

CHAPTER TWO

LITERATURE REVIEW

To effectively review information that had been gathered regarding reading strategies utilization in EFL secondary school learners, the review of related literature to this study includes the following topics. First, the reading foundation is presented. Second, the reading models are discussed. Third, the reading strategies are explained. Fourth, the reading skills are indicated. Finally, the researches related to reading strategies utilization for enhancing students' reading comprehension are reviewed, respectively.

2.1 Reading Foundation

Reading research has substantiated the validity of four major principles (Hall, 1989). First, skilled reading is a complex task that involves perceptual, cognitive, and linguistic processes (Hiebert & Raphael, 1996). Second, reading is interactive in the sense that readers derive information from many levels (e.g., phonemic, morphemic, semantic, syntactic, pragmatic, interpretative) rather than proceeding sequentially from basic decoding to comprehension. Third, the human information processing system limits capacity for processing texts (e.g., attention, perception, Working Memory, Long-Term Memory). When lower-level process (decoding) functions automatically, this frees up more space for higher-level function. Fourth, reading is strategic.

Presumably, the basic component process is decoding. Decoding means deciphering printed symbols or making letter-sound correspondences by using a whole-word (matching/pattern recognition) or a phonetic (sound out/recoding) approach (Gagne, Yekovich & Yekovich. 1993). In the whole-word approach, the word's meaning is activated by matching the printed words to a similar pattern in LTM (long-term memory). In the phonetic approach, one pronounces a word by dividing it into syllables and generating corresponding sounds. Both techniques employ top-down and bottom-up processing, respectively (Just & Carpenter. 1980; Resnick. 1985).

In addition to the important of sound-letter correspondence and phonological awareness, students ultimately employ contexts clues in deciphering unknown words. These clues are embedded in two categories: semantic, "which entails using the meaning constructed from text, and syntactic, which uses the structure of the language and knowledge of how words go together" (Cooper. 1997).

Precisely, semantic knowledge is related to constructing meaning in text from "the reader's background experience, knowledge, interest, attitudes, perspectives, and present context or situation in reading" (Reutzel & Cooter. 1996). Anderson and Pearson (1984) point out that constructing meaning from text relies heavily on the reader's prior knowledge and experience of what they are reading. Syntactic knowledge is related to the order of language, as well as to how language works. Syntactic knowledge, "results in grammatically correct phrases and sentences" (Reutzel & Cooter. 1996). The use of proper word order in language is important because it relates to how meaning is constructed from print.

Generally, learning to read involves two basic processes. One process is learning to decipher print; the other is comprehending the meaning of the print. Liberman (1992) argues persuasively that humans are equipped for learning to produce and comprehend spoken language easily, but they are not equipped for learning to decode written language easily. Processing spoken language is governed by central phonological structures in the brain. The brain is specialized for processing spoken language, but it has no special central equipment for processing written language. Apparently, this is why learning to decipher print is not the “natural” process. In order for reading to develop, grapheme must attach to “deep” phonemes, not simply to “surface” sounds within words (Liberman, 1992). However, these are not straightforward steps so that special experiences and instruction are needed for learners to engage the brain in learning to decipher prints.

In short, applying a cognitive view to reading presents the reader as one who intentionally uses cognitive processes. These processes are frequently called reading. Hence, reading is as deliberate, cognitive steps that learners can take to assist in acquiring, storing and retrieving new information, and which can therefore be accessed for conscious use.

2.2 Reading Models

In the last four decades, different views concerning the nature and the process of reading have resulted in the emergence of several reading models. The bottom-up model (Gough, 1972), the top-down model (Goodman, 1967; Smith, 1971), and the interactive model (Rumelhart, 1977, 1980; Stanovich, 1980; Carrell, 1983a, 1983b) are usually discussed in literature on reading. Almost every single reading strategy is

based on some of the theoretical assumptions of these models. In this section, I will briefly discuss their main tenets, their implications for reading instruction, and how reading is explained in each model.

2.2.1 Bottom-Up Models

Usually described as “linear,” the bottom-up theory of reading was widespread in the 1960s and revived by Gough’s (1972) views of the process. The reader starts with letters in the decoding; proceeds to words; and then, ultimately, understands sentences. This data-driven process mainly utilizes the textual elements to construct the meaning of a passage, becoming so automatic that sometimes the fluent reader is unaware of it. Since the bottom-up approach emphasizes sight-reading of words in isolation, rapid word recognition is essential (Van Duzer. 1999).

Bottom-up models are also hierarchical, which means that one needs to know not only all the letters of a word to access its meaning but also all the words in a clause or a sentence to access their total meanings (Paron. 1997). Therefore, the bottom-up approach puts more emphasis on knowledge of vocabulary than other models do. Beyond letter recognition, words in bottom-up models seem to represent the basic units of meaning, whose comprehension is a prerequisite for that of the entire text.

A second important aspect of the bottom-up model is its focus on orthographic recognition. According to this view, second- language learners, like the Saudis, whose first languages have different orthographic systems from the target language, may have some difficulty in word identification and recognition (Coady & Huckin. 1997). This observation emphasizes the role of vocabulary knowledge, which facilitates automatic decoding in second language prefixes, suffixes, and foreign root

words. This automaticity allows readers to focus more attention on comprehension rather than on decoding individual words. It seems that the more effort put in decoding words, the less processing capacity is left for comprehension. It has also been confirmed that fast decoding improves comprehension (Breznitz, 1997; as cited in Pressley, 2000).

2.2.1.1 Implications for Instruction

According to bottom-up models, comprehension processes demand resources. Therefore, “educators should aim at helping learners automate lexical access through a great amount of repeated exposure to print” (Taguchi, Gorsuch & Sasamoto, 2006: 3). Readers can make use of some of their attentional resources to achieve better comprehension by executing word recognition fast and automatically (Samuels, 1994). Therefore, students should learn how to identify individual letters first (visually) and then how to put these individual letters and letter combinations to different meaningful sounds. Although many approaches to teaching decoding concentrates on sounding out words, all such instruction focuses on automatic decoding and on comprehension. The main assumption in this model is that (until proven to be wrong by diagnostic tests), poor readers have potential decoding problems (Purcell-Gates, 1997).

2.2.1.2 Bottom-Up Models and L2 Reading

The increased importance attributed to automatic word recognition in L1 reading has extended to the L2 reading area. Haynes (as cited in Weir & Urquhart 1998) points out that instructors and teachers need to raise the level of automaticised vocabulary rather than focus on decoding. She cites evidence from L1 studies that found fluent reading is achieved by increasing one’s bottom-up processing of print

and by decreasing semantic and syntactic guessing. However, Bernhardt (1996) goes so far as to claim that the ultimate goal of L2 reading is automaticity, since the good L1 reader processes language without thinking consciously.

Although there is a great deal of consensus on the role of automaticity in L2 reading, there is less agreement on how to achieve it. Haynes (cited in Weir & Urquhart 1998) argues that the importance of word unit processing needs to be recognized in ESL teaching. Therefore, precision of encoding, spelling, and pronunciation can be increased through oral and written practice of important vocabulary from reading. Conversely, Weir and Urquhart (1998) point out that automaticity in most skills comes from over learning, although she admits that we do not know what exactly how word recognition becomes automatic. Is it recognition of common sound spelling patterns, or recognition of high frequency words?

Emphasizing bottom-up processing, Paran (1996) argues strongly for developing exercises to help EFL students recognize vocabulary more automatically. He places a good deal of emphasis on bottom-up processing. According to Paran (1996), good readers do not depend solely on hypothesis formation as is generally believed. Rather, bottom-up processing as well as visual inputs occur during reading. He also argues that guessing is not an appropriate strategy for the lower levels of processing (word or phrase recognition). Furthermore, top-down approaches would seem to be more suited to expeditious reading such as skimming or search reading where the focus is on the macrostructure of the text.

The researcher believes that the use of bottom-up models in Saudi classrooms can be justified for two reasons: the age of the language learners, and the lack of input

and incidental learning in the total FL learning environment. According to the Critical Period Hypothesis,

language learning, which occurs after the end of the critical period, may not be based on the innate structures believed to contribute to first language or second language acquisition in early childhood. Rather, older learners depend on more general learning abilities –the same ones they might use to learn other kinds of skills or information. (Lightbown & Spada. 1997: 42)

Compared with many second-language learners in second language situations, foreign language learners are also at a disadvantage in terms of the role of the learning environment in reinforcing FL learning. Therefore, they are still limited to traditional classroom settings. FL (such as EFL) and L2 (such as ESL) learners are usually classified into the same group. However, the amount of exposure to the second language might vary from one country to the other. To achieve a desired proficiency in FL learning, an appropriate learning atmosphere should be carefully created in the language classrooms. Practicing decoding skills as well as phonics instruction-both of which are recommended by bottom-up models proponents-immensely benefit EFL students.

In fact, this is what teachers really do in classroom nowadays in Thailand since there is no concern about teaching “isolated skills”. According to this reading theory, by isolating the decoding process into pieces, we make it easier to grasp and practice. The authors of bottom-up models suggest that their theories implicate instructional activities as well. They propose repeated readings, which increases accuracy and automaticity in word recognition; reading familiar texts if the student’s problem is decoding, and reading interesting and satisfying texts within the student’s decoding ability (Purcell-Gates. 1997).

Finally, when applying bottom-up models, such as Automaticity Theory (AT) to Thai reading classrooms, Thai learners usually start from an absolute beginning language learning stage and should progress until they acquire the desired proficiency. Before they get involved in complex tasks in real interactive communication, they need to become more fluent, automatic, and efficient in some mental processes. By incorporating integrative tasks in the learning situation, people can use different skills they have developed in more complex activities.

However, a major problem of bottom-up models is their view of word recognition. Although Gough (1984) believes that word recognition is mediated by letter recognition, Samuels and Kamil (1984) have found frequent words to be processed and identified as holistic units. They found no difference in the processing time between short and long words, which supports a holistic word-recognition processing. Another problem with the bottom-up model of reading is that it does not seem to consider the contribution of the context or the reader's background knowledge to reading comprehension. Going beyond the printed letters seems to receive little or no attention in this model. Recognition of inadequacies in the bottom-up model, such as how it explicates the reading process, led to the emergence of other models, such as the top-down model.

2.2.2 Top-Down Models

Academically, Goodman (1967) introduces the top-down model of reading, in which reading was viewed as a psycholinguistic guessing game. Another renowned advocate of the top-down model is Smith (1971). In this concept-driven model, readers' background knowledge and expectations guide them in their reconstruction of the meaning of the text. Based on their background knowledge, readers start with

certain expectations concerning the text. They then use their vocabulary knowledge in decoding words in the text to confirm, disconfirm, or modify previous expectations (Aebersold & Field. 1997). This process is usually called “sampling” of the text. Describing the process, Cohen (1990: 75) maintains that “the reader does not read all words and sentences in the text, but rather chooses certain words and phrases to comprehend the meaning of the text”.

The top-down model focuses on some reading skills, such as prediction, inferences, and content guessing. Unlike the bottom-up model, in this model, texts have no stand-alone meaning. It is the reader who reconstructs the meaning of the text by fitting it into his prior knowledge. Samuels and Kamil (1984: 187) have noted: “It is more accurate to assert that [Goodman’s] model always prefers the cognitive economy of reliance on well-developed linguistic (syntactic and semantic) rather than graphic information.” This would entail the existence of well-developed linguistic knowledge, of which lexical knowledge may be the most important.

Thus, the top-down model assumes that readers would have no decoding problems to use the text as a prompt for activating and implementing global and top-down processes and strategies. Therefore, some reading researchers (Stanovich. 1980) believe that the top-down model seems to explicate the reading process of fluent readers but not for poor or beginning ones.

Despite the fact that bottom-up processes play a central role in reading, top-down processes are still of great importance. Reading studies have shown that predictable words are fixated on for shorter periods of time. Besides, readers tend to skip these words more often than the less predictable ones (Rayner & Pollatsek. 1989).

2.2.2.1 Implications for Instruction

As for implications for instruction (top-down models), the main purpose of reading in this model is comprehension. The learners should always deal with whole texts, which are read for authentic purposes (whole language instruction). Breaking the process down into isolated pieces is counterproductive to comprehension. It deprives the learners from using all the cue systems and from engaging in a full cyclic use of reading strategies in the pursuit of meaning (Purcell-Gates. 1997).

Teachers who adopt these ideas will encourage their students to read the texts that they want to. These teachers will not focus on reading fluency. Rather, their focus will be on helping students make sense of texts by the use of translation. Therefore, students in these classes may rarely be asked to read aloud for accuracy. If they happen to do so, it is to share their favorite readings or because the teacher can learn more about different ways and strategies students use in pursuit of meaning (Goodman. 1994; Rosenblatt. 1994).

2.2.2.2 Top-Down Models and L2 Reading

Presumably, the importance of Goodman's attribution to hypothesis formation and sampling has had a considerable influence on L2 reading theory. Grabe, Eskey and Dubin (1986) point out that because this approach is based on a good understanding of the reading process, its effect on methods and materials for the teaching of second-language reading has been both dramatic and mainly positive. They continued to argue that much of the credit for the new concern in language teaching with reading as an independent skill, and for improvement in reading pedagogy and materials, is accorded to the work of Goodman and Smith and their

supporters. The latter have successfully promoted a top-down model of the process (Grabe et al. 1986).

Because comprehension is viewed as a personal transaction between the reader and the text, teachers will use the traditional comprehension questions for activities calling for different responses to texts-questions neither evaluated as correct nor incorrect. Besides, teachers neither tend to read nor encourage their students to read simplified texts. They believe that by reading simplified texts, we damage their nature (as a natural language) and hence the reader stops using his language knowledge and strategies (Purcell-Gates. 1997).

Under this model, teachers should employ highly predictable texts for beginning readers so that they can engage with the whole text very easily. Teachers can use patterned language such as jingles, songs, and poetry to help these readers employ some of their reading strategies such as predicting, sampling, and selecting. Teachers also help students engage in the confirming and disconfirming of correction (Purcell-Gates. 1997).

2.2.3 The Interactive Model

Introduced by the writings of Rumelhart (1977) and Stanovich (1980), the interactive model suggests an interaction between bottom-up and top-down processes. Proponents of this model assert that neither bottom-up nor top-down models can by themselves describe the reading process. Each type of processing is seen to contribute to the reconstruction of the message encoded in the text (Eskey. 1988). Stanovich (1980) suggests that poor readers tend to resort to high-level processes more often than skilled or fluent readers. The use of top-down processes seems to compensate for poor readers' lack of recognition skills or use of bottom-up processes.

The interactive model also incorporates several major findings from research on schema theory. Anderson and Pearson (1984: 259) define schema as “an abstract knowledge structure.” A schema is usually described as a kind of prior knowledge that readers use to put the information from the text in a certain perspective so as to better comprehend it. Some schema researchers suggest that comprehension of texts involves using the text as a guide to the kind of background information that needs to be activated for comprehension (Carrell, 1983a). Bensoussan (1998) found that 23% of EFL learners’ incorrect answers to comprehension questions were attributed to activating inappropriate schemata. Carrell (1987) describes two types of schemata—a content schema and a formal schema—while Cohen (1990) suggests the existence of three types, namely, content (subject, culture, etc.), language (vocabulary, cohesive structures, spelling, and punctuation), and textual (rhetorical structure of different genres).

For fluent native speakers, Eskey (1988) maintains that knowledge about language is part of their schema which can be readily available and thus activated automatically. In the realm of second-language reading, Eskey believes that rapid and accurate decoding is an important skill for L2 readers. This accurate decoding will certainly allow other important higher and top-down processes to operate simultaneously. L2 readers usually need linguistic knowledge, of which vocabulary knowledge is paramount. Such knowledge enables readers to use the text efficiently during the comprehension process. Clarke (1979) has also suggested that there is a linguistic threshold, after which L2 learners may read L2 texts as efficiently as they read their L1 texts. Stanovich (1980) and Carrell (1984) believe that bottom-up and top-down processes compensate for each other.

When a reader lacks the appropriate content schema for a certain text, he will rely more heavily on bottom-up processes to compensate for a lack of necessary background knowledge. The opposite could be true about some readers who lack the bottom-up processes necessary to comprehend a text. The interactive approach assumes that good readers are proficient at both decoding and interpreting the text (Eskey, 1988). This approach also endorses the idea that having automatic recognition skills will free the reader's mind to make connections between the parts of the text, interpret the text more accurately, and comprehend what is being read. Such interaction between high-level and low-level processes seems to take place simultaneously.

2.2.3.1 Implications for Instruction

As a "whole-part-whole" instruction (Purcell-Gates, 1997), the interactive model of teaching involves learners in meaningful reading and writing activities to extract some specific skills. These focused-upon skills are then integrated into authentic activities for practice in the actual reading and writing process. Because they acknowledge the role of social context, the teachers use different reading and writing strategies in various genres and for different audiences and purposes (Rumelhart, 1977).

In summation, approaches in reading theories assume that the reading process, even in L2, is interactive. It involves a mixture of bottom-up and top-down processing. This is a widely accepted view by researchers, in that both models interact during the reading process. The reader, using them, interacts actively with the text (Block, 1992). Therefore, teachers who adopt the interactive model in their reading instruction take comprehension as the only purpose for reading. Hence, in

their classrooms, they stress meaning making activities. Some teachers might even teach isolated skills or involve their students in the reading and writing of compelling texts.

2.2.3.2 The Interactive Model and L2 Reading

If one sees reading as a process of constructing meaning, evidence of reading growth will include, but not be limited to, achievement data. Braunger and Lewis (2006: 14) assert:

Additional evidence of literacy development comes from naturalistic studies of students actually reading, for example, teachers' observations and analysis of literacy experiences; classroom research on the impact of social interaction, strategic modeling, and materials on literary learning; readers' use of all cue systems in reading (letter-sound, meaning, syntax, and pragmatics); connections between learners' reading and writing; and a host of other variables involved in the reading process.

For skilled readers, top-down and bottom-up processing are concurrent.

Comprehension takes place only when accumulated evidence strongly supports a particular hypothesis. Because comprehension depends on both graphic information and information in the reader's mind, it may be obstructed when a critical skill or a piece of information is missing. Then, comprehension is hampered; the skilled reader compensates by decoding key words, by relying on context, or both (Rumelhart, 1980). A skilled reader is the one who is able to use all kinds of information such as sensory, syntactic, semantic, and pragmatic to accomplish his goals. These different information sources interact in complex ways during the reading process.

Finally, the interactive model places a great deal of importance on vocabulary building in developing reading fluency. It is not only important to have an extensive vocabulary, but it is also a precondition for the development of reading fluency and

reading skills. Consequently, it is crucial to develop word recognition since it is more important in developing fluency than contexts clues are (Abisamra. 2001).

2.3 Reading Strategies

Academically, reading strategy research emphasizes the reading process rather than comprehension. Garner (1987) has concluded that insufficient strategies and limited involvement in the reading process lead to comprehension problems, even among students who have sufficient vocabulary knowledge and decoding skills. These findings may suggest that low EFL-reading proficiency problems may not be related to attitudinal factors. According to several EFL reading studies conducted in Saudi Arabia (Al-Arfaj. 1996; Al-Samani. 1999 & Al-Akloby. 2001), learners seem to have positive attitudes towards learning English and reading EFL materials. Their problems, therefore, may be attributed to poor linguistic or strategic knowledge. Sheorey and Mokhtari (2001) believe that an awareness of reading strategies and comprehension monitoring is an important characteristic of good readers. Sheorey and Mokhtari (2001: 433) claim that to comprehend a text, readers need to use their metacognitive knowledge about reading and “invoke conscious and deliberate strategies.” This may mean that if readers are not aware of certain strategies, they will not use them in the reading task. Thus, good readers both know and utilize appropriate reading strategies.

2.3.1 Definition of Reading Strategies

Literature on reading provides several definitions of reading strategies. According to Garner (1987), reading strategies are mainly deliberate, planned activities used by active readers, to remedy apparent cognitive failure. Carrell, on the

other hand, defined reading strategies based on the writing of several reading researchers as “actions that readers select and control to achieve desired goals or objectives.” Both definitions reflect the reading strategies that will be used in this dissertation research.

2.3.2 Classification of Reading Strategies

Precisely, reading strategies can be classified according to the time they are used-before, during, or after reading. They also can be categorized as either global or local according to the part of the text on which they focus (Young & Oxford. 1997). A general distinction is also made between cognitive and metacognitive strategies. Garner (1987: 16) states: “If cognition involves perceiving, understanding, remembering, and so forth, then metacognition involves thinking about one’s own perceiving, understanding, and the rest.” Flavell (1979: 909) maintains that “cognitive strategies are invoked to make cognitive progress, metacognitive strategies to monitor it.” Moreover, Sheorey and Mokhtari (2001) suggest that the metacognitive knowledge of readers includes an awareness of an array of reading strategies.

Importantly, in this study, the researcher will maintain the first classification. For this research, reading strategies are grouped into three main types: planning strategies (before reading), attending strategies (while reading), and evaluating strategies (after reading).

2.3.2.1 Planning Strategies (Before-reading Strategies)

A variety of nonfiction reading strategies designed to increase student comprehension prior to engaging a textbook are available to middle school science teachers. Some of these comprehension strategies coincide within the theoretical

framework of constructivism and schema theory by which science is often taught in the middle school classroom. Additional strategies such as making predictions or inferences, anticipation guides, and knowledge of science textbook structure, may also be effective and appropriate pre-reading strategies and are described below.

1) Prior Knowledge

Understanding concepts presented in nonfiction texts is often dependent upon the student's knowledge of the textbook's structure, their ability to apply and connect with their prior knowledge, and attention or motivation. Similarly, Smith (2004; 49) emphasizes the importance of tapping into a student's prior knowledge by stating, "What goes on in the learner's head is dramatically influenced by what is already there". By recognizing and allowing students to communicate a variety of experiences and prior knowledge within many areas of science, teachers could afford the entire class the opportunity to use a collective background knowledge set to compose elaborations and in-depth inferences about the topic (Mariotti. 2010). This sharing and activation of prior knowledge may be especially important for students with limited English proficiency (Smith. 2004) or for those students who may have limited educational opportunities at home or from their previous home country (Watkins & Lindahl. 2010).

This collective knowledge may provide or build upon concepts of which students are aware and is aligned with the framework, constructivism and schemata theory, in which how science is often taught (Hassard. 2005). For instance, prior to engaging in a discussion of high and low pressure systems within a hurricane during science class, a teacher may inquire as to students' experiences of a hurricane or heavy rain storm. Activating the student's schema previews the upcoming lesson,

prepares students for what is being read, and may serve as a motivator to read the nonfiction text. However, some nonfiction textbooks incorrectly assume that students have adequate background knowledge and may create misconceptions of scientific concepts (Gunn & Pomahac. 2008). One such pre-reading strategy incorporating students' and teachers' prior knowledge is included in the nonfiction reading comprehension resource guide.

2) Making Predictions or Inferences

Another pre-reading strategy incorporating predicting and inferencing skills often used in the science classroom is also presented in the resource guide. By quickly scanning pictures, diagrams, graphs, chapter headings and subheadings, students may gain a sense of what will be learned in the upcoming reading (Harris & Storr. 2005). Graphics often found in nonfiction textbooks may provide the reader with an organizational framework of the topic or information not explicitly stated in the textbook . As students view these features of their science textbook, their prior knowledge may be activated enabling the student to gain a more meaningful and deeper understanding of the concept (Cresswell2002). Slavin et al. (2009) suggest teachers provide probing questions that facilitate a class discussion requiring students to make predictions about the topic. As students make predictions about the upcoming section to be read, prior knowledge is activated and comprehension of the text may be increased. This type of reading comprehension strategy was recommended by middle school language arts teachers of a large Chicago suburban school and is outlined in the resource guide for this project study.

3) Anticipation Guides

Although an anticipation guide can be used throughout the reading process, it is primarily considered a pre-reading strategy (Kozen et al. 2006). Under this framework, the teacher creates true and false statements centered on the main topic in a content area. Students activate their schema and react to the statements. After students engage in the text, they are given the opportunity to revisit their initial responses and provide rationales for their original or new responses. Several benefits to using the anticipation guide is that it can be used in any content area, relatively ease of use, and are appropriate for a vast array of student populations with varying levels of intellectual performance (Kozen et al. 2006).

4) Textbook Structure

The structure and organization of nonfiction textbooks greatly differ from those found in fiction books. Often infused with a table of contents, glossary, and index, these differences overwhelm some students who are unable to understand the purpose of each of these tools found within nonfiction textbooks (Bluestein. 2010) such as science. Maloch (2008) encourages teachers to provide time for students to interact with nonfiction texts. By allowing time for students to become aware of the structural differences and organizational patterns found in nonfiction texts, it is possible that students will be more familiar and utilize these textbook tools more effectively. In fact, Myers and Savage (2005) propose that students need to become familiar with the textbook by examining the features and structures prior to initiating any instruction within the curriculum.

In addition to the table of contents, glossary, and index, Lapp et al. (2008) suggest teachers make students aware of structural features, such as captions, bold

words, and diagrams, as a way to increase reading comprehension. These textbook structures provide students with hints about upcoming topics and allow the activation of their schemata prior to reading (Bluestein. 2010). In their study of middle school students with learning disabilities, Faggella-Luby and Deshler (2008) found student comprehension is increased when teachers provided instruction of nonfiction textbook structures. Kendeou and van den Broek (2007) concluded from their study of student comprehension of scientific texts that much of a student's understanding depends upon their knowledge of how the text is structured, their ability to implement reading strategies, and their prior knowledge. According to Willis (2009), students may experience difficulties simultaneously coordinating these skills as teachers attempt to implement instructional methods in order to meet students' individual needs as readers.

As an area of concern identified by middle school science teachers and given the importance of understanding the basic structure and elements often found in scientific textbooks, three reading comprehension strategies designed to assist students understand the structure of their science textbook are presented in the project.

2.3.2.2 Attending Strategies (While-reading Strategies)

When engaging a nonfiction text, students often encounter unfamiliar vocabulary terms. Each of these vocabulary terms may hold significant meaning and future concepts may build upon a student's understanding of these terms. In addition to familiarizing themselves with new vocabulary terms, students may also find themselves negotiating with partnerships between concepts, organizing processes, or determining cause and effect relationships while reading their science textbook (McKeown, Beck & Blake. 2009). The use of graphic organizers and study guides

are nonfiction reading comprehension strategies middle school science teachers may use when designing lessons to demonstrate relationships between concepts or main ideas and supporting details. Several nonfiction comprehension strategies designed to assist students in acquiring new vocabulary, sorting main ideas from supporting details, and utilizing graphic organizers are presented in the resource guide.

1) Vocabulary

Understanding new vocabulary terms may pose difficulties for some students as less emphasis is placed on vocabulary development and instruction in middle school curricula . Sanacore and Palumbo (2009) argue that students should be exposed to more instruction on vocabulary terms and given the opportunity to apply their meaning while reading and writing. Knowledge of root words, suffixes, and prefixes may also increase a student's ability to make meaning of new vocabulary terms . Bhattacharya (2006) argues that middle school students with reading difficulties benefit in their reading comprehension when taught how to decode the multiple syllable scientific vocabulary term into smaller components or syllables. Knowledge of stems or root words may increase reading fluency, increase knowledge of vocabulary and reading comprehension .

Rather than using the glossary found in many nonfiction textbooks, technology may also play a role in assisting students to locate the meaning of an unknown vocabulary term. For instance, a study conducted by Fry and Gosky (2007) found that student use of pop-up dictionaries, designed to allow the definition of a vocabulary term to appear on a computer monitor, while reading informational text may be one method to increase reading comprehension. Although this method may be limited in scope by subject area, Fry and Gosky (2007) note that students'

comprehension increased when the pop-up dictionary was used compared to a traditional glossary found in nonfiction textbooks. However, Wijekumar (2007) cautions that although technology can be used to improve reading comprehension, barriers such as financial resources, infrastructure, changing technologies, and physical space requirements may exist for many school districts.

There may be times when the new vocabulary term is not explicitly stated in the glossary or within the reading passage. When this occurs, students may become frustrated because the answer is not easily located. Context clues, whereby students use implied meaning from the surrounding sentences from where the unknown word is located, may assist students in identifying the meaning of the vocabulary term. According to content area teachers can assist students with unfamiliar vocabulary terms using context clues by asking questions about the surrounding sentences and modeling this questioning technique throughout other content areas.

In their research, Lesaux et al. (2010) found that middle school students who are taught using a variety of learning modalities centered on vocabulary strategies demonstrated an increase in comprehension and vocabulary skills. Such strategies may include vocabulary games, spelling practice, flashcards, and the opportunity for students to incorporate and build upon their prior knowledge through written words or visual representations. Creating a word map or web that links prior knowledge to new vocabulary terms may be beneficial to students when learning new terminology (Bishop et al. 2006; Mariotti. 2010). A total of eight nonfiction reading comprehension reading strategies specifically for vocabulary and context clues using a variety of modalities are recommended by middle school language arts teachers of a large Chicago suburban school to assist students and included in the project.

2) Sorting Main Ideas and Supporting Details

It may be difficult for some students to determine important and unnecessary information when reading a nonfiction text (Bluestein. 2010) or sort main ideas from supporting details, opinions, and examples (Montelongo et al. 2010). A variety of reading comprehension strategies exists to assist students in sorting main ideas and supporting details. Such strategies may include graphic organizers (Massey & Heafner. 2004) and study guides (Belk et al. 2005) used as during reading strategies designed to increase comprehension. Ermis (2008) suggests teachers use graphic organizers to demonstrate relationships between main ideas and supporting facts, thus resulting in increased student understanding of how concepts are related and organized. The primary purpose of these strategies is to organize new information into existing schemata while simultaneously monitoring what is being read and addressing misconceptions as the reader engages the text (Belk et al. 2005).

Graphic organizers and study guides exist in many formats. For instance, one graphic organizer resembles a wheel with spokes extending from its center. Another graphic organizer may appear with the main idea centered at the top of the page with a bulleted list of details underneath. Similarly, study guides also vary in form ranging from a traditional outline to a guided reading format whereby students complete key vocabulary terms or ideas, similar to fill-in-the blank, or cause and effect charts (Montelongo. 2008).

2.3.2.3 Evaluating Strategies (After-reading Strategies)

Asking students to answer questions about what they have read to check for understanding has been a constant in many content area classrooms (Duke & Pearson.

2008). However, science teachers of a large Chicago suburban middle school identified students' ability to paraphrase or summarize concepts presented from their science textbook as an area of concern. After-reading strategies such as verifying comprehension via homework questions and paraphrasing or summarizing either orally or in written format are reading strategies that may be used to check for student understanding (McKeown et al. 2009). Three such strategies targeted toward paraphrasing and summarizing while building upon students' previously learned concepts or schemata as a means to verify student understanding of scientific ideas are presented in the resource guide.

1) Checking for Comprehension

When asked to recount a concept presented in a nonfiction textbook as part of a homework assignment, some students may write verbatim the passage in the textbook or not understand what the question is asking (Singletary. 2010). For example, Kinniburgh and Shaw (2008) developed the question-answer relationship (QAR) strategy designed to reduce the amount of time students spend searching for answers that require a prediction or relate to prior knowledge. This strategy enables students to identify what the question is seeking, such as a direct answer from the textbook, student prediction, connection to student prior knowledge, or connection to a previously learned concept (Kinniburgh & Shaw. 2008). Welker (2006) encourages teachers to provide instruction on words that may alter the meaning of sentences, especially when answering questions. For instance, words appearing in homework type questions such as always, not, entire, and only may greatly impact a student's ability to accurately demonstrate their understanding of the concept assessed (Welker. 2006).