit instruction in the thought processes that enable comprehension</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2. includes teacher modeling of thought processes and idea organization that facilitate comprehension</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3. includes scaffolded instruction, in which explicit instruction and modeling leads to guided and supported practice, progressing to independent practice with instructive feedback</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4. includes multiple opportunities for students to practice skill application and receive instructive feedback from the teacher within a targeted time frame (i.e., the initial skill practice occurs repeatedly within the same instructional unit rather than being scattered throughout multiple units throughout the school year)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>5. features an instructional process that provides frequent opportunities for instructive feedback</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6. provides instructive feedback based on an established and understandable standard</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7. includes small groups characterized by literature-focused interaction, comprehension skill application, and collaborative reasoning that facilitates deepening understanding of text</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

| Part 2 Total                                                                                     | 6    | 21  |
| Part 2 Mean (Total/7)                                                                            | 0.86 | 3   |
**Table D.3. Program Comparison Results, A Research-Based Rubric for Reading Comprehension Components, Part 3**

<table>
<thead>
<tr>
<th>The program’s:</th>
<th>Spot</th>
<th>F&amp;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. instructional literature represents a collection of high quality works</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2. instructional literature provides multiple opportunities for the application of targeted comprehension skills</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. instructional literature represents readability levels appropriate for the student population</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4. instructional literature increases in difficulty at a logical pace and in a logical sequence</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5. materials facilitate independent application of thought processes that aid comprehension</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6. materials facilitate the connection of ideas in understanding an author’s message</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

| Part 3 Total | 6 | 18 |
| Part 3 Mean (Total/6) | 1 | 3 |
### Table D.4. Program Comparison Results, A Research-Based Rubric for Reading Comprehension Components, Part 4

<table>
<thead>
<tr>
<th>Part 4: Professional Development</th>
<th>Spot</th>
<th>F&amp;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. includes all major instructional components, such as cognitive processes related to learning, beginning reading (e.g., phonemic awareness, phonics), reading comprehension instruction, small group leadership, vocabulary instruction, assessment, content area reading, and instructional design</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2. includes the theoretical support for the instructional methods and process</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. includes the modeling of instructional methods by proficient practitioners</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4. includes opportunities for teachers to practice new instructional methods with instructive feedback from the trainer</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5. includes opportunities for teachers to work collaboratively on the development of instruction</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Part 4 Total</strong></td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td><strong>Part 4 Mean (Total/5)</strong></td>
<td>0.4</td>
<td>3</td>
</tr>
</tbody>
</table>
Table D.5. Program Comparison Results, A Research-Based Rubric for Reading Comprehension Components, Part 5

<table>
<thead>
<tr>
<th>Scale Descriptors</th>
<th>Spot.</th>
<th>F&amp;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0=No Evidence: The program lacks any evidence of the described element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1=Limited Evidence: The program features limited evidence of the described element, raising questions of its effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2=Adequate Evidence: The program features adequate evidence of intentional inclusion of described element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3=Consistent Evidence: The program features consistent evidence of the described element, making the program exemplary in the described area</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part</th>
<th>Mean</th>
<th>Spot.</th>
<th>F&amp;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 1</td>
<td>0.83</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Part 2</td>
<td>0.86</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Part 3</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Part 4</td>
<td>0.4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.09</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Final Mean (Total/4)</td>
<td>0.77</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>