Incorporation Reading and Writing Strategies in Middle School Science Classroom

Kelly A. Wilcox
St. John Fisher College

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Thesis

Degree Name
MS in Mathematics, Science, and Technology Education
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Reading and Writing Strategies in the Middle School Science Classroom

Literacy in today's classroom is becoming a problem that is interfering with students and how they understand the concept that is being taught. Many middle schools are set up that students move from subject to subject, or a new expert teacher comes in to teach a different content. Schools are now seeing the impact that this has on standardized test scores that measure reading and writing proficiencies. These test scores have been negatively impacted because of the disconnect between reading and writing and content area courses. Many of content area teachers feel inadequate when it comes to promoting quality reading and writing because of their lack of expertise. Teachers today do not necessarily need to become skilled in the area of literacy, they just need to know how and when to use the tools that exist within our educational society.

Reading and writing strategies have been around for the past 30 years and only recently have they begun to make headlines for improving literacy. These strategies range in topic from pre-reading, post reading, organization, and writing. Students that use strategies have an easier time accomplishing the end task successfully. Many of the strategies that have been created are ones that make content area courses easier to understand. Many content area courses focus on specific topics that revolve around a key idea. These topics usually have content related vocabulary, which then become the hurdle for many students. By incorporating different strategies, students are then able to become more successful at the reading and writing of that particular subject.

This research will focus on reading and writing strategies mainly because of the lack of literacy that many students exhibit in the area of Science. There are many daily
hurdles that students have to overcome, just to understand the topic, let alone key ideas. By introducing, a variety of strategies and using them throughout the week, students will become more focused and a connection between the subject of Science and literacy will develop. This will aid in making students responsible for their learning. They will understand and figure out what specific strategies will work well for themselves. By showing them a few missing pieces (strategies) to making science literacy more realistic, will allow students within a science classroom more successful in their learning. Upon completion of a school year, students will leave with a repertoire of strategies and knowledge of how to use them. Some students will leave as better writer, others as better readers and some will have learned the skill of organization.
Literacy is a driving factor on how middle school students understand and synthesize information in content area classrooms. Many students do not have the knowledge or background information to decode the text that is in front of them. In many instances, students will attempt to figure out what the text in front of them is requiring. A vast majority of students have very little success at this, so they are unaware of what their content area textbooks are asking, and more importantly how to navigate through them. Therefore, the question becomes, are we setting our students up for failure? Now students have to make an informed decision as to figuring out how to comprehend the text. By incorporation reading and writing strategies into content area classrooms, students can make a connection with the text and the concepts needed for lesson mastery.

With the implementation of standardized testing, students need to know what the test is asking as well as how to respond to the question. Common sense indicates that students cannot pass standardized tests that they cannot read (Bell, 2003). Students that can read and still do not pass these tests cannot write. Students use complete sentences on all assignments and when verbally answering questions we are able to better prepare our students for these high stakes tests. Teachers that show students how to use a variety of strategies that will aid in vocabulary, writing, and reading, will have students that are better prepared not only for the test, but also for success in their content area classroom. The past 30 years have brought with it a wave of new ideas to help promote literacy in middle school content area classrooms. In the elementary classroom, children are
learning to read and write, while it is not until the middle school years that students are then required to read for understanding within the text and write for meaning and growth (Barton, 1997).

Literacy

We are not helping our students acquire the strategic reading skills they will need to cope with the ever-increasing demands of the educational setting. Administrators, teachers, and parents need to make literacy a top priority and reading skills must be incorporated into courses across the curriculum (Barton, 1997). Society has become one that is reporting a rise in graduating students that are illiterate. As our economy changes from a manufacturing base to a technology base, our students need to know how read and write for meaning and understanding at a much higher level than in the past.

Educators need to address the question, what can we do to ensure that our graduating students can read and write effectively? Many schools do not promote reading and writing as an activity that can be enjoyed as a leisurely pastime. Classrooms are perfectly timed so that every minute is use to teach content and often do not promote taking 20 minutes a week in all grade levels to have students read for pleasure. One science teacher has worked strategically with the reading supervisor in her school and implemented DIRT – Daily Independent Reading Time (Topping & McManus, 2002). Students always carry a reading book with them to every class, if the opportunity arises; students then have the ability to read silently for a few minutes. John Hodson who is a sixth-grade teacher has implemented daily Sustained Silent Reading and bi-quarter book shares (Loranger, 1999). During this silent reading, students were asked
to keep a daily reading log (see Appendix A). Students that can read in the content area have fewer problems with literacy and the crisis at large (Barton, 1997). Literacy and science in the elementary classrooms make sense. Many of these teachers have strong backgrounds in the English language. Teaching science involves predications, explanations and communication, this can be done in conjunction with reading and writings. Reading and writing both are processes that are parallel with scientific inquiry (Holloway, 2002). Both are skills that teach questioning, analyzing and being able to draw conclusions. Results show that when a study of 545 teachers in 33 schools integrated literacy within the content classes, the overall result showed an increase in reading comprehension (Holloway, 2002).

By promoting reading in our classroom, students of all levels will gain a greater appreciation for books and reading. To help promote reading every teacher should do the following: early on in the school year establish an atmosphere in which students support one another’s reading efforts, start each class off with some reading activity, and provide students with books about the content being presented (Bell, 2004). According to Bell, Oprah Winfrey’s book club has become an over night hit with our nation, and educators must do the same within the classroom. Every teacher should have 10-12 books that they have read and enjoyed that students can read for extra credit. The books do not have to deal with your subject area as long as they make the students think.

The Science content is an area that many teachers feel over burdened by trying to teach content as well as incorporate meaningful reading into the curriculum. With the new standardized testing and the focus narrowing in on literacy, the demand to have motivated and engaged science students seems to be rapidly declining (Holliday, 1999).
Integrating Language Arts and Science has been successfully achieved through the use of innovative and modern teaching techniques. Many science classrooms today offer a variety of reading materials. These can be books, magazines, journals or even newspapers. With a variety of reading materials, students will be able to pick and be responsible for a part of their learning.

Many middle school and high school teachers complain that their students do not know how to read content area text. Many teachers themselves have little to no training at how to teach strategies that improve reading comprehension let alone reading itself. Teachers need to be able to identify the following factors to help promote reading in the content area: the difference between a narrative and an expository text and how learning varies within each type of text, helping students understand how they learn, and teaching a variety of strategies (Loranger, 1999). Without this training, many teachers do not have the ability to help students read, especially in a content area classroom. Thus, to ensure that students know what is happen in the text, teacher's end up telling the students the concepts and over arching ideas instead of requiring them to read the text (Billmeyer, 1996). It is necessary that teachers become trained in teaching strategic informational reading skills. These skills will allow students to become more literate in their content area classes.

There is a definite link between strategic teaching and student learning (Fisher, Frey & Williams, 2002). Teachers need to have on-going professional development that will allow for personal growth across all areas of content. Teachers as well as parents need to be educated on how to teach literacy. Many students want to know if they are right or wrong as opposed to explaining how they derived at the meaning or idea.
Engaging students in the subject is half the battle and a battle that can be won if persecuted properly. Science trade books are being introduced into the science classroom to help increase a child's understandings of the key ideas. Science books are the second most popular type of book among children, after general fiction (Royce & Wiley, 1996). This type of book can help increase children's science skills, such as observation, predications, hypothesizing and knowledge about facts concerning their own world. Children learn to read by either becoming emotionally evolved to the text (aesthetic), or by reading the text to simple gather information (efferent) (Royce & Wiley, 1996). One must preview the text and decide what they want the child to take away from the piece; this will help the child in determine the method of reading that they must endure. Teachers that read a science trade book to the class and then test the children on information that is factual will develop efferent readers. Teachers that want children to see the larger picture and elaborate on what the text was trying to portray will increase the number of aesthetic readers.

Science trade books typically do a good job illustrating abstract concepts, organizing information and encourage scientific way of thinking. However, some of these books divulge huge areas of misconceptions. One must make sure that the information that is being presented is factual and that the fact can be differentiated from fiction. The illustrations are labeled properly so that a students looking at the pictures will not be mislead. Another must, for using science trade books, it to make sure that the information provided is factual (Royce & Wiley, 1996).
Reading

Reading was once thought of as a process in which students simply decoded a paragraph. Reading today is viewed as a dynamic process in which readers work to actively construct meaning (Barton, 1997). This is all accomplished through strategic reading. Strategic readers can: change their reading to help them understand the text, use various strategies to help construct meaning of confusing text and have the ability to carry on a mental conversation with the writer.

Readers that are not affective have little idea as to the role that they as the reader hold. They do not connect with the writer, there is no prior knowledge unveiled, and the reader cannot construct meaning. Not all content area texts are written in the same manner, they are not set up in the same way and they do not allow the reader to obtain information in the same fashion. Readers really need to be aware of the purpose for reading and adjust their reading to meet that goal. By teaching strategies that will help the reader use background information, understand what the text is asking and by drawing on prior knowledge, a reader can be successful.

Accessing background knowledge is crucial for every student in all content areas. Background knowledge is will allow the teacher to unveil any misconceptions; it will provide a scaffolding affect to for the student for the lesson at hand. Activating prior knowledge allows the student time to reflect and assess what they already know about the topic presented. To allow students the opportunity to draw on previous experience, can be done with the help of various pre-reading strategies. Research indicates that when a students' background knowledge is well developed and accurate, they understand and
remember more of what they read (Anthony & Raphael, 1989). Students bring with them a variety of prior knowledge to the class. Therefore, teachers should employ an array of pre-reading strategies that will help them activate, assess and extend each student’s level of prior knowledge (Barton, 1997).

Some of the pre-reading strategies that are highly effective in accessing prior knowledge are the K-W-L, an Anticipation Guide, and the DRTA. The K-W-L (see Appendix B) is a chart that students fill out prior to the introduction of a new topic or concept. Students have the opportunity to fill in two of the three columns that help with cognitive recall. The K stand for *What I already Know* about the topic, the W stands for *What I want to Know* while the L is filled out after the lesson had been taught. The L serves as a reflective prompt for students to think and write down any information that *They have Learned*. An Anticipation Guide (see Appendix C) can take many forms like debates or true/false questions. This guide will engage and motivate students for the topic being studied. It will also allow misconceptions to be unmasked. The DRTA or Directed Reading/Thinking Activity provides students a focus and a reason for reading as well as having student’s hypothesis about what the topic is further about.

Once pre-reading strategies have been established, strategies that allow for better text comprehension should be introduced. Students need to be taught how to use a textbook and the importance of previewing the text before reading it needs to be stressed. The SQ3R method allows the students to preview the text, before they being to read. The S stand for survey the text, Q is to access the questions at the end of the chapter, and 3 R relates to: Read the text, Recite what you have read and Recall the important facts. Many of today’s textbook have bold faced words, graphics, and are divided into chapters with
heading and sub headings. All of these features are to highlight importance and allow the reader to see the connection between the topics presented (Holliday, 1999). This is helpful during the Recall method of SQ3R. During the actual reading of a content area text, teachers need to put a greater emphasis on vocabulary, since the vocabulary tends to revolve around the concept being taught. Instead of having, students memorize the new vocabulary word, which then pulls the word out of context; teachers need to make the new words meaningful. This can be done through demonstrations, skits or hands-on activities. By showing the student's how the word is relevant and meaningful and understanding of the word ensues. Once vocabulary in the text has been read, give students an article to read with the vocabulary words embedded or show them a short video clip that illustrates the meaning of the newly learned words (Topping & McManus, 2002). This helps point out the relevance and the makes the word realistic to the students. Relating a conceptual theme to students will help in clarifying the vocabulary words. When teaching about water quality, take the students outside and perform experiments in testing for water quality. While discussing the concept make sure that, the vocabulary words are reiterated throughout the demonstration (Holliday, 1999). One strategy that helps with vocabulary is referred to as the Definition Starfish (see Appendix D). This strategy includes a variety of process cues, one in each leg of the starfish (Loranger, 1999). Each leg requires the recall of different information that the student had learned.

Teaching students to be aware of the words that affect the meaning of sentences has been an investigation of William Welker (2006). After years of investigation, he has classified some terms as positive road signs and negative road signs. The most common
positive road signs include all, many, must always, some entire, usually, everyone and often. The negative road signs include not, none, never, hardly, rarely, no one, and seldom. These are word that when placed in a reading passage can have adverse affect on what is trying to be stated. These are words that students have developed a tendency to skip over when reading. This error can have a major impact on what the meaning of the passage or directions hold. Examples of these road sign words and their importance to the meaning of the sentence can be seen in Appendix E. By teaching our students the importance of these words and the impact that they can have, we are essentially creating more effective and conscientious readers.

Reading Comprehension

In a typical science classroom, students are given many chances to read expository texts. In these texts, the students are required to sift through a variety of formats and concepts. The purpose of the texts could be to understand the steps of an experiment, to explain the procedure in a cycle, to compare and contrast two or more items that need evaluating. Students read books, directions for experiments, articles, websites and even peer work, all of which have different concepts and formats. The reading tasks going on in a science classroom are quite extensive and do show that efforts are being made to help promote reading comprehension in a content area classroom. Although many science teachers are presenting a variety of reading materials to students, many do not understand the relationship these materials have with the fundamentals of literacy. Few students are able to read and comprehend information that is found in texts and written in the language of that specific content (Norris & Phillips, 2003).
The mutual characteristic of science inquiry and reading is made explicit in the following definition of inquiry:

Inquiry is a multifaceted activity that involved making observations; posing question; examining books and other sources of information to see that is already known; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results.


More simply stated, students must be able to read and comprehend in order to communicate the results scientifically. What do science teachers need to know in order to foster development and the transfer of inquiry strategies from science to reading?

Instead of knowing everything about science and reading, teachers should know a few basic rules well. They should know: (a) the relationship between the cognitive process and reading comprehension, (b) how these processes can be transferred, and (c) how to promote a deeper learning through teaching (Miller, 2003). Miller, has developed the Science-Cognition-Literacy (SCL) Framework (see Appendix F) to allow science teachers a visualization of the process of cognitive sequences and classroom activities for developing science inquiry skills and applying them to reading and wringing activities based in science. The SCL Framework is best used during longer units of study that will incorporates inquiry and reading/writing materials, in a project centering around one scientific concept. The longer units of study allow for a deeper level of student reflection.
and understanding. These long units can be broken up into smaller subunits and individual strategies then be applied from the SCL Framework to show its effectiveness.

The SCL Framework that is applied to a unit rather than a lesson will allow the students to read a variety of expository texts to help promote the understanding of the unit being presented. The variety of texts should include textbooks, newspapers, particles, magazines, internet articles and even trade books (Royce & Wiley, 1996). Students should be taught cognitive strategies through modeling and scaffolding. Such strategies include think-alouds, text analysis and graphic organizers. The texts, and strategies would serve as the Acquisition phase, which is aimed at developing student inquiry skills and science content knowledge.

The next phase of SCL Framework is called Internalization. This phase focuses on two activities: practicing the newly learned inquiry during reading/writing, and developing the skills of reflection. Since most science classrooms, do not plan time for reflection, the Internalization phase requires this time to be built into the lesson. Students are allowed time to critically reflect and share their thoughts in their investigations and reading activities during cross-talk activities, serving to further construct meaning (Miller, 2006). Teachers can aid in the facilitation of discussion to help promote the inquiry that took place in their investigations. Helping students to think about the processes that they used, the questions that they came up with, and the predictions that they concurred all are done during the Internalization phase.

The Transformation phase is the hub at which communication is derived both orally and written. The tasks can be short essays or long compositions, lab reports, newspaper articles or journal entries. The key to this phase is the quality and type of
communication that is presented. This phase requires strict guidelines that produce a product that show the new knowledge that was gained, as opposed to a reiteration of facts (Miller, 2006). Writing in this manner promotes the reinforcement between the reading and writing connection.

Johnson and Martin-Hansen (2005), felt that science teachers needed a repertoire of strategies to use to encourage science-reading comprehension. Concepts being taught in science often rely on students' reading to build background knowledge or to follow inquiry produced. If students cannot comprehend the materials in science, then their understanding of the scientific concept will suffer. Teaching science also involves teaching students how to read for a variety of purposes. Many strategies will help promote the scientific concept that is being taught. The job of teachers is to make sure that students are implementing the strategies that they have taught (Martin, 2002).

Predicating the answer is a strategy that engages the learners in a lesson before reading actually begins. The teacher hands out five statements that the students need to identify as being true or false. All of this is done without discussion and help from the teacher. After students are finished, the text is read and students can check their answers against the text. After the reading the discussion can begin, reflecting on the students answers before and after the text was read.

During the reading of a text, students can use a response log. This log can be teacher structured or open-ended. The response log increases comprehension by having the students respond to a set of specific questions located within the text. The open-ended logs allow the students to take accountability for their learning. This way they have a purpose for reading and will read for meaning. Another strategy use during the
reading of a text is Say Something (Harste, Short, & Burke, 1988). This strategy encourages thinking while reading, and cooperative learning. Small groups of students read a passage together out of a text. The students and the teacher predetermine various stopping points throughout the text. When each group has reaches a stopping point in the text, all students are required to say something about what they have just read. It can be in the form of a statement or a question. The other students in the group then have to respond to what was said by the previous student, this is an extremely powerful tool that can aid in comprehension of the reading passage.

After reading strategies are particularly important to help promote reflection and unmask any questions that students might still have about the topic. Readers typically process and try to make sense of what they have read, long after the actual event of reading (Johnson, Martin-Hanson, 2005). Teachers can use the RAFT technique to recreates what was read. The RAFT (Role, Audience, Format and Topic) (Vanderventer, 1979), is used as a creative writing and reading comprehension assessment. Students are asked to write for a particular Role, to a specific Audience, using a precise Format on a detailed Topic. For example, students that are studying the circulatory system could be writing as a blood cell to the heart, as an editorial, about their journey throughout the body.

Writing

Reading is not the only piece to the broken literacy puzzle; writing can be just as big of an obstacle for many students. To become scientifically literate for our society teachers must make the time to and put forth the effort on how to teach acceptable
writing. Writing to learn emphasizes better thinking. The focus is driven by the content, teaching students to develop and expand upon their ideas. The elaborating on the subject is the main focus, while the students learn to write. This is a process that needs constant revision, while using a core group of strategies that will be embedded within the student’s scope. Teachers have numerous excuses as to why they do not have enough time to teach writing. Some of the excuses that are commonly heard today are: science teachers are not trained English, the first job of a science teacher is to engage students in hands-on inquiry based lessons, and standardized testing is more short answer and multiple choices as opposed to long detailed essays (Holliday, 2000). Many students in a science classroom are either overconfident or too timid when it comes to writing essays in science. Students feel that if they have a paper that is typed, neat, and mechanically correct, the teacher will not notice errors within the text of the assignment.

Graham, Harris and MacArthur (1995), interviewed a fifth-grader about writing, and what makes a good writer. The student responded, "Well, they take all of their brainstorming ideas and put them in a piece of paper and just write the rough draft. Then they come back and find mistakes and think of some other ideas and do it over again" (p. 251). Educators need to provide their students with a means of organization. Too many times our average writers struggle with conceptualizing the information and recording it in a neat and orderly fashion, what about our struggling writers and their need for organization. Teaching students to write and then revisit the information and adjust their thoughts and ideas can be a difficult task in itself, but what about students with learning disabilities. These types of students typically generate text as ideas come to mind, with each preceding phrase or sentence stimulating the generation of the next idea (Graham,
Harris & MacArthur, 1995). There is no emphasis placed on revisiting the text that has already been written. Teaching these students to reevaluate can be done, but there needs to be a different mode of organization. We need to assess the writing piece that is assigned and ask ourselves, is it meaningful, does it allow for reflection, and most of all, how can these writing pieces allow for success? There is no doubt that children who have to write because it was assigned to them will feel disconnected to the task. By allowing students the ability to choose and let them have some room in determining the assignment will have allowed for more student success. Instead of having, students write for an extended length of time, allow them shorter, more frequent intervals at which they can write. When the writing process does happen throughout the day, allow students to use strategies, work collaboratively with others, observe you as the teacher writing and have an opportunity to reflect and refine their writing. While such principles can help us build a classroom environment where students with poor writing skills can prosper and grow as writers, we also believe that teachers need to explicitly teach (within meaningful content) skills and processes that are essential to the development of effective writing (Harris & Graham, 1994).

Like reading, writing requires teachers to model, scaffold and provide feedback on various assignments. When having students writing in a content area classroom, teacher need to show students a procedure that will help make their students successful. This success will be accomplished when strategies are embedded within the lesson will help promote writing. Students need goals and help setting these goals when a writing assignment is the task to complete. There must be objectives and a sense of organization that will allow the student to see a pattern that can be established within the writing piece.
Once students begin the note-taking process, they must be reminded to revisit their notes and the development of them. Students need constant monitoring in all of the processes mentioned above. Some students write well with music playing, while others find this too distracting. Some, set goals and write for a certain period and then watch a few minutes of TV, or play a video game. While others need to verbalize their next move and plan out how to execute it. Once students have figured out the process in which they produce the best-written pieces, they then must be given tools to improve their writing. These are a few strategies that have improved the writing of students; each writing strategy is different and requires students to figure out which one(s) will work well for them.

Just as strategic reading is a valuable tool for educators; strategic writing provides an approach for students that help them become successful in an area that many students dislike; Writing. Introducing strategic writing to students usually consists of at least four steps: identifying a strategy worth teaching, modeling of the strategy to students, allowing the students the opportunity to execute it, with teacher supervision, and then allowing for student independence of the strategy through repetitions until the students has reached a mastery level. When identifying a strategy that is worth teaching, pick a strategy that will lend itself to success. Set the students up for victory rather than failure, and your result will be overwhelming positive and the students will start to see the value of using strategies. Find strategies that produce higher quality writing and are more self-regulatory in that they help students set goals and monitor progress toward achieving them (Collins & Collins, 1996). Strategic writing encourages writers to think about their writing, to set goal for writing, and to devise a plan for achieving the goals. Strategic writing shows a considerable promise in making good writers, better writers.
with more detail and support. The writing process in a classroom with no strategies will produce poor, undesirable work that had little to no effort involved. Many times these students end up copying or rewording what the author has originally wrote. These students do not typically enjoy the writing process and the struggling writer never learns the proper ways in which to write.

**Graphic Organizers**

Graphic organizers are visual representations that have a variety of names such as Venn Diagram, Semantic Maps, and Concept Maps. These organizers can be both teacher and students generated and implemented to serve a variety of purpose (Goodnough & Long 2003). They are used as both prereading and prewriting tasks, during reading/writing and post read/writing. Concept maps help readers gain a greater understanding of the information that they have read. These maps help formulate new ideas, clear up any questions and improve comprehension in both reading and writing (Holloway, 2002). Primarily teachers use these graphic organizers to help construct meaning and knowledge of a subject, to link the factors of a concept and to help organize thoughts and ideas. Content area teachers can use these graphic organizers to help paint a clearer picture so that the depth of the material that is covered can be greater. Many graphic organizers have been around for many years in the educational systems, although one organizer Mind Mapping (Wycoff, 1991) is a technique that many educators believe allow for student success. In mind mapping students are encouraged to use key words, instead of sentences, these key words are stemmed from a central idea, color is introduced as a means of highlighting and marking importance, images and symbols are
used to help illustrate the importance and connection of the ideas. Mind mapping has proven to be a very beneficial tool to educators since it is so diverse and links itself nicely to Gardner's Theory of Multiple Intelligence. It can be used as part of instruction or given as an assessment. As an assessment, mind mapping can prove to be a very powerful authentic choice. It allows student the creativity and the flexibility in producing an item that best shows their understanding of a concept. Students that are struggling writers can first use the mind mapping technique to show the path that an essay might take.

By increasing the student's skills of science inquiry and showing them how to read, teachers show their students a new way to think about the science and text presented. Students not only read, but they learn from what they read. By providing, students with a common and useful strategy for learning from comprehension test teachers are supporting them to achieve at their highest levels in middle school and more importantly life (Miller, 2003). Concepts often being taught in science often rely on students' reading and writing to build background knowledge or to follow inquiry procedures. Teachers need to have a variety of strategies that can be taught the students to make the process of reading and writing more meaningful and successful. By allowing poor comprehension in a classroom, a teacher is expecting that the student's scientific understanding of the concept will be poor as well. When teaching in a content area, educators are also teaching students how to read and write for a variety of purposes with a variety of material, all of which allow for better readers and writers.
Students today must be able to communicate through reading and writing if success is to be had on any standardized test. Many school districts measure both student and teacher performance through the scores of such tests. By increasing the awareness of reading and writing strategies through modeling and repetition, students can become more successful in both a classroom setting and at taking these standardized tests.

Introducing a dozen reading and writing strategies to a heterogeneous group of 29 eighth graders was a daunting task. Many of these students have not used these abstract concepts and viewed them as a hurdle instead of a means to improve both their reading and writing. This class had 8 boys and 21 girls of which 9 students have an IEP or a 504 plan. The diversity of this class is such that the spectrum of students reading ability range from a second grade through a twelfth grade. Differentiation in this class is a must to keep the higher level students engages and active, while assisting the lower level students at understanding the concepts being taught. This class met for a total of 42 minutes once a day second period.

By giving the students a portfolio of strategies that would assist them in the reading and writing process, hopefully the students saw the convenience and the organization that the strategies provide. The strategies were introduced weekly and modeled extensively so that the students understood how and why they were being used. Homework and class work revolved around the using and understanding of the specific strategy presented.

Assessing the effectiveness of the strategies was done as a qualitative and a quantitative approach. Students were given a pretest that would require a specific skill —
organizing, main idea, writing for understanding, and then a strategy that meets the skill tested is introduced. Later on in the week, students were given the same test and the use of a strategy to complete the task. Rubrics and checklists will determine the raw score and sever as a means to identify a numeric score. A comparison of pre and post test was also used to help determine the success. Students were also required to fill out summarizers that help determine whether the strategy that was taught appeared to be useful. Each response was supported by reason that was concluded by the student. Prompts would be given to help guide the students in the process of evaluation the strategy. Some of the prompts included what other areas do you think that this strategy could be used in, what was beneficial about the strategy, what did you find difficult about this particular strategy? There was a teacher's assistant in this class making the process of observations more accurate.

The use of various strategies and the repetitiveness of each strategy have helped ensure that students experience success. Research indicated when students are actively engaged and know what the expected outcomes are; they tend to exhibit a greater understanding of the concept being taught. Strategies helped ensure that students remained on task; they could see the progress of evolution of their work. By building a repertoire of strategies students can begin to take ownership in their education and more important in how they learn.
Reading and writing strategies in a content area is becoming a greater focus of more school districts. With content area classes students are expected to display understanding through standardized tests, which displays high levels of reading and writing. For success to be had by the students, they need to know how to utilize a variety of strategies that will allow them to better organize their thoughts and materials. The focus of the implementation of writing strategies did not happen due to the lack of time and the amount of preparation.

Students in an eighth grade Physical Science Class were given four reading strategies to learn. This was a heterozygous grouping of now 24 students with a large special education population. These strategies were introduced over a period of five weeks to allow for understanding and multiple uses. The students were then allowed to pick the strategy that worked the best for them during the sixth week.

In this study the first strategy introduced was the KWL concept chart, What I Know, What I Want to Know and What I’ve Learned. This strategy which is to activate prior knowledge and prepare the students mentally for the concept that will be presented. The KWL chart was modeled for the students to understand how to use it. For students to grasp the concept of this strategy, they need to be accountable for their own learning, and these eight grade students were not. This was evident by the blank stares on their faces during the introduction of it. After students were taught how to use a KWL, they were asked to fill out the “K” and the “W” column on a new topic individually. The responses that were written down were poorly written with little to no effort applied. Getting the
students to think and write down responses that showed higher levels of thinking was not a skill that students would obtain from the KWL.

Later that same week the KWL was reintroduced and this time students were allowed to complete the chart working in small groups. Students were actively engaged in the topic. When volunteers were asked to present, the number of hands that went up was evident of their eagerness. The effectiveness of the KWL was more apparent in a large group where students were now accountable to their peers as well as themselves.

The Anticipation Guide was introduced during week two. This was a guide that consisted of ten True /False question relating to a topic to be studied that day. Students had to read the questions and then decide if the statement was true or false. Students filled out the ten questions in seconds and did not bother to read the questions. Some students were questioned as to the lack of time taken to complete the activity. Their response was, "We just put a “T” or “F” down and did not read the questions.” The second time they saw the Anticipation guide there were only five questions. This time the questions had more depth to them and spaces for the students to justify their reasoning. These five questions took the students about seven minutes to complete since they had more accountability associated with the task. The third time the students saw the anticipation guide they again had five questions with justification line and this time, they had room to record were the information was located within the text. During the reading of the text students would find the correct answer and record the page numbers where the information was found. These new applications to the guide were the most successful in small groups of two where a small competition would occur to find the answer first. The only problem that still needed addressing was the fact that the students enjoyed
disagreeing with their fellow classmate so much that the debate became the focus, instead of the question presented. This changed the way the answers were shared. Students had to raise their hands and wait to be recognized, before they could rebut someone else's answers. Their rebuttals needed to be factual and they needed to be done tactfully so that no feeling would become hurt. This new system work allowed students to answer questions and give their thoughts without the worries of being ridiculed by their classmates.

The Frayer Model was the third strategy introduced. This model was hard to plan for as well as teach. The original model had four parts in which the students needed to complete. The first square the students had to define the vocabulary word using any prior background knowledge that they already had. The second square was a definition from their book or a dictionary. The third square was a sentence that the students had to write using the new word in it. The last square was an antonym of the word. When introduced the students seemed to grasp the concept as they nodded their head and gave well thought out answers to the sample model. When the students tried to model on their own the problems and the flaws seemed very evident. The students would take little time in creating their own definition, before jumping to the book definition. They would then copy the sentence that was in the book in which they found the definition. For the antonym they would pick any word they could think of. During the sample students were made aware that the antonym needs to have relevance to the original word.

The first revision came with the order in which the item were done. The student thought definition need to be done first and receive permission from an adult before they could go on to the next part. By adding this step the students were more accountable for
what they originally thought and it gave the observer and idea of the knowledge that each student had about the word. The definition from the book or dictionary was to be done second. There were no revisions to this piece. Using the word in a sentence also had revisions since it was evident that the students were just copying the sentence that they found when they looked up the meaning of the word. The purpose for the sentence is to once again make the students aware of the word in a contextual sense. They need to use their own cognitive approach to the word and pull from prior and newly acquired knowledge to create a meaningful sentence. This time also incorporating a picture or graphical representation that went along with the sentence. Students were eager to share their finding with each other. Once again a small competition ensued as the student tried to come up with sentences and pictures that would out do one another. The antonym was still a part that students struggled with. No matter how many times examples were given, students would either not complete this part and wait for someone else to give them an answer or they would write anything and quickly erase their response when a better answer was given. This part of the Frayer Model is still a work in progress. Currently, the class does this part of the model as a group, with the hope that over time the students will be able to complete it by their selves.

The SQ3R was introduced, but quickly put on hold because of the time factor. The students were not committing the time and the effort needed to make this strategy a successful one. The time constraint for gathering the data and results was another reason the SQ3R was not studied further. The students viewed this strategy as a duplicate of a study guide that the students already complete as a means of classroom test preparation.
The last strategy introduced was a concept map. Students were given a central idea or word and then they had to write anything that had meaning and value to the concept. These central words/ideas were written on large chart paper and placed around the room. In small groups of two to three students would take turns rotating around the room and add to anyone else’s ideas. Many problems with this ensued, as the students in groups of three would ultimately have one student that would write while the others talked and goofed around. The next time the students brainstormed they preformed this task in groups of two and each group had a different colored marker. The different colors worked well in keeping track of the groups and the ideas. Most students were on task and the amount of side conversations were very minimal since they only had less than a minute to read all the current responses and then respond as a group. After students had a chance to brainstorm each piece of chart paper was analyzed and the main ideas were circled and then recopied onto clean paper. Students would then add to the main ideas as the text was read and new ideas were formed. Students were responsible for keeping a copy in their notebook and adding to it as the master list grew. One student suggested that they too color code everything in their notebook just like the master list was. This approach became very successful and since the students were able to change the strategy to fit their needs they were more accepting of it. Some students took the mapping one step further and once the chart was complete, they mapped everything on the computer and printed off a clean easy to follow concept map.

During the sixth week when students had a chance to pick the strategy that worked the best for them, it was evident that the Frayer Model and the Concept Web were the best liked. Almost ninety percent of the eighth grade students choose these two
strategies. The consensus among the students was that these two strategies allowed them to better understand the concept and the fact that they could perform minor alterations to make the strategy their own. Another fact was that they could express their thoughts through pictures as well as words. This seemed to make more sense for some of the students. When asked if the strategies were worth the time and effort to learn, the majority of the students admitted that they had used one or more in another class. This was evident of how powerful these strategies actually were. These strategies do create some extra work for the students and they were willing to do this because they saw the benefits. Many students stated that they had a greater understanding of the lesson, because they have visual and that they became more responsible for their own learning.
Discussion and Conclusion

This study of incorporating reading and writing strategies into the science Content area revealed many truths behind the strategies that the literature failed to mention. Nowhere in the literature did it mention the amount of time one would need to plan and present the materials. Many content area teachers do not take time to plan and investigate using strategies that will enhance the learning in their classroom. To become effective in the strategy one must understand why and how the strategy will work, and then incorporate it into a lesson that is appropriate for its success. The other factor of time devoted in class to the explaining of the strategy is greatly over looked.

The KWL strategy that was used as the first strategy is one that appears to be simple and relatively easy to understand. By introducing the strategy, the students seemed to understand the mechanics behind it, and then disaster occurred. The students filled out the chart but took no time to think, reflect and try to make the chart a useful tool. Instead, they rushed through it and wanted nothing to do with higher levels of thinking. Getting the students to be accountable for their own learning is a completely new study. The student's main objective was to just fill it in to be done as quickly as possible. Many different techniques were implemented to focus the students thinking, and make the students aware of their own learning. This proved to be rather useless as eighth grade students are not mature enough to want to take ownership in their own learning and self-growth. When used as a strategy with the whole class and teacher guidance, the students responded to the concept behind the KWL, showing its could be effective. Less debates and discussions would happen between the students and more
brainstorming occurred. As students shouted out what they knew, misconceptions were unveiled and noted for correction in the lesson. Misconceptions were not corrected, as they were unmasked because students needed an opportunity to reveal what they knew and no one wanted to disturb the dynamics that the class had established. I could also focus future lessons on trying to tie in the students “Want to Know” with the content that needed to be covered. This made the lessons more personable and the students were more actively engaged.

Some of the changes that could be suggested would be to change the names of the column titles from “What I Know” to “What I Think I Know”. This way more students would be willing to participate in the class discussion without feeling the pressure that they might be wrong. The word think implies that the student is essentially “guessing” and does not need to be 100% sure that their response is correct. The KWL should be done on large chart paper that could be saved and periodically reviewed throughout the chapter and

The Anticipatory Guide was by far the most effect tool that was unmasked due to its ability to unveil misconceptions and activate prior knowledge. The literature did not suggest anything about the number of questions that should be used. Through trial and error it was discovered that by making the questions more detailed the strategy could have few questions and get better results from the students. The strategy was introduced initially, by asking ten question and found this tedious and monotonous in both planning and waiting for the students to finish answering. Many students would start answering the question with good purpose and intent and then would end up guessing by the end, especially if they were a slow reader or struggled with reading comprehension.
Variations on the form were also made to make the students more accountable for their responses. The students had to answer true or false to the statement and justify their thinking. There were also lines left so that during the reading or discussion in class, the students could record the page number and the correct response or a supporting detail to the statement. The anticipatory guide gave way to many misconceptions that students had. This tool allowed for an accurate preassessment in the fact that it guided my planning according to the student’s responses.

The Frayer Model is a strategy that proved to be both beneficial and as well as having major flaws in design. The Frayer model allows for more than one intelligence to be used so many of my students seemed to have success when using this strategy. The original copy of the model was laid out so that the students had to write their own definition, then look up the definition and then use the word in a sentence. The second two steps did not account for the fact that students struggle with their own accountability for learning by copying the definition and a sentence. Students would take no time or effort in trying to figure out which definition might be the correct one or to create a unique sentence that they had thought of. The last step proved to be an area that most students struggled with. In this step that students had to tell what the word is not. For example, photosynthesis is not respiration and a bacterium is not a virus. This step was by far the biggest obstacle. Making the students aware that this box really probed at higher levels of learning and this would help them understand the word better was a great challenge. Many students would pick random objects and write them down, for the last step. If the vocabulary word was Photosynthesis, students would write down items such as table, car or even space. Very few would understand that Respiration or fermentation
were actually the more correct answers. Even though there was no right or wrong answer, we had to change this last step to antonyms/synonyms. Now the students had a greater focus and they were able to be more successful in understanding what the word meant. The literature did discuss the hardship and the struggle that students might potential face with this strategy. This strategy probes at higher levels of thinking and encourages deeper levels of understanding. Students that are not regularly exposed to this type of learning find it difficult and can become frustrated with the strategy. The literature did recommend that the word choice start on a very elementary level and progressively become more complex. This would help ease the students into correctly manipulating the strategy. Another change was the student made sentence and include the fact that students could draw items that were associated with the word. Some of the students found that by drawing they were more successful in understanding and remembering the meaning of the word. The literature did not mention any problems that arose with this last step and in general found the strategy to be very beneficial. It allowed for various degrees of thinking among students and it provided an opportunity for students to succeed at any level.

SQ3R was another strategy that I really grew to understand and appreciate its role in organization. This method had built in time that allowed the students to preview the chapter before it was read. This helped familiarize the students with the text and it allowed them to see what was coming. Many students said they were able formulated questions about the chapter even before any formal reading occurred. The S or survey part was done independently and quietly for the first two minutes. Many of the students needed reminders that they were only to survey, and not read in depth. Many students
would get off track and start reading if they found something of interest. It was awkward stopping the students from reading, since this was the goal. Students needed a visual to help them keep track of their time so a PowerPoint with a running clock was shown so the students could visualize the amount of time that they had remaining. This really seemed to help focus the students and make them more productive. The Q was to locate and read all questions found throughout the chapter. By doing this step, the students were aware of what was important and what they would be accountable for. The questions throughout the text made students aware of the important ideas. By reading these questions, the text was that much more familiar to the students. Class discussion before the chapter was read was now something that needed to be taken into consideration while planning. The students never seemed to ask any questions before we read the text, and now they were asking questions and formulating hypotheses and eager to find the solutions. The three Rs represented read, recite and review. The students would read the chapter; recite any important information or key ideas. By reciting the key ideas, the students were reviewing the big picture at the same time. The SQ3R is a powerful tool that promotes self-reflection and through a reading passage (Martin, 2002). According to Martin, once students get into a pattern with using various strategies, their levels of excitement increase for the content area. This is partly because now the students understand what they are reading. This was indeed noticed since there was more students questioning and connections that were being made.

The SQ3R lent itself quite nicely to the students and seemed to be very user friendly. The students did not have a hard time picking up what they were supposed to do. By previewing and talking about the chapter before reading it, made the students
much more focused and driven to succeed at being part of the class. There were a few changes with the formatting of the SQ3R. A space was inserted under the Survey to have the students fill in the main ideas and subheadings of the chapter. At the end of the form was a place for the students to write down any questions that they still might have. This proved to be very beneficial, since teachers would walk around and silently read as the students were filling these forms out. Some of the students had questions, but would not ask because they were too shy or embarrassed. Trends were noticed throughout the class, on various levels of understanding.

The concept map allowed for flexibility and student inflicted style. The main idea(s) were given to the students and they had to map ideas and categories. This map was done on paper and then transferred to the computer into a webbing program. The webbing program allowed students to create a web with both words and pictures to represent the main ideas. This way the map could be easily changed or added to quickly. The depth at which the students webbed varied from individual to individual. The map allowed for differentiation among students, word banks could be given to various students that contained key ideas thus promoting a more positive interaction between the students and the strategy. The web did not allow for a concrete knowledge of the subject because of the varying degrees at which the web could be completed unless it became teacher directed. This approach did not let the students map what they knew; instead, they mapped what was told to them defeating the purpose. Readers continue to process and make sense of what they read long after the actual reading event. (Johnson & Martin-Hanson, 2005).
The literature did talk about the connections that would be made completing the web. According to Johnson and Martin-Hansen many students did find it easier to make connections throughout the chapter is they could visually see how each was related. The visual aspect of the web proved to be very beneficial to many students. Students said that they could see the interconnectiveness of a topic and how sections of a book related with one another. The webs could then be turned into concept maps for studying and review. The maps were started and finished throughout the chapter with more information being added each day. One way that we changed the map was to have groups of students each write a different main idea. The students would then rotate around the room with different colored markers adding to each others work. This seems to be the best method of completing the maps since each and every students would input and write on a map. The maps were then hung on the walls and examined daily after class, to see if any revisions or additions were needed to be made.

Literature strategies help students understand the main ideas to a topic within a content area class. Too many times students do not understand what is being taught because they so not have the basic skills needed to help them solve the item that is impeding their learning. By introducing literacy strategies students are being taught how help themselves in figuring out the main ideas in a content. The content area classes are strongly focused on vocabulary and with many students being weak in this area; they then have a tendency to struggle in a high vocabulary based class. By embedding these strategies, students will learn to become more proficient in their classes. The strategies help with organization, unveiling misconceptions and showing a teacher where a class stands knowledge wise at a particular topic. By teaching students to use resources that
will help in their understanding of an area, we are making students more responsible for their own education. The strategies are not cookie cutter, since not all strategies will work the same in each class. Teachers need to learn the strategy and then make adjustments that will work for their class. Sometimes minor alterations are needed while other times the entire strategy needs overhauling. Strategies that sound and look good on paper can sometimes end up being the most disastrous. Teachers need to take the time and show the students how to properly use a strategy and the benefits of using it. This will make the students more accountable in their own learning. By taking the time to learn and teach the strategy educators are passing ideas and means for success of students in their future education.
References


Reading Log

Keep track of how much you read daily.

<table>
<thead>
<tr>
<th>Date</th>
<th>Title of the Book</th>
<th>Pages</th>
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<tbody>
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Appendix B:

KWL Chart

<table>
<thead>
<tr>
<th>What I Know</th>
<th>What I Want to Know</th>
<th>What I Learned</th>
</tr>
</thead>
</table>

KWL Chart
Appendix C:

Anticipation/Reaction Guide

**Instruction:** Respond to each statement twice: once before the lesson and again after reading it.

- Write A if you agree with the statement
- Write B if you disagree with the statement

<table>
<thead>
<tr>
<th>Response Before Lesson</th>
<th><strong>TOPIC:</strong> Dinosaurs</th>
<th>Response After Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dinosaurs are the most successful group of land animals ever to roam the Earth.</td>
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<tr>
<td></td>
<td>Paleontology is the study of fossils.</td>
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<tr>
<td></td>
<td>Human beings belong to the Zenozoic Era.</td>
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<td></td>
<td>Most dinosaurs have Greek names.</td>
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<tr>
<td></td>
<td>Some dinosaurs are named for places in which their fossilized remains were found.</td>
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<tr>
<td></td>
<td>Dinosaurs ruled our planet for over 150 million years.</td>
<td></td>
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<tr>
<td></td>
<td>Dinosaurs had small brains</td>
<td></td>
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</tbody>
</table>
Appendix D:

Definition Starfish

A four-word descriptive phrase

An example

Three describing words

A word that begins with the same letter that reminds you of the word

Vocabulary Word

How well you understand the word (on a scale of one to ten)
Appendix E:

Content Area Road-Sign Words

Content Area Road-Sign Words

Family and consumer sciences- Read all directions carefully before painting your porch.

Health: Coughs are usually caused by colds. But if a cough lasts more than two weeks, see your physician.

Literature: Sherlock Holmes would trust only his good friend Dr. Watson when explaining his deductive thoughts in reference to a case.

Mathematics: After dividing 30 by 6, everybody is to check the answer by using multiplication.

Physical education: Nobody should diet excessively to "make weight" for wrestling because it is hazardous to an athlete's health.

Science: We have hardly scratched the surface of knowledge about animals in the deepest areas of the oceans.

Social studies: George Custer and his men were entirely surrounded by Indians at Little Big Horn.

Technology education: There are many websites to help elementary students learn how to read better through phonics exercises that increase word recognition.
Appendix F:

Science-Cognition-Literacy (SCL) Framework

Communicating knowledge to others

Process writing:
  Develop-Draft
  Review-Revise
  Polish-Publish

Prior Knowledge

Developing inquiry skills through hands-on activities:
  Questioning
  Observation
  Predication
  Content Reading

Practice and transfer of cognitive skills from inquiry to reading and writing

Interpretation of scientific evidence

Assessment of understanding by self and peers