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# A Compilation of Literacy Strategies to be Used in Science and Earth Science Units

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A Compilation of Literacy Strategies to be Used in Science and Earth Science Units

By

Robert Atkinson

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A project submitted to the Department of Education and Human Development of the  
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## Abstract

Today in Education, reform and change have taken a center stage above all else to ensure that students are receiving the most beneficial education possible. With these changes come new Common Core Standards focused on making students more college and career ready when they graduate high school. This project tackles that problem, and presents many literacy strategies that can be used in the science classroom to make students more college and career ready through science. The project highlights many units of science, and breaks down the units into meaningful pieces. The content standards and common core standards, objectives, essential questions, are all addressed. The project also provides research based literacy strategies that can be implemented into each unit. In addition information about the strategy and how it related to the standards are addressed for each unit. A research based rationale is provided for all the strategies presented for each unit. This project is to be a guide to help science teachers implement the common core standards and provides a framework of literacy strategies to use in order to implement the standards into their own classroom. It can be the first step a teacher takes to start the process of reform one classroom at a time.

## Chapter 1 Introduction

### A. Problem Statement

This need for students to be more college and career ready is part of the push by the National Government for the Common Core State Standards [Council of Chief State School Officers (CCSSO) & National Governors Association Center for Best Practices (NGA Center, 2010)]. Those standards state the need for students to have more literacy instruction within all of their core subjects. Too often students are leaving college without the necessary skills needed to become successful adults. Therefore, implementing literacy into the science classroom is a necessary change that needs to be made for current teachers. Implementing Literacy into the science classroom allows students to develop the necessary college and career ready skills (CCSSO & NGA Center, 2010). Literacy researchers, educational psychologists, sociolinguists, and science educators emphasized the need to bridge the gap between literacy practices and teaching and learning science (Guzzetti & Bang, 2011). Therefore, the need for change is imminent in education today.

### B. Significance of the Problem

There are many instances where this project will be useful. There has been a recent push in New York State for students to be college and career ready by obtaining important literacy skills that are necessary across all subject areas. This project will present many strategies that can be used in a science classroom and provide information

on how to implement these strategies to enhance the science curriculum. Areas in which literacy- based science strategies are useful include but are not limited to:

- Engage students in a new manner
- Enhance students college and career ready skills
- Developing students ability to extract information from text
- Increasing academic achievement in inquiry based labs with literacy

C. Purpose

The goal of this project is to create several units in the area of general and earth sciences that incorporate the common core literacy standards using research based literacy strategies. By looking at the main concepts in each unit, aligning concepts with the content standards and then infusing common core standards the desired result of making students more college and career ready can be achieved.

D. Rationale

One of the most important aspects of an individual's life is the education they receive from their early childhood through adolescence. Making that education as effective as possible includes ensuring that the student is college and career ready when they leave high school. In order to ensure that students are college and career ready, students need to develop several necessary skills before they leave high school. One of the necessary skills that students need to develop the ability to extract information from text in order to make informed decisions. For this reason, it is important to implement

various literacy strategies into the classrooms of all subject areas including science to help students develop necessary skills.

#### E. Definition of terms

**LITERACY-BASED SCIENCE INSTRUCTION:** An interdisciplinary instruction that integrates science and literacy

**WEBQUEST:** An online literacy strategy that includes an introduction, task, list of resources for learners, the process, criteria or rubric, and a conclusion for a specific concept or idea

**LITERACY CIRCLE:** cooperative learning groups that have differentiated roles extracting information from text

**COMMON CORE STATE STANDARDS:** literacy- based standards to be implemented into the core subject area and created by the Council of Chief State School Officers (CCSSO) and the National Governors Association Center for Best Practices (NGA Center, 2010)

#### F. Summary

The next chapter of this project will focus on the literature review of literacy strategies. In the first chapter of the literature review reasons for change, fostering literacy skills in the classroom, and barriers to education reform will be address as pertaining to this project.

Then the strategies that will be implemented into each unit will be discussed and how they are effective. This section will also address implications for science teachers, the

impact of literacy on student engagement, perceptions and learning and finally a conclusion of the literature review.

After the research behind implementing literacy into the science classroom is thoroughly addressed the project will then focus on the actual implementation into the general science and earth science content. Each unit addressed will have a chart that breaks down important aspects of each unit including the literacy strategies used in that unit. Following the chart, there will be a breakdown of the strategies and how and why they will be implemented backed up with research.

## Chapter 2 Literature Review

### Table of Contents for Literature Review

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## Part One: Introduction Literature Review

### **Reasons for Change**

Making that education as effective as possible includes ensuring that the student is college and career ready, able to participate effectively in society, and have personal health and wellness when they leave high school. In order to meet these demands, students need to develop college and career readiness skills in high school. One of the necessary skills that students need to develop is the ability to extract information from text. For this reason, it is important to implement various literacy strategies into the classrooms of all subject areas including science.

This need for students to be more college and career ready is part of the push by the National Government for the Common Core State Standards [Council of Chief State School Officers (CCSSO) & National Governors Association Center for Best Practices (NGA Center, 2010)]. The standards of both, state the need for students to have more literacy instruction within all of their core subjects. Therefore, implementing literacy into the science classroom is a necessary change that needs to be made for current teachers to allow students to develop the necessary college and career ready skills. (CCSSO & NGA Center, 2010). Literacy researchers, educational psychologists, sociolinguists, and science educators emphasized the need to bridge the gap between literacy practices and teaching and learning science (Guzzetti & Bang, 2011). Therefore, the need for change is imminent in education today.

## **Fostering Literacy Skills in the Science Classroom**

Implementing literacy strategies into the science classroom is what we call literacy-based science instruction. Literacy-based science instruction is an interdisciplinary instruction that integrates science and literacy (Guzzetti & Bang, 2011). It can take the form of many strategies that promote the student use of text to extract information. Some of those strategies include science journalism, reading infusion, literacy circles, web quests, using authentic texts and everyday texts, argumentation with text, blogs and other forms of technology.

Literacy-based science instruction and incorporating literacy into science curriculum does not mean just reading textbooks everyday in class. Effective literacy-based science instruction requires that, “Science teachers no longer rely solely on their textbooks to provide students with practice in reading and writing” (Montelongo & Herter, 2010, p.89). Incorporating a variety of literacy strategies makes the instruction more effective for the student.

## **Barriers to education reform**

In order to implement education reform including literacy-based science instruction, teachers and administrators need to be aware of the barriers that they will come across when trying to implement education reform. Unfortunately, several complications make it more difficult to implement reform. One huge barrier that is prevalent in almost every school is that most teachers and administrators are a product of a traditional school experience in which classrooms were not student centered or literacy based (Johnson, 2007). Therefore, in order for teachers and administrators that grew up under these circumstances to enact reform they have to go against what they have experienced in education. This makes reform more difficult.

Fang and Wei (2010) said the tradition view of science for a long time has been that it's a hands on subject with little literacy. This is a cultural view that has also become a barrier to science reform. In order to combat this problem, Fang and Wei (2010) suggest the need to inform educators that reading-science integration is necessary in order for students to develop into scientifically literate citizens. Scientists have to read and write to effectively do their jobs, and students need to read and write to effectively practice science learning. They also encourage science educators to use documented language and literacy practices in the service of science teaching and learning (Fang & Wei, 2010).

Another way to combat the cultural perceptions, such as the tradition view of science and how teachers learned science for themselves is for teacher collaboration. Johnson (2007) also suggests that teacher collaboration can be the key way to combat this cultural barrier of perception of science instruction. This includes collaborative professional development opportunities in specific literacy strategies and common core implementation workshops.

There can also be technical barriers that teachers and administrators must overcome in order to create literacy- based science instruction. “Technical barriers include lack of instructional and content skills that teachers need in order to implement standards-based instruction” (Johnson, 2007, p173). The standards-based instruction includes the Common Core State Standards [Council of Chief State School Officers (CCSSO) & National Governors Association Center for Best Practices (NGA Center, 2010)] that would make science instruction literacy-based.

Due to these and many other barriers to education reform, it is important for science teachers to be aware of the difficulties that they will face when implementing literacy-based science instruction. It is also important whenever possible to take part in professional development that creates opportunities for growth in the area of literacy-based science instruction. It is important that teachers recognize these barriers and try to embrace the change that is necessary for the most effective instruction for our students.

The best way to embrace the change necessary for the most effective instruction is for teachers to have a voice and express their needs and concerns to administration (Johnson, 2007). This includes a continued professional development intervention in which teachers need to advocate for themselves (Johnson, 2007). With this extra-added professional development, teachers can gain the necessary teaching skills that address the State Common Core Standards.

The importance of literacy-based science instruction and the need to change curriculum to align with a literary approach makes it necessary for teachers to know effective strategies and how to implement those strategies into the classroom. These necessary changes are needed so that our students are college and career ready when they leave high school. In order to implement the necessary changes we must address the barriers to education reform in order to move forward.

## Part Two: Review of Literature

### **Strategies for implementing literacy- based science instruction**

In order to maximize the effectiveness of literacy-based science instruction, it is important to choose strategies that are the most effective. There are many literacy strategies that are effective in the science classroom. Some of the effective strategies are science journalism, reading infusion, literacy circles, web quests, using authentic texts and everyday texts, argumentation with text, blogs and other forms of technology. All of these strategies can be implemented into the science content to create literacy-based science instruction. In the following sections, the research basis for each of these strategies and implications for classroom practices will be discussed.

**Science journalism.** Science journalism is a strategy in which “students learn lifelong science literacy skills by reporting the news” (Poleman, Newman, Farrar, & Saul, 2012). In this strategy, student’s research current events and issues related to science that interests them. They then investigate, gather information, contextualize the information and bring critical eyes to what they read and write (Poleman, Newman et al., 2012). This critical eye requires that students analyze and contextualize scientific information that emphasizes the most important elements (Poleman, Newman et al., 2012).

This strategy allows students to do practical research and forces students to use multiple resources and determine if the sources they are gathering information from is

credible and reliable before they report back the information to their peers. This allows students to practice a critical skill that they will need in order to be college and career ready. It also allows students to become engaged in a topic that interests them and it also part of the science standards. Poleman, Newman, et al. (2012) mention that “everyone needs to be able to engage intelligently in public discourse and debate about important issues that involve science and technology.”

One of the most important aspects of the Science Journalism is the evaluation of informational sources that students must perform as a part of the strategy. Just as inquiry begins with a question or a problem, so does student reporting (Poleman, Newman, et al., 2012). Students have to gather and evaluate information and are not limited to specific sites with the strategy. While students use sites, they have to sift through the sites that they find to determine if the information is credible. This key skill is one of great importance that students can take away from practicing this strategy.

**Reading infusion.** In this strategy, students participate in explicit reading strategy instruction (Fang & Wei, 2010). The strategy brings in specific literacy skills such as text reading, vocabulary strategies, written explanations, and comprehension strategies that are normally done in an English classroom and implements them into every aspect of the science classroom. In reading infusion the students were explicitly taught reading, writing and thinking strategies in the curriculum and used conceptual vocabulary strategies to help comprehension (Fang & Wei, 2010). The study that was done surrounding this strategy found that by infusing reading into the science curriculum students outperformed

other students that were not a part of reading infusion classrooms on specific tests given to both sets of students (Fang & Wei, 2010). Fang & Wei (2010) also suggest that through reading strategy instruction students became more strategic in their reading, enabling them to better cope with the demands of secondary text.

**Literacy circles.** Literacy circles use cooperative learning groups that have differentiated roles extracting information from text (Devrick & LeSage, 2010). Literacy circles bring science and literacy together in a way that allows students to use their strengths to teach each other about the concept in science that they are working on.

With the science literacy circles there are three main components that are incorporated into the process. The parts are science notebook organization, science literacy circle roles, student-generated artifacts and big ideas charts (Devrick & LeSage, 2010). The student notebooks can come in many different forms that use literacy. Students can be asked to create lab write-ups, notes from class, pictures and diagrams, and student created projects that can be included.

The literacy circle comes into play when students take different roles to learn about a new science concept. Students can become the inquiry organizer, word explorer, visionary, thinking connector, web master, and big idea developer (Devrick & LeSage, 2010). Having the different roles allows students to become an expert in a particular area and helps students take on roles that work to their strengths. All of the roles involve students working with text to gather information. The strategy forces students to

communicate effectively and teach one another about their particular role and the information that they bring to the concept. (Devrick & LeSage, 2010). This is another skill in order to be college and career ready.

The literacy circle strategy can also use multilevel texts. By providing students with multilevel tasks it gives all students the opportunity to engage in the discipline specific tasks without being encumbered by a difficult text (Dennis, Parker et al., 2011).

### **The supportive role of technology in literacy- based approaches.**

**Technological based literacy-strategies.** Technology provides authentic problems that can enhance critical and complex thinking skills (Ikpeze & Boyd, 2007). Technology can enhance critical and complex thinking skills when students are presented with a problem or they discover their own problem to solve by using technology to research. According to Montelongo and Herter (2010), technology obligates schools to encourage students to fully engage its potential in their own learning.

Guzzetti (2009) said that, adolescents complain that they are more interested in and learn more from their own explorations in informal settings through interactions with media or digital text, such as websites, television programs, video games and trade books. That is why it is important to incorporate literacy- based activities through the use of technology. One such literacy strategy is the Modified Sentence Completion task strategy using computers and websites. This strategy has several steps that are as follows in the table below.

Table 1: The Modified Sentence Completion task Strategy (Montelongo & Herter, 2010).

| Step       | What teacher does   |
|------------|---|
| Step One   | Choose content rich paragraph   |
| Step Two   | add extraneous sentences  |
| Step Three | Choose important vocabulary from paragraph  |
| Step Four  | Students then come up with meaning of paragraph followed by placing extraneous sentences in order |
| Step Five  | The last step of the process is to have students determine meaning and write in their own words   |

All of these steps are done on a teacher created website which is teacher generated. By using technology to enhance this strategy, it is a more engaging way to give students extra practice on vocabulary and sentence structure. It also teaches students to go beyond the boundaries of text while guiding and grounding their comprehension of the text (Montelongo & Herter, 2010). This is another skill that students need to develop in order to be college and career ready.

**Webquests.** WebQuests are a strategy that uses technology to have students conduct research in an authentic, problem-solving environment (Ikpeze & Boyd, 2007). “The essential parts of the WebQuest include an introduction, task, list of resources for

learners, the process, criteria or rubric, and a conclusion.” (Ikpeze & Boyd, 2007, P.645). It is a way for teachers to scaffold research where students can extract information from credible sources to gain valuable knowledge on a specific content. Another reason WebQuests are an important literacy strategy to use in a literacy-based science classroom is because they take advantage of technology to enhance literacy

Not only do WebQuests support the use of technology, many of the above strategies as well as blogs, argumentation, and authentic text strategies can also use technology to support their strategies

**Authentic and Everyday Texts.** Examples of authentic and everyday text are newspaper articles, internet journals, or as in the subject of forensics, actual text evidence that can be explored. Of course this topic is not just limited to these authentic texts, in reality it can be any literary text that relates to the content in some way. One of the big motivations for using these texts is that they are sources of information that students will access in their adult lives outside of school.

Guzzetti (2009) researched a high school chemistry class in which a unit on forensics was done. In this study, the teacher used literacy- based science instruction within a forensic unit. Students were given opportunities to work with authentic texts such as crime scene reports, dental record reports, forensic related websites, and handwriting analysis using actual evidence from crime scenes (Guzzetti, 2009). All of these examples are authentic texts that were used in the unit to engage students in the

topic of forensic science. In the study, authentic text was used when the students had to analyze documents and make conclusions based on it. The analyzing of authentic text was then translated in a writing activity. The Students “wrote storylines that forensic technique that they had learned in class, such as chromatography for fiber analysis and graphology for analysis of handwriting samples” (Guzzetti, 2009, p.196).

Authentic and everyday texts can also come from the newspaper. News stories on science and current events help make science real and immediate for the young readers, creating connections between the classroom and the real world (Jarman & McClune, 2012). It also offers students the opportunity to read beyond the worksheet, textbook and revision aid, to include a greater range of genres of scientific writing such as those encountered for example in newspapers” (Jarman & McClune, 2012, p.1).

In their research, Jarman & McClune (2012) found that when science teachers used a Space Science News newspaper complete with real news stories, into their curriculum, the response from teachers was mostly positive. In teacher interviews after the implementation of the newspaper, teachers said that it encouraged reading for enjoyment in science class, and that using the newspaper allowed teachers to supplement their astronomy units (Jarman & McClune, 2012).

Teachers in the study also mentioned that using the newspaper, they were able to employ several activities using the authentic text. Teachers used directed activities relating to texts, information searches, discussions/ debates, and media focused activities.

Implementation of these strategies promote the use of text to extract information from an authentic text such as a newspaper.

Authentic and everyday text can also be text used from scientific professional journals. For instance in earth science, students could read excerpts from a geologist about his findings pertaining to a volcano. Or students could read weather forecasts from the national weather service discussion and use that information to create their own forecasts. The use of authentic text will deter students from saying “school is boring and has little relation to everyday life outside of classrooms” (Guzzetti, 2012, p.192), which makes the learning more meaningful to the students.

**Argumentation with text.** Allowing students the opportunity to express their ideas aloud, gives them the opportunity to make their ideas concrete through their own expression (Their, 2010). During argumentation, students get a chance to articulate their thoughts and this helps students better understand the information they are trying to assimilate (Their, 2010). Exchanging ideas with other students also allows students to practice using evidence to support their point of view. It also allows students to work collaboratively with one another when extracting information (Their, 2010). The skills that are practiced when students argue/ debate ideas are important skills that are important skills that students should have to be college and career ready.

Thier (2010) examined the role of argumentation in the science classroom and how it can be used to help develop science processing skills. In order to have the most

successful implementation of the argumentation strategy, teachers need to provide a good guideline for students to go by to ensure that the students provide the adequate evidence for their argument. The table below was presented by Thier (2010) and is a good set of guidelines to instill before students take part in argumentation in the classroom.

| Guidelines (Thier, 2010, pg 71)  |
|--|
| 1. Begin by stating the main ideas of the issue, explaining your point of view and why it is important to believe the way you do |
| 2. Clearly state point of view, and present information and evidence   |
| 3. Include only information that supports your ideas   |
| 4. Focus only on your argument and the most important points   |
| 5. Determine other arguments related, state them and offer evidence against them   |
| 6. Support your argument with evidence from the research   |
| 7. Summarize argument and restate the strongest evidence   |

If the students follow these guidelines then they are going to be extracting information from their research and providing details as to why their argument is the correct one.

Argumentation in the classroom, if done correctly requires students to use literacy and science processing skills, data analysis, discussing of issues and extending their learning, and it requires students to support their opinions with evidence (Their, 2010).

Practicing these real life skills in science allows students to develop these processing skills and therefore makes students more college and career ready.

**Blogs.** Web logs or blogs can be another strategy that uses technology to engage learners by asking them to reflect on real-world problems by learning how to express ideas, concepts, positions and communicate through writing (Duplichan, 2009). “Blogs are a multigenre, multimedia, visually minded medium that can be used to promote student engagement” (Duplichan, 2009, p. 2). Blogs also give teachers a chance to tap into a student’s technology skills that the students have developed due to the influx of technology. Teachers can use blogs as an informal way to assess students, through online portfolios, responses to questions, a chance to support their opinions on a topic and much more. Not only do blogs give students an interactive place to read and write but Blogs provide students the opportunity to engage in evidence based argumentation, and a place for students to discuss a topic they are discussing in science. Students could use blogs as a forum for debates and expression.

## **Implications for Science teachers**

There are many implications for science teachers to implement the various literacy strategies into the classroom. First of all, teachers need to overcome the various barriers and begin to use as many literacy-based strategies that have proven effective.

There should be a huge emphasis on scaffolding the activities and literacy instruction (Montelongo & Herter, 2010). The scaffolding needs to integrate reading, writing, and vocabulary instruction (Montelongo & Herter, 2010). Different parts of literacy instruction, such as a lesson in vocabulary can be introduced through scaffolding and become integrated exercise that has a greater purpose and goal to the students.

Many of the strategies presented including WebQuests require the proper amount of scaffolding in order for them to be successful. Teachers using WebQuests need to ensure that learners are directed through meaningful steps, while at the same time giving them opportunities for exploration and encouraging them to take ownership of their learning” (Ikpeze & Boyd, 2007). In order to allow many of the strategies to be successful, teachers should present the strategies in a way that allows it to be most successful and that means the proper scaffolding.

Another important implication for literacy- based science is the use of several different strategies in the classroom. As you recall, “Science teachers can no longer rely solely on their textbooks to provide students with practice in reading and writing” (Montelongo & Herter, 2010, p.89). The strategies can be combined in activities that

promote reading, writing, and talking about related concepts (Guzzetti & Bang, 2011). By providing a variety of literacy strategies using multimedia resources teachers can engage student's curiosity and increase science learning from a variety of expository text (Montelongo & Herter, 2010).

The instruction that is done “should include emphasizing interactivity and collaboration in the activities; relating content concepts to ordinary life through a variety of textual forms and forums; and providing opportunities for learning and practicing higher-order thinking/reading skills” (Guzzetti & Bang, 2011, P.56). This makes it important that teachers include collaboration, relate the literacy strategies to the student's interests and include activities that promote higher order thinking skills. Incorporating learning that is meaningful for the learner by providing students the opportunity to gather information from their own environment provides students the chance to be more engaged and teaches them to access multiple sources when the extract information (Ikpeze & Boyd, 2007).

Young people solicit information from friends and family, the radio, TV, video clips, blogs, and sites such as Ask, Google, and eHow (Poleman, Newman et al., 2012). It is important to choose literacy strategies that allow students to extract information from the text on their own. This is another important Common Core State Standard (CCSSO & NGA Center, 2010). This provides students with another critical skill that makes them more college and career ready. By requiring students to extract information from text on their own students are forced to develop critical thinking skills of evaluating the source of

information and not just the information itself (Poleman, Newman et al., 2012). “The ability to measure credibility is a life skill useful inside and outside of the classroom” (Newman et al., 2012, p.46). This means that teachers need to allow students more freedom to research on their own whenever possible using literacy strategies.

The last important implication for teachers to consider when creating literacy-based science instruction is to incorporate technology whenever possible into literacy instruction. This can be done with most literacy strategies. Science teachers need to provide students with developmentally responsive curricula and instruction that is both rigorous and relevant (Dennis, Parker et al. 2011). Technology can provide the complex text to students while still making the content relevant to the students. Technology, which is related to everyone’s lives, is very relevant today and therefore using it whenever possible is important with all strategies. Technology also encourages improved comprehension of reading and more elaborate writing in the science classroom by motivating students to act on their curiosity, access resources, and embellish their work.

All these implications are important to consider when deciding how and what literacy strategies to implement into the science classroom. Scaffolding the activities, using a variety of strategies, using student collaboration, student interests, student-driven research to extract information, and incorporating technology are all important implications to consider when using any of the strategies.

## **Impact of Literacy on student engagement perceptions and learning**

Once implemented, it is important to examine the impact of literacy in the science classroom on student engagement, perceptions, and learning. In order to create a literacy-based curriculum that promotes student engagement and allows students to have positive perceptions and learning outcomes, a teacher needs to provide structure and consistency to their units (Guzzetti & Bang, 2011). The structure needs to be constructed in a way that still allows the strategies to be student-driven. This includes developing and implementing strategies that help students develop their critical thinking skills and observations skills. It also entails teachers providing a variety of strategies that are student driven meaning students are given choice and are expected to create their own ways to decipher text.

**Student engagement.** In their research, Guzzetti and Bang (2011) found that allowing students to author their own text is a way that allows students to become engaged in the content. The study focused on fifteen different teachers redeveloping a forensic science unit to incorporate literacy into the unit. The study had another group of teachers teach the units through inquiry without literacy strategies (Guzzetti & Bang, 2011).

The units that incorporated multiple literacy strategies allowed students to be engaged in multiple literacy activities. Some of the activities included students practicing handwritten analysis by analyzing their own handwriting in short crime stories they wrote

(Guzzetti & Bang, 2011). Students also had the opportunity to read a fictional forged will and determine the forger by analyzing the suspect's handwriting. Students also wrote in journals about their observations throughout the unit. Students were also expected to read real crime scene documents from crime scenes and use the information extracted from the reading to make conclusions and help solve the crimes. These are some of many examples of literacy activities that were used in the unit that were found to promote student engagement.

Enhancing engagement can also be done using newspapers on science topics. The study that was done, gave teachers an actual newspaper on Space Science News that was used in the classroom as part of science curriculum. The newspapers used had different sections with themes such as moon, planets, eclipses, space exploration and many more. The newspapers were used as a primary document for students to extract information out of to make conclusions about space (Jarman & McClune, 2012). The teachers that used the newspapers found that the articles along with games, current events, and activities made the science more engaging for their students (Jarman & McClune, 2012). The teachers also noted, "The news stories helped makes science real and immediate for the readers, creating important connections between the classroom and the wider world" (Jarman & McClune, 2012 p.4). Along with the other strategies presented, using newspaper articles (paper or electronic) is a good way to supplement concepts in the classroom and bring literacy into the science classroom because it makes it more

meaningful for the students. It also allows the teacher to bring connections to the students' everyday lives by using current events.

Science Journalism as stated earlier is a strategy that promotes engagement because it allows for student choice within the science field. It also helps students develop the necessary critical thinking skills that are needed to be college and career ready. Students are expected to research a topic, determine what is important and relevant to them, synthesize the information on the topic, and then report the information back to their peers (Poleman, Newman, Farrar & Saul, 2012). It allows students to find a compelling topic that they are interested in, that may or may not be a part of the curriculum. The task itself meets science teaching standard A that says to “select science content and adapt and design curricula to meet the interests, knowledge, understanding, abilities, and experiences of students NRC 1996,P.30 (Poleman, Newman, Farrar & Saul, 2012). The strategy also requires that students examine multiple sources and check for credibility of those sources. This is an important skill, which students need in order to be college and career ready.

**Student learning.** Along with many activities, Guzzetti & Bang (2011) found it very important for students to read and reflect on observations made and extracted from crime scene evidence All the activities discussed during the study, allowed students to take the center role in constructing meaning using literacy in science. They also brought in strategies that used real life examples and literary text that related to students lives in some way.

The results of the study found that in the literacy-based forensic units, learning was increased. They determined this data by giving students surveys and tests (Guzzetti & Bang, 2011). The study found that the students achieved higher academic results on unit tests than the students that did the traditional inquiry without literacy (Guzzetti & Bang, 2011)

Literacy-based instruction has also proved to increase academic achievement. Guzzetti & Bang (2011) found that after surveys, scientific inquiry skills tests and achievement tests, students' results showed significant academic gains while no change in student attitudes and interests.

**Student perceptions.** Within the literacy- based science instruction unit in the study, students were challenged to read, write, and talk science to produce literate text. (Guzzetti & Bang, 2011). This gives students the positive perception that they are practicing science like a real scientist.

Implementing literacy into the science classroom can take on many other forms as well. Another strategy that can be used in the science classroom is using web logs (blogs). Blogs are a great way to use technology and to allow students to write in the science classroom (Duplichan, 2009). Using technology, promotes positive perception in the science classroom because students are constantly using technology in their everyday lives. It is a way to make a connection to their everyday lives in which they use iPhones, computers, games, Xboxes, digital cameras, YouTube, and facebook (Duplichan, 2009).

Just as Guzzetti & Bang (2011) found, it is important to relate the literacy to students' everyday lives to give students a positive perception on learning. Duplichan (2009) found that blogs could be used for lab reports, current events, debates, creative writing, online reading and asking questions. The format of the blog and the content is up to the teacher and can be adjusted to fit any content. The sheer format of the blog takes a topic creates a positive perception (Duplichan, 2009).

The most important thing that a teacher needs to consider when trying to implement a new literacy strategy in their science classroom is what impact it will have on their students in terms of student engagement, perceptions and learning. Whether it is taking actual literary artifacts and using them to solve a mystery, using blogs to have students read and write, using science journalism or newspaper articles; the most important thing a teacher can do is to use those strategies and make the content meaningful. This can be done by having students actively working on research, current events and topic selection. Students will then relate the content to the student's lives in some way. If the teacher can do that when implementing the strategies then the literacy strategy implemented will be more engaging and the student learning and perceptions will be positive.

### Part 3: Conclusion Literature review

In the current educational world the need for change is greater than ever. There is a huge need in the educational field to create an education in which students are more college and career ready when they graduate high school. In order to help students become more college and career ready they need to develop critical skills that involve the use of text. This makes literacy-based science instruction extremely important. Literacy-based science instruction is an interdisciplinary instruction that integrates science and literacy (Guzzetti & Bang, 2011).

Once the barriers to literacy-based science instruction have been addressed then it is important to use effective literacy strategies in the science classroom. Those strategies include science journalism, reading infusion, literacy circles, web quests, using authentic texts and everyday texts, argumentation with text, writing to learn, blogs and other forms of technology. Finally, in order to implement these literacy strategies teachers need to be aware of the implications for teachers, and the impacts on students learning, engagement and perceptions. After all of these considerations and implications have been thoroughly examined, then and only then can the necessary and effective changes be made in order to ensure that the students are more college and career ready when they leave high school.

### Chapter 3 Application: A description of the project

In this section of the project each unit is presented within a chart that breaks down every aspect of the unit. The chart includes the major concept within the unit and the specific researched-based literacy strategies that are used. The chart breaks down the desired results for the unit, and correlates the results to the content and common core standards.

The chart includes the knowledge, skills, enduring understandings, related misconceptions and essential questions that students will. It also includes all forms of assessments for the unit. The chart also specifically breaks down how the literacy strategies will be implemented, it also identifies the researched-based rationale for the particular strategies and will include materials/worksheets and attachments that related to the particular literacy strategy.

It is the goal that by reviewing each unit chart, the reader will gain a better understanding of what the goals are and how the literacy strategies presented will help students develop skills necessary to become more college and career ready related to the given content. It is also the goal that the reader can better understand how to implement the specific literacy strategies presented into the content and incorporate the common core standards.

|   |   |  |  |
|---|---|--|--|
| <b>Title of Unit One</b>  | Density and Measurement   | <b>Grade Level</b>   | 8-9  |
| <b>Concept within the Unit</b>  | <ul style="list-style-type: none"> <li>▪ Density</li> <li>▪ Effects of temperature and pressure on the density of gases and liquids</li> <li>▪ Scales modeling</li> </ul> | <b>Literacy Strategies used</b>  | <ul style="list-style-type: none"> <li>▪ Reading infusion</li> <li>▪ Authentic and everyday text</li> <li>▪ Technological based literacy strategies</li> </ul> |
| <b>IDENTIFYING DESIRED RESULTS</b>  |   |  |  |
| <b>Content Standards</b>  |   |  |  |
| Physical Setting Earth Science- Standard 1,6, & 7<br>W.9-10. 2 & 10 Common Core Writing Standard history, Science, Technology<br>R.9-10.4 Common Core Reading Standard history, Science, Technology |   |  |  |
| <b>Knowledge</b><br><i>Students will know...</i>  |   | <b>Skills</b><br><i>Students will be able to....</i>   |  |
| How to compute density, volume and mass<br>How to interpret density<br>How to explain the effects of temperature and pressure on the density of gases and liquids                                   |   | Use given information to compute density, volume and mass<br>Determine the density of an object using common measurement materials |  |
| <b>Enduring Understandings</b>  |   | <b>Essential Questions</b>   |  |
| Students should understand how changing volume affects the density of objects made of the same composition.<br>Students should also understand the process to determine the density of an object    |   | In what ways can the knowledge of density benefit the everyday life of the student?  |  |
| <b>Related Misconceptions</b>   |   |  |  |
| Larger objects/volumes have higher densities<br>If you cut an object of the same material in half the density will also be cut in half  |   |  |  |

| <b>Assessment Evidence and Artifacts of Learning</b>  |   |
|---|---|
| <b>Summative Assessment</b>   |   |
| Using authentic and everyday text, students will determine the density of objects in a lab using information provided in text. Lab includes a writing piece where students have to explain in complete sentences exactly how they determine different variables including density, volume and mass. |   |
| <b>Formative Assessments</b>  | <b>Performance Assessments</b>  |
| Students will use reading infusion during the unit in several areas and have to extract information from the text provided. Students will organize the information in various ways including graphic organizers, K-W-L charts and the Three-way tie strategy  | Students will determine density, volume and mass using common measurement tools<br>Students will also write a paragraph in which they explain how the variables were determined |

| <b>How the strategy will be implemented</b>  |
|--|
| <p><u>Reading infusion</u><br/>The reading infusion strategy will be used over the course of the unit using literature that students need to extract information from in order determine density, volume, and mass. Using a specific article that explains how to compute density students will find density of given objects of their own. Students will also determine the definitions of several important terms found in the reading. Those terms include mass, weight, gravity, volume, density and displace among others.<br/>An important implication for science teachers to implement literacy strategies is to scaffold all activities according to student needs (Montelongo &amp; Herter, 2010). Therefore, depending on student need, there may be explanations/ mini lessons on the graphic organizers used, and specific reading strategies that can help the students extract information.</p> |
| <p><u>Authentic and Everyday text used in conjunction with technology</u><br/>The authentic and everyday text literacy strategy will be used in conjunction with the supportive role of technology in literacy- based approached to help students find a rationale to knowing density. Students will conduct their own newspaper search on the importance of density. Students will be given the opportunity to explore the internet and find an important reason to know the density of objects. Students will then relate this to their everyday lives as part of the research and then report back to class in small groups. The smaller groups will then report to the class the most meaningful reasons they learned about in the group. The class will then compile the results and it will give students a purpose as to why they should know about density.</p>  |
| <b>Rationale for Using Particular Strategy</b>   |
| <u>Reading infusion</u>  |

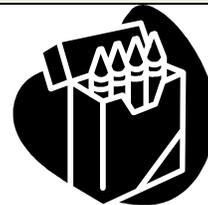
According to Fang & Wei (2010), The reading infusion strategy is a strategy that uses specific literacy skills such as text reading, vocabulary strategies, written explanations, and comprehension strategies. It is very important that students develop a meaning for content specific words that will allow them to gain a better understanding of the concept of density and measurement. Therefore, the reading infusion strategy will be used with text to allow students to determine their own meanings for several important vocabulary words and to put those words into a meaningful way for them. This is an important skill students should have to be college and career ready and aligns with the State Common Core Standards.

Authentic and everyday text in conjunction with technology

There are several rationales for using the authentic and everyday text strategy in conjunction with technology. Poleman, Newman et al. (2012) said that young people solicit information from friends and family, the radio, television, video clips and sites such as Ask, Google, and eHow and it is important to choose literacy strategies that allow students to extract information from text on their own. Therefore, using this informal assignment to allow students to find meaning in density can help students to use familiar sites while trying to find information about density. It also allows students to extract information from text to find meaning which is a common core standard. Allowing students to extract information on their own allows students to be more engaged in the content as well (Guzzetti & Bang, 2011).

**Example of assignment(s) listed above**

Name: \_\_\_\_\_



**Density Lab**

**Problem**

Does the density of a material vary with volume?

**Materials**

- Balance      -Water      -Paper towels      -Metric ruler      -Graduated cylinder
- Wooden stick      -Ball of modeling clay      -Crayon with paper removed
- unknown mineral

**Procedure**

1. In your plastic bag you should find a wooden stick, ball of clay, crayon with paper

removed, and an unknown mineral.

2. Use a triple beam balance to find the mass of the wooden stick. Record the mass in the data table provided
3. Add enough water into the graduated cylinder so that the stick can be completely submerged and measure the initial volume of the water.
4. Place the stick in the graduated cylinder and measure the new volume of the water. The volume of the stick is the difference between the water levels in before and after the stick. Record the volume in the data table provided.
5. The density of the stick equals its mass divided by volume. Calculate the density of the wooden stick and place it in the data table. Round to the nearest tenth.
6. Thoroughly dry the stick with a paper towel. Then carefully break the stick into two pieces. Repeat steps 1 through 5 with each of the two pieces. Record the data in the table.
7. Repeat steps 1 through 6 using clay rolled into a rope. Record data in the table and round density to the nearest tenth.
8. Repeat the steps using the crayon. Record data in the table and round density to the nearest tenth.

**Observations**

| <b>Data Table</b>    |  |                 |                                |                                       |                                    |
|----------------------|--|-----------------|--------------------------------|---------------------------------------|------------------------------------|
| <b>Object</b>        |  | <b>Mass (g)</b> | <b>Volume (cm<sup>3</sup>)</b> | <b>Volume Change (cm<sup>3</sup>)</b> | <b>Density (g/ cm<sup>3</sup>)</b> |
| <b>Wooden Stick</b>  |  |                 |                                |                                       |                                    |
| Whole                |  |                 |                                |                                       |                                    |
| Piece 1              |  |                 |                                |                                       |                                    |
| Piece 2              |  |                 |                                |                                       |                                    |
| <b>Modeling clay</b> |  |                 |                                |                                       |                                    |
| Whole                |  |                 |                                |                                       |                                    |
| Piece 1              |  |                 |                                |                                       |                                    |
| Piece 2              |  |                 |                                |                                       |                                    |
| <b>Crayon</b>        |  |                 |                                |                                       |                                    |
| Whole                |  |                 |                                |                                       |                                    |

|                       |  |  |  |            |  |
|-----------------------|--|--|--|------------|--|
| Piece 1               |  |  |  |            |  |
| Piece 2               |  |  |  |            |  |
| <b>Unknown object</b> |  |  |  | <b>N/A</b> |  |

**Analyze and Conclude**

1. For each object you tested, compare the density of the whole object with the densities of the pieces of the object.

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2. Use your results to explain how density can be used to identify a material.

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3. How would you find the volume of a rock if it was too large to fit into the graduated cylinder?

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4. Find the density of the unknown object provided in the plastic bag. Write a paragraph explaining exactly how you determined the density of the object. Include every step taken to determine the density. In that paragraph, explain what would happen if you cut the object in half to the densities of both pieces?

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Name \_\_\_\_\_

Date \_\_\_\_\_

**KWL**

**Topic:** \_\_\_\_\_

| <b>K</b><br>What I Know | <b>W</b><br>What I Want To Learn | <b>L</b><br>What I Have Learned |
|-------------------------|----------------------------------|---------------------------------|
|                         |                                  |                                 |

©This printable graphic organizer is from [www.teach-nology.com](http://www.teach-nology.com)

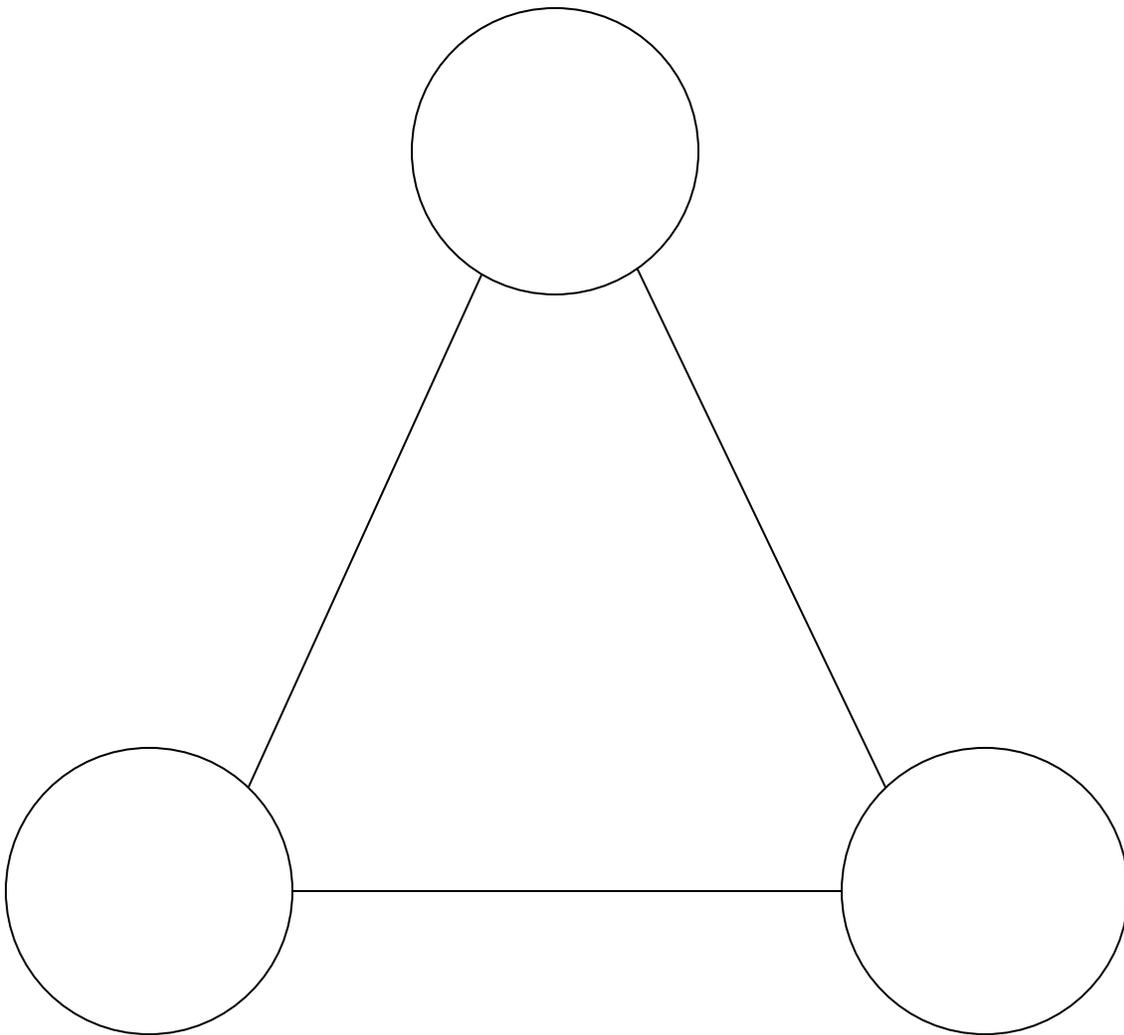
Name: \_\_\_\_\_  
\_\_\_\_\_

Period: -

### Three-Way Ties

### Metric Vocabulary

**Directions:** Looking at your glossary from this unit, choose any three words and write them in the circles on the diagrams below. Find another person in the class and exchange papers. Each of you will choose two of the words and write a sentence that connects them in some way. You **must** use the vocabulary words in the sentences. Give the paper back and repeat the process until all words have been connected with a sentence.



|   |  |   |  |
|---|--|---|--|
| <b>Title of Unit Two</b>  | Rocks and Minerals   | <b>Grade Level</b>  | 8-9  |
| <b>Concept within the Unit</b>  | <ul style="list-style-type: none"> <li>▪ The rock cycle</li> <li>▪ Rock formation</li> <li>▪ Identifying &amp; classification of rocks and minerals</li> </ul> | <b>Literacy Strategies used</b>   | <ul style="list-style-type: none"> <li>▪ Blogs</li> <li>▪ Technological based literacy strategies</li> </ul> |
| <b>IDENTIFYING DESIRED RESULTS</b>  |  |   |  |
| <b>Content Standards</b>  |  |   |  |
| Physical Setting Earth Science- Standard 4 , key idea 3 : performance Indicator 3.1 a,b<br>W.9-10. 1, 6 9 &10 Common Core Writing Standard history, Science, Technology<br>R.9-10.1 Common Core Reading Standard history, Science, Technology |  |   |  |
| <b>Knowledge</b><br><i>Students will know...</i>  |  | <b>Skills</b><br><i>Students will be able to....</i>  |  |
| <p>How each type of rock forms</p> <p>How to determine rock type using the ESRT</p> <p>Know the properties of rocks</p> <p>How to determine minerals using specific properties (cleavage, fracture, hardness, color, streak)</p>              |  | <p>Identify rock by visually comparing them</p> <p>Identify rocks based on given characteristics using the ESRT</p> <p>Identify minerals using their properties</p> |  |
| <b>Enduring Understandings</b>  |  | <b>Essential Questions</b>  |  |
| <p>The rock cycle</p> <p>Characteristics necessary to identify rocks and minerals</p>   |  | <p>How has the rock cycle shaped the planet earth into what it is today?</p>  |  |
| <b>Related Misconceptions</b>   |  |   |  |
| <p>Sedimentary rocks form just from rock fragments</p> <p>Each type of rock forms exactly the same way</p>  |  |   |  |

| <b>Assessment Evidence and Artifacts of Learning</b>  |  |
|---|--|
| <b>Summative Assessment</b>   |  |
| Rocks and minerals Identification Lab. Students will have stations in the classroom complete with all the materials needed to make rock and mineral identifications. Those sets include specific descriptions on how the rock or mineral formed, scratch plates, glass, magnifying glass, objects with hardness listed, copper penny and the actual rocks and minerals themselves               |  |
| <b>Formative Assessments</b>  | <b>Performance Assessments</b>   |
| Students will answer daily questions about rocks and minerals. Students will be given descriptions, and any information necessary to identify specific rocks and minerals using their ESRT. Students are expected to respond in a blog and give their reasons why they choose the rock and mineral they did. <ul style="list-style-type: none"> <li>▪ Tickets in and out of the door</li> </ul> | Students will do in class lab where they are expected to identify rocks and minerals at stations. Students will be given all the information needed to make a determination. |

| <b>How the strategy will be implemented</b>   |
|---|
| <p>The blog strategy will be implemented into the rocks and minerals unit in a series of a few lessons at first and then students will use on their own. To begin, Students will receive a lesson on how to use blogs complete with registering for a blogging account. As part of the lesson the teacher will have students write a blog with questions on how to use it. After students, know how to use blogs then will receive a serious of blog questions to answer throughout the unit. Students will be given class time occasionally in case of no home computer.</p> <p>Sample blog questions for this unit follows:</p> <ul style="list-style-type: none"> <li>▪ How do sedimentary rocks form? Explain how an igneous rock can become sedimentary in complete sentences? Also explain where we could look to find igneous rocks and why.</li> <li>▪ Where in the country could this metamorphic rock in the picture have been formed?</li> <li>▪ Name a rock that has a grain size of .006 to .2 cm, and is formed from the compaction and cementation of those fragment sizes. Explain how you came to that conclusion step by step..</li> <li>▪ Write a creative story in which you explain how you as a grain of sand went through the rock cycle and became all three types of rocks.</li> <li>▪ Examine the picture of the (rock, mineral) and determine a location in our location where this rock could be found. Please provide evidence for where it could be located.</li> </ul> |

| <b>Rationale for Using Particular Strategy</b>  |
|---|
| <p>Blogs are another strategy that can use technology to engage learners by teaching students to reflect on their learning and how to communicate by writing (Duplichan, 2009). It is also a way to constantly assess the students during the unit by providing them with daily opportunities to practice identifying rocks and minerals. As stated before, “blogs are a multigenre, multimedia, visually minded medium that can be used to promote student engagement’ (Duplichan, 2009,p.2). Any activity that increases student engagement while at the same time makes a valuable assessment choice to gage student learning. Students will also have the opportunity to review each other’s work the occasionally and practice argumentation through text when the opportunity arises.</p> |

Students can debate whether or not a specific example is one or the other type of rock and why. Finally, the use of the blog allows the teacher of this unit to change the format as the need arises (Duplichan, 2009).

### Example of assignment(s) listed above

Pioneer Central Schools Site Manager - Windows Internet Explorer  
http://www.pioneerschools.org/cms/Workspace/Section/Section.aspx?DomainId=518

Centricity™ View Website Community & Support Feedback Sign Out (ratkinson)

SITE & CHANNELS  
Atkinson, Robert  
(Pioneer Middle School)

### Blog Posting

Enter your blog post details.

General Posting Author

Normal Font Name Font Size B I U

How do sedimentary rocks form? Explain how an igneous rock can become sedimentary in complete sentences? Also explain where we could look to find igneous rocks and why.

Sedimentary rocks form from the compaction and cementation of rock fragments and biological fragments as well as precipitates. An igneous rock can become a sedimentary rock by getting weathered and eroded and then the pieces being cemented and compacted together. Igneous rocks can be found anywhere near the earth's surface, but more specifically in regions where volcanic activity as occurred.

Sedimentary rocks could be found anywhere on earth due to uplifting processes that cause rocks to be moved.

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Activate on my page

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|                                |  |                                 |   |
|--------------------------------|--|---------------------------------|---|
| <b>Title of Unit Three</b>     | Weathering and Erosion   | <b>Grade Level</b>              | 8-9   |
| <b>Concept within the Unit</b> | <ul style="list-style-type: none"> <li>▪ Weathering and erosion process</li> <li>▪ Agents of erosion</li> <li>▪ Erosional-depositional system</li> </ul> | <b>Literacy Strategies used</b> | <ul style="list-style-type: none"> <li>▪ Science Journalism</li> <li>▪ Literacy Circles</li> <li>▪ Technological literacy based strategies</li> </ul> |

## IDENTIFYING DESIRED RESULTS

### Content Standards

Physical Setting Earth Science- Standard 6 & 4, key idea 2 :  
 performance Indicator 2.1 p,q,s,t,u,v  
 performance Indicator 3.1a,b,c,q  
 W.9-10.4 &10 Common Core Writing Standard history, Science, Technology  
 R.9-10.6 Common Core Reading Standard history, Science, Technology

### Knowledge

*Students will know...*

How to distinguish between weathering and erosion  
 The agents of erosion(wind, gravity, waves, running water, glaciers)  
 How to distinguish between chemical and physical weathering  
 How to effectively communicate their ideas to their peers

### Skills

*Students will be able to....*

Report an erosional event and describe how it is moving sediment.

### Enduring Understandings

Physical and chemical weathering  
 Erosion  
 Agents of erosion

### Related Misconceptions

Weathering and erosion are the same thing

### Essential Questions

How weathering and erosion shaped the way the earth has looks today?

| <b>Assessment Evidence and Artifacts of Learning</b>   |   |
|--|---|
| <b>Summative Assessment</b>  |   |
| <p>Students write an essay about the agents of erosion and relate the essay to the science journalism report they created. The essay needs to include all agents of erosion and how those agents move sediment. The agents of erosion that need to be included are wind, waves, gravity, running water, glaciers. The student's journalism project will focus on just one of these agents and will be one of the formative assessments. A finished project will include a written synopsis of their report on one type and then include the rest of the agents of erosion by explaining what the agents are, how they move sediments and in what areas of the world this occurs. Students will do research to help answer these questions.</p> |   |
| <b>Formative Assessments</b>   | <b>Performance Assessments</b>  |
| <ul style="list-style-type: none"> <li>▪ Students will be assessed during a few class periods when they are practicing science journalism. In this circumstance, students will be reporting to the class about an agent of erosion in the news. (Landslides, floods, tornados, etc.) This will test the students' knowledge of the specific agent of erosion and how it relates to the real world. It will also describe how the agent of erosion moves sediment.</li> <li>▪ Literacy circle will also be used as a formative assessment for the unit. In this assessment, students will work in groups to distinguish between physical and chemical weathering and the types of each.</li> </ul>  | <p>Students' performance in their individual role within the literacy circle will be assessed for accuracy and group use. Roles include (Devrick &amp; LeSage, 2010):</p> <ul style="list-style-type: none"> <li>▪ Inquiry organizer</li> <li>▪ Word explorer</li> <li>▪ Visionary</li> <li>▪ Thinking connector</li> <li>▪ Webmaster</li> <li>▪ Big ideas developer</li> </ul> |

### How the strategy will be implemented

#### Science journalism

Student reporting begins with inquiry by posing a question or problem, then students need to evaluate the information they find, and students have to search through the sites to determine which ones are credible for their story (Poleman, Newman et al. 2012). So to begin this strategy, students will begin with a choice of what agents of erosion they are going to search in the news. For instance, they start by choosing what to research (wave action, landslides, floods, wind events). After they choose their topic, student's research news events to find the story that they want to research more. Upon a few days of research, students are expected to report their story back to the class, and explain how that agent erosion moves sediments and could affect their everyday lives.

Within that report, students need to explain a true real life news event from the last several years that relates to the agent of erosion they researched. They also need to describe how it affects human's everyday lives and if anything can be done to prevent the movement of sediments. Another part of the report is to include how human influences may have led to the event reported on. Finally, students need to tie this back to how that agent of erosion moves sediments.

#### Literacy circles

This strategy will be implemented by presenting the students with text on chemical and physical weathering and everyday examples of each. Before students begin to digest the text, students will be asked what they know about both. This is will be done in K-W-L format. Students will then be explained the literacy circle format and placed into groups. Students will then be presented with the different roles. Those roles include, inquiry organizer, word explorer, visionary, thinking connector, webmaster, and big idea developer (Devrick & LeSage, 2010). The following will break down exactly what each role entails all according to Devrick & LeSage (2010).

#### Roles

Inquiry organizer- provide prompts for each part of the notes taken as the text is read

Word explorer- select new and interest vocabulary words

Visionary- create charts, diagrams and illustrations for the group

Thinking connector-make connections to everyday life

Webmaster- search websites for the information about the concepts

Big idea developer- prepares a big ideas information for the group. This person will be in charge or organizing the poster that the rest of the group is developing together.

After the students choose their roles within the groups the students will gather their information and the ultimate goal of the group is to create a poster that explains the difference between the two types of weathering with their definitions, illustrates at least one example, lists at least two examples of each with definitions and include a presentation portion.

## Rationale for Using Particular Strategy

### Science journalism

You may recall that science journalism is a strategy in which “students learn lifelong science literacy skills by reporting the news” (Poleman, Newman et al. 2012). In the strategy students research current events and issues related to science that interest them (Poleman, Newman et al. 2012). Students are also required to analyze and contextualize scientific information into the most important elements (Poleman, Newman et al. 2012). These skills are important college and career ready skills that relate to the common core. For this reason, this strategy will be useful to help students conduct their own research, find meaning and then report back to the class. It also gives students a chance to effectively communicate their ideas, which is another important skill after high school.

One of the most important reasons for choosing this strategy is the evaluation of informational sources that students do as a part of the strategy (Poleman, Newman et al. 2012). Students are required to determine if the sources they use are credible. Therefore, the science journalism strategy can be a very effective tool to use in the weathering and erosion unit.

### Literacy circles

As stated earlier, literacy circles bring science and literacy together in a way that allows students to use their strengths to teach each other about the concept in science that they are working on (Devrick & LeSage, 2010). Allowing students to use their strengths to come to a common goal increases student engagement (Guzzetti & Bang, 2011). Therefore, this strategy can be a way to increase student engagement and allow students to have choice when deciphering text. Each role in the strategy focuses on a different intelligence and therefore can benefit different styles of learning. Devrick & LeSage (2010) explains the word explorer is the student in the group that works with the tough vocabulary. By focusing on the tough vocabulary, it can help the rest of the group interpret the text in a more meaningful way. Finally, the literacy circle can use multilevel texts, which gives all students the opportunity to engage in discipline specific tasks without being encumbered by difficult text (Dennis, Parker et al., 2011).

**Examples Lesson and Resources**

Science journalism

**Science Today Report: Agents of Erosion**

Task:

- You are a reporter for the Science Today News and it is your job to report to the class about a current event in the news recently surrounding a specific agent of erosion (wave action, landslides, floods, wind events etc.) Your report should include specific details on the concept you choose as well as the current event that is relevant
- Choose of the agents of erosion discussed in class and find a current event that has to do with that agent of erosion
- Conduct research about the agent of erosion and explain what it is within your news report
- Include a current event that matches that agent of erosion, how it relates to the agent and how that event impacts the lives of everyday people ex. Hurricane Sandy involves wave action, and wind action and resulted in loss of life, massive coastal erosion, power outages etc.
- As part of your report, you must include visual images, pictures and text that goes with the report.
- Once everything is included you will report the event to the class and classmates will answer questions.
- Any website, newspaper that is used should be properly cited and why it is credible should be included as part of the citing. A citing sheet will be provided to fill out for each source.
- These bullets will be used as the rubric and as long as all parts and citing sheets are included a perfect score will be awarded.

Citing Sheet

Name of Source: \_\_\_\_\_

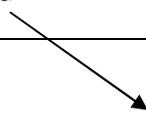
Type of Source: \_\_\_\_\_

Rationale as to why the source is credible:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Literacy circles

Sample K-W-L used



Name \_\_\_\_\_ Date \_\_\_\_\_

**KWL**

**Topic:** Chemical and Physical

| K<br>What I Know | W<br>What I Want To Learn | L<br>What I Have Learned |
|------------------|---------------------------|--------------------------|
|                  |                           |                          |
|                  |                           |                          |

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Literacy Circle Activity- Physical and Chemical Weathering

**Task:** Your group has to use the text provided to create a poster that explains chemical and physical weathering, provides at least an example of each and includes pictures or diagrams to enhance the descriptions.

**Roles:** Each member of the group will be expected to have a different role on this assignment. The roles are explained next.

Inquiry organizer- provide prompts for each part of the notes taken as the text is read

Word explorer- select new and interest vocabulary words

Visionary- create charts, diagrams and illustrations for the group

Thinking connector-make connections to everyday life

Webmaster- search websites for the information about the concepts

Big idea developer- prepares a big ideas information for the group. This person will be in charge or organizing the poster that the rest of the group is developing together

**Directions:**

Step One: Decide as a group who is going to take each role.

Step Two: Preview the text and discuss as a group, what the text is about, what might be important to focus on. Record this information on the organization sheet provided

Step Three: Read through text on your own and focus on your specific tasks as you read.

Step Four: After each member has read, each member of the group should discuss the main ideas and how its important for their research.

Step five: Each member will discuss their part/ role so the rest of the group can gather that information

Step six: Group puts together project, with the visionary, big idea developer and webmaster taking leading roles for this part of project. Making sure to use information provided by other group members

Step seven: Present to class

Organization Sheet for Students for literacy Circle

Group Members:

---

Preview of Text:

---

---

---

*Main ideas of text/important notes as a group:*

*Inquiry organizer- provide prompts for each part of the notes taken as the text is read*

*Word explorer- select new and interest vocabulary words*

\_\_\_\_\_ -  
*meaning* \_\_\_\_\_

*Visionary- create charts, diagrams and illustrations for the group*

*Thinking connector-make connections to everyday life*

\_\_\_\_\_ *-how is it related to our lives*

---

---

---

\_\_\_\_\_ *-how is it related to our lives*

---

---

---

\_\_\_\_\_ *-how is it related to our lives*

---

---

---

\_\_\_\_\_ *-how is it related to our lives*

---

---

---

*Webmaster(computer provided)- search websites for the information about the concepts*

---

---

---

---

---

*Big idea developer- prepares a big ideas information for the group. This person will be in*

*charge or organizing the poster that the rest of the group is developing together. This person takes the lead role when putting together the presentation*

|                                |  |                                 |   |
|--------------------------------|--|---------------------------------|---|
| <b>Title of Unit Four</b>      | Glaciers/Deposition/Oceans   | <b>Grade Level</b>              | 8-9   |
| <b>Concept within the Unit</b> | <ul style="list-style-type: none"> <li>▪ Factors affecting deposition</li> <li>▪ Glacial/beach/erosional features</li> <li>▪ Ocean currents</li> </ul> | <b>Literacy Strategies used</b> | <ul style="list-style-type: none"> <li>▪ Technological literacy based strategies with Reading infusion</li> </ul> |

### **IDENTIFYING DESIRED RESULTS**

#### **Content Standards**

**Physical Setting Earth Science- Standard 4, key idea 2 : performance Indicator 2.1 p,s,t,u,v,w**  
**W.9-10. 4, 5, & 10 Common Core Writing Standard history, Science, Technology**  
**R.9-10. 1 & 7 Common Core Reading Standard history, Science, Technology**

#### **Knowledge**

*Students will know...*

**What factors determine the rate of deposition**  
**Where deposition occurs**  
**What features deposition causes**

#### **Skills**

*Students will be able to....*

**Distinguish among different glacial features using images and real life examples**  
**Distinguish among beach/ erosional features using images and real life examples**

#### **Enduring Understandings**

**Depositions relationship to weathering and erosion**

#### **Related Misconceptions**

**Deposition only occurs in streams**

#### **Essential Questions**

**How does deposition and the features created by deposition affect our everyday lives**

### **Assessment Evidence and Artifacts of Learning**

#### **Summative Assessment**

Students will explore the web to research specific content on glacial and erosional/beach features. Upon completion, students will create a power point of the glacial features with pictures and research-based descriptions of each. Examples of features that will be researched are moraines, terminal moraines, lateral moraines, cirques, arêtes , horn, jetty, sandbar, etc.

| Formative Assessments  | Performance Assessments   |
|--|---|
| Progress checks of students work. Students are expected to digest how they are conducting their research and list which websites have been used. | Students are expected to name specific features after class has presented materials related to glacial and beach erosional features |

| <b>How the strategy will be implemented</b>   |
|---|
| <p>Technological based literacy strategies with reading infusion will be used in a research format with very little student direction after the basic guidelines and directions. Reading infusion will be incorporated when students are asked to use literacy reading strategies as they conduct their research. Students are expected to use the highlighting comprehension strategy Fang &amp; Wei, 2012) as part of their research by word processing important parts into a word document. Students are also asked to include vocabulary terms they deem important.</p> <p>The main project itself will include students conducting research on a given list of glacial features, erosional features, and beach features. Students are expected to find a picture, and provide a research based description of each. Students also need to hand in their notes with reading infusion strategies provided. The framework for the reading infusion would have been presented at this point so only minor reminders of those skills would be needed.</p> <p>Upon completion of project, students would use laptops to present their power points in a gallery fashion with half the class viewing and half the class presenting and then switching.</p> |
| <b>Rationale for Using Particular Strategy</b>  |
| <p>Technology can be used in most of the strategies prevented in this research, but when its not specific to one of the other strategies prevented in can just be considered technological based literacy strategies. Technology can provide authentic problems that can enhance critical and complex thinking skills (Ikpeze &amp; Boyd, 2007). In order to enhance these critical and complex thinking skills students need to solve an issue on their own using technology. By presenting students with a general goal and not very much direction, students can practice real life skills they will need upon graduation. It also obligates the school to encourage students to engage in their own learning (Montelongo &amp; Herter, 2010). Duplichan (2009) said that as stated earlier that using technology promotes positive perception in the science classroom because students are constantly using technology in their everyday lives. Therefore, using technology to allow students to learn on their own about glacial/beach and erosional/ depositional features can make the learning more engaging and allow students to practice a necessary college and career ready skill.</p>  |
| <b>Student guidelines</b>   |
| <p style="text-align: center;">Glacial Features research Project<br/>Use the websites provided at the library website:<br/><a href="http://www.pioneerschools.org/Page/1945">http://www.pioneerschools.org/Page/1945</a></p>  |

Students can also use the following databases for help:

- Gale reference suite
- Grolier encyclopedia suite

Create a power point of your research to be shared with the class including the following information:

- glacial feature name (at least 5 features) include written description and picture
- erosional feature name (at least 5 features) include written description and picture
- beach feature name (at least 5 features) include written description and picture

Name: \_\_\_\_\_



**Note Sheet for Websites**

Author's Last Name, First Name: \_\_\_\_\_

Title of Page or Document: \_\_\_\_\_

Title of Website: \_\_\_\_\_

Name of Sponsoring Institution: \_\_\_\_\_

*\*Write n.p. in your works cited page if no sponsoring institution is available*

Date of Document or Most Recent Update: \_\_\_\_\_ Day \_\_\_\_\_ Mon.

*\*Write n.d. if no date is available*

Year \_\_\_\_\_

Medium of Publication: Web

Date Accessed: \_\_\_\_\_ Day \_\_\_\_\_ Mon. \_\_\_\_\_ Year

URL (web address): \_\_\_\_\_

Notes:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

|                                |  |                                 |  |
|--------------------------------|--|---------------------------------|--|
| <b>Title of Unit Five</b>      | Plate tectonics  | <b>Grade Level</b>              | 8-9  |
| <b>Concept within the Unit</b> | <ul style="list-style-type: none"> <li>▪ Earth's crust and interior</li> <li>▪ Earthquakes</li> <li>▪ Evidence for crustal movement</li> </ul> | <b>Literacy Strategies used</b> | <ul style="list-style-type: none"> <li>▪ Reading infusion</li> </ul> |

## IDENTIFYING DESIRED RESULTS

### Content Standards

Physical Setting Earth Science- Standard 4, key idea 2: performance Indicator 2.1 k,l,o,m

W.9-10.10 Common Core Writing Standard history, Science, Technology

R.9-10. 8 Common Core Reading Standard history, Science, Technology

### Knowledge

*Students will know...*

What evidence is there for continental drift  
 The theory behind plate tectonics  
 How to differentiate between the types of plate boundaries

### Skills

*Students will be able to....*

Use a text document with details on plate tectonics and fossils to reconstruct a map of the past pangea

### Enduring Understandings

Convection currents  
 Continental drift  
 Theory of plate tectonics

### Essential Questions

What are the results of continental drift and how has it affected the current landscape of the world?

### Related Misconceptions

The current placement of continents has always been the same

## Assessment Evidence and Artifacts of Learning

Summative Assessment

|  |   |
|--|---|
| Students complete a creative story, in which they write, as they are Alfred Wagner, and are proposing the theory of continent drift, and explain it with plate tectonics. As part of this project students are expected to obtain their information from a text document and include pictures to represent their project |   |
| <b>Formative Assessments</b>   | <b>Performance Assessments</b>  |
| Using the same text document as the project, students will put together a map of the world using fossil evidence to link up continents as they were during pangea. This will give students a chance to use data to put together a diagram, which is a common core standard.  | Putting together the map using fossil evidence will test students' abilities to gather and synthesize data. |

|   |
|---|
| <b>How the strategy will be implemented</b>   |
| <p>Reading infusion within the project scope will be implemented by providing students with a text document on the theory of plate tectonics and how it relates to continental drift. The text will also include an activity where students are presented with fossil data from the continents of the world during current days. Students will then take the fossil data and use it to place the continents into their locations during pangea by matching up the fossils.</p> <p>The main part of the reading infusion will occur when students use the information in the text to write a creative story as if they are Alfred Wagner. As part of the process of creating the project students are expected to read the article, and then discuss with a group. From there students are expected to write down the important parts that they gathered from the group discussion, go back, and highlight important parts of the reading based on their discussions. This specific reading literacy skill is part of the reading infusion (Fang &amp; Wei, 2010) that is done for the project.</p> <p>The completed project will include students creating a letter that includes five pieces of evidence for continental drift and also a section explaining plate tectonics. Within their plate tectonics section of the letter students need to explain the convection currents in the athesnosphere and the types of plate boundaries that occur. Students need to relate plate tectonics to continental drift and include an illustration.</p> |
| <b>Rationale for Using Particular Strategy</b>  |
| <p>Using specific literacy strategies within the scope of a text is reading infusion (Fang &amp; Wei, 2010). Scientists use language in inquires and use language when communicating ideas and for these reasons has been characterized by a mix of inquiry and argument (Fang &amp; Wei, 2010). In order for students to create, a good argument then requires the use of reading infusion strategies so that students can develop good science literacy. Therefore, since the nature of this project is to argue that continent drift is real and provide evidence it is a good strategy to use in order to meet the demands of the unit as an assessment piece that also incorporates the common core standards.</p>   |

It is also important to note, that the reading infusion strategies use of “explicit instruction of reading strategies likely enhances students awareness of as well as the ability to use the reading processes and skills, such as predicting, inferring, monitoring, making connections, analyzing, drawing conclusions, problem solving interpreting and critiquing” (Fang & Wei, 2010, p.270). These skills are all important to science and also skills that students need to be collect and career ready. So the hope is that using this strategy will help students to develop these necessary skills further.

**Example of assignment(s) listed above**

## Prehistoric Landmasses

### Page 1 of 2

Gondwanaland was a prehistoric supercontinent comprised of the modern-day landmasses of South America, Antarctica, Australia, Africa, Madagascar, and India. Use the landmass illustrations on page 2, the chart and map key code below to mark the locations where four types of fossils have been found.

| Fossil Name         | Description          | Present-Day Locations   |
|---------------------|----------------------|---|
| <i>Glossopteris</i> | A fern               | <ul style="list-style-type: none"> <li>- Southern tip of India near Madurai</li> <li>- Prince Harald Coast, Antarctica</li> <li>- Southern tip of Madagascar</li> <li>- Oates Coast, Antarctica</li> <li>- Southeastern Australia (near Melbourne)</li> </ul> |
| <i>Cynognathus</i>  | A land reptile       | <ul style="list-style-type: none"> <li>- Southeastern Argentina (near Bahia Blanca)</li> <li>- Southwestern South Africa (near Cape Town)</li> </ul>  |
| <i>Lystrosaurus</i> | A land reptile       | <ul style="list-style-type: none"> <li>- Wilhelm II Coast, Antarctica</li> <li>- Madagascar, north of Antananarivo</li> <li>- Central India (between Bangalore and Hyderabad)</li> <li>- Eastern Tanzania (near Dar es Salaam)</li> </ul>                     |
| <i>Mesosaurus</i>   | A freshwater reptile | <ul style="list-style-type: none"> <li>- Eastern Brazil (near Salvador)</li> <li>- Cameroon, West Africa</li> </ul>   |

#### Map Key Code

*Glossopteris* = Green "G"

*Cynognathus* = Orange "C"

*Lystrosaurus* = Red "L"

*Mesosaurus* = Blue "M"

## Prehistoric Landmasses

Page 2 of 2



**Sample Template for Letter –students will complete before final draft**

Dear \_\_\_\_\_,

My name is \_\_\_\_\_ and I just discovered a new theory that I would like to explain. My new theory is continental drift and I would like to tell you what the theory is and why I believe it is occurring.

Continental drift is

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

There are also some scientific concepts I would like to explain to help you understand this theory. Those concepts include convection currents and plate tectonics. The meaning of these two terms is explained next.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I have five pieces of evidence that prove my theory to be plausible, and the evidence includes

- \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.
- \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.
- \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.
- \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

- \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_.

In conclusion I want to include some diagrams to help explain this theory further and I thank you for listening to my proposal on a new theory. The diagrams/pictures are on the next page.

Sincerely, \_\_\_\_\_

|                                |   |                                 |   |
|--------------------------------|---|---------------------------------|---|
| <b>Title of Unit Six</b>       | Astronomy   | <b>Grade Level</b>              | 8-9   |
| <b>Concept within the Unit</b> | <ul style="list-style-type: none"> <li>▪ Earth and Universe</li> <li>▪ The solar system</li> <li>▪ Orbital forces and celestial motion</li> <li>▪ Moon and its effects</li> </ul> | <b>Literacy Strategies used</b> | <ul style="list-style-type: none"> <li>▪ Blogging</li> <li>▪ Authentic and everyday texts</li> <li>▪ Technological based literacy strategies</li> </ul> |

### IDENTIFYING DESIRED RESULTS

#### Content Standards

Physical Setting Earth Science- Standard 4, key idea 1: performance Indicator 1.1 d, f, h,  
 W.9-10. 9 & 10 Common Core Writing Standard history, Science, Technology  
 R.9-10. 1 Common Core Reading Standard history, Science, Technology

#### Knowledge

*Students will know...*

#### Skills

*Students will be able to....*

What causes the apparent motion of celestial objects  
 What causes the moon phases

Describe and name the phases of the moon through observations in the night sky  
 Calculate eccentricity of objects in the sky

#### Enduring Understandings

#### Essential Questions

The motions of the sun, earth, and moon

#### Related Misconceptions

When half the moon is illuminated it is called a Quarter Moon  
 Objects in the sky's movement are caused by the movement of those objects

How does the moon affect the earth?

### Assessment Evidence and Artifacts of Learning

#### Summative Assessment

Students will complete an Astronomy simulations activity that will test their abilities to interpret simulations based on several celestial objects in space. This will be a

culminating activity where students use their knowledge from the unit to complete the online simulations. The simulations will be implemented simply by having students go to website and participate in directed simulations.

| <b>Formative Assessments</b>  | <b>Performance Assessments</b>  |
|---|---|
| <ul style="list-style-type: none"> <li>▪ Students are expected to blog daily about the moon in the sky. Including naming the phase and describing where it is illuminated.</li> <li>▪ Students will also work with a Space Science Newspaper and are expected to write summaries and answer questions based on the magazine.</li> </ul> | <ul style="list-style-type: none"> <li>▪ Students are expected to manipulate specific simulations during their summative assessment to show how certain celestial objects move in space.</li> </ul> |

**How the strategy will be implemented**

Blogging  
 Students will be expected to log into a blog created by the teacher where students log daily what they see in the sky. Students are expected to explain the portion of the moon illuminated, where the moon is in the sky at 8, 9, and 10 pm and to name the phase of the moon they are experiencing. The blog will also feature questions for students about the moon's phases occasionally that they will answer as part of the blog.

Authentic and everyday text  
 Students will receive several articles from Space Science News: Special Edition throughout the unit. The students will be expected to read highlighted articles within the newspaper and answer questions given and summarize certain sections. The task type activities that are included in the newspaper are directed activities relating to text, information searches, discussions, imaginative activities and media focused activities (Jarman & McClune, 2012). This is the same newspaper as presented in Space Science News: Special Edition, a resource for extending reading and promoting engagement with newspapers in the science classroom by Ruth Jarman and Billy McClune (2012).

**Rationale for Using Particular Strategy**

Blogging  
 For the purposes of this unit, it is important for students to view the sky at night to see for themselves things that are talked about during the unit. One very important part of our sky is the moon and its phases. For this reason, blogging serves as a way for students to record their observations about the moon. As stated before, blogging is a strategy that uses technology to engage students and asking them to reflect on real world things (Duplichan, 2009). Using technology also promotes a positive perception because students use technology in their everyday lives (Duplichan, 2009). Duplichan (2009) found it very practical to use blogs for current events and asking questions among other things, which is exactly what the purpose of the moon observations activities are.

Authentic and everyday text  
 The Space and Science Newspaper is going to be used in this unit because it allows

students to extract information from a current event newspaper that relates to the content they are learning about. A study that was done by Jarman & McClune (2012) found that student engagement was increased when the newspaper was used. Jarman & McClune (2012) explained that the newspaper has topics such as moons, planets, eclipses and space exploration as well as games current events and activities within the newspaper. All of these fit into the curriculum and help to add engagement for students. In addition, allowing students to extract information from text is an important college and career skill that students should have. Using news stories has been found to make science real and immediate for the readers, creating important connections between science and the real world (Jarman & McClune, 2012). By connecting the content to the students' everyday lives, the content becomes more meaningful. For these reasons, this strategy will be used in this unit.

|                                |   |                                 |   |
|--------------------------------|---|---------------------------------|---|
| <b>Title of Unit Seven</b>     | Weather and Climate   | <b>Grade Level</b>              | 8-9   |
| <b>Concept within the Unit</b> | <ul style="list-style-type: none"> <li>▪ Insolation and factors affecting it</li> <li>▪ Factors affecting climate patterns</li> <li>▪ The water cycle</li> <li>▪ Heat and temperature</li> <li>▪ Weather variables</li> <li>▪ Clouds and precipitation</li> <li>▪ Weather maps and forecasting</li> <li>▪ Severe weather</li> </ul> | <b>Literacy Strategies used</b> | <ul style="list-style-type: none"> <li>▪ Web quest</li> <li>▪ Argumentation with text</li> <li>▪ Technological literacy based strategies</li> </ul> |

## IDENTIFYING DESIRED RESULTS

### Content Standards

Physical Setting Earth Science- Standard 4, key idea 1 & 2  
 performance Indicator 1.2g,  
 performance Indicator 2.1a, c, d, e k,  
 performance Indicator 2.2 a, c, d, p  
 W.9-10. 1, 4, 9, 10, Common Core Writing Standard history, Science, Technology  
 R.9-10. 1, 4 Common Core Reading Standard history, Science, Technology

### Knowledge

*Students will know...*

What factors affect climate and how they affect climate  
 How scientists forecast the weather  
 Techniques for forecasting the weather

### Skills

*Students will be able to....*

Use weather instruments to measure weather variables including thermometer, barometer, sling psychrometer, anemometer, and wind wave  
 Determine a forecast using weather data

|  |   |
|--|---|
|  |   |
| <b>Enduring Understandings</b>   | <b>Essential Questions</b>                      |
| <b>The difference between weather and climate</b>                          | <b>How does weather affect our daily lives?</b> |
| <b>Related Misconceptions</b>  |   |
| <b>High pressure means hot weather<br/>Low pressure means cold weather</b> |   |

| <b>Assessment Evidence and Artifacts of Learning</b>   |  |
|--|--|
| <b>Summative Assessment</b>  |  |
| Students will complete a forecasting project using specified sites. Students will have a list of weather variables they are supposed to conduct a forecast for and students will be expected to explain why they made determinations for forecasts using scientific ideas learned about in the unit.   |  |
| <b>Formative Assessments</b>   | <b>Performance Assessments</b>   |
| <ul style="list-style-type: none"> <li>▪ Although the WebQuest could also be a summative assessment, in this case it just focuses on climate, which is important to making weather forecasts. Therefore, the WebQuest on climate will be a formative assessment for the unit.</li> <li>▪ Students will argue Global warming caused by humans vs. natural causes in a debate style</li> </ul> | Students will use weather instruments to take measurements on weather variables including temperature, pressure, humidity, wind speed and direction, and make observations of the sky. |

| <b>How the strategy will be implemented</b>  |
|--|
| <p><u>WebQuest</u></p> <p>Students will be given a series of websites that they can use to learn more about the factors that affect climate. They will also be given the criteria for their research which includes the following:</p> <ul style="list-style-type: none"> <li>• Where is the location? Find a specific location on the earth</li> <li>• What does it look like? Google image and Google earth help!</li> <li>• What types of geographical features are in the region?</li> <li>• What are the characteristics of the climate? Temperature, precipitation, wind, humidity. Are these characteristics year round?</li> </ul> |

- What factors contribute to the climate type? (altitude, topography, proximity to large bodies of water, ocean currents, wind patterns, latitude)
  - i. Explanation of the factors that contribute/ how they lead to the characteristics.
- Pictures that relate to the information/ characteristics given.
- What does your climate region look like? Vegetation? Land features?
- What animals are present?

The finished project will be a brochure or poster that is for the particular climate type they include. It will include the factors present to create that type of climate in the location they choose.

### **How the strategy will be implemented**

#### Argumentation with text

The following guidelines will be used in order to implement the argumentation or whether global warming is human caused or a natural cycle. Students are expected to write an argumentative piece and then a concluding debate in class will occur after students have done their research and completed the papers. The guidelines listed below are according to (Thier, 2010).

#### Guidelines (Thier, 2010, pg 71)

1. Begin by stating the main ideas of the issue, explaining your point of view and why it is important to believe the way you do
2. Clearly state point of view, and present information and evidence
3. Include only information that supports my ideas
4. Focus only on your argument and the most important points
5. Determine other arguments related, state them and offer evidence against them
6. Support your argument with evidence from the research
7. Summarize argument and restate the strongest evidence

#### Technological based literacy strategies

Using common websites (weather.com, Accuweather.com & noaa.gov) students will create a video forecast of a specific day they are assigned. As part of the forecast, students are expected to draw high and low pressure, fronts, clouds, and precipitation on a map provided. Students also have to complete a weather forecasting sheet that asks specific questions about weather variables. For instance, did the pressure in the last day go up or down and how will that affect weather? On the other hand, what is your prediction for temperatures? Why are they going to change in the way you have described? A completed project will be one that fills out the forecast sheet, fills out the map of the US based on their forecast, and makes a video of their forecast predictions

for the rest of the class to view.

- Map Provided drawing
  - Draw the current high and low pressure centers on the map
  - Any fronts listed
  - Shade where there is clouds and precipitation
  - Place a station model on the map at Springville that shows forecast conditions for Springville
- Video
  - Create a weather forecast that is 30 seconds long and includes graphics from Accuweather professional.
  - Video should include forecast high temperatures, low temperatures, sky conditions, if it will rain and why we are receiving those conditions

### **Rationale for Using Particular Strategy**

#### WebQuest

“WebQuests represent an important bridge between content learning and technological literacy” (Ikpeze & Boyd, 2007, p.651). As stated before it is a strategy that used technology to have students conduct research in an authentic, problem solving environment (Ikpeze & Boyd, 2007). Research and problem solving are two skills that students should have to be college and career ready and therefore this strategy aligns with the common core and meets the goals of the unit. Guzzetti and Bang (2011) also said that to increase engagement teachers need to provide a variety of strategies that meet the goals. Therefore, this can act as a method to increase student engagement.

### **Rationale for Using Particular Strategy**

#### Argumentation with text

Argumentation with text gives students an opportunity to make their ideas concrete through that expression (Their, 2010). A student-centered strategy allows students to do the thinking. You may recall, that It also allows students to articulate their ideas and better understand the information they are trying to assimilate (Their, 2010). The strategy also gives students a chance to practice common core skills such as “using evidence to support their point of view” (Their, 2010). This strategy can also help to develop science-processing skills, and requires students to use literacy and processing skills (Their, 2010). Therefore, this strategy will be used because it allows students to practice those college and career ready skills that align with the common core.

#### Technological based literacy strategies

The weather forecasting project is a project that focuses on many common core standards and uses technology to meet those standards. The rationale behind using technological based literacy strategies is that technology can enhance critical and complex thinking skills (Ikpeze & Boyd, 2007). It also provides an opportunity for teachers to provide students with responsive curriculum and instruction that is rigorous and relevant (Dennis, Parker et al. 2011). Incorporating the technology aspect to the forecasting project makes in relevant to students today and provides the rigor because students have to discern that information to determine what is valuable instead of presenting them with the information on a sheet of paper that they need. For these

reasons, another technological based literacy strategy was used.

### Examples of the Project(s)/assignments(s) listed above

#### Weather Forecasting Project

During lab on the day listed in bold, you and your team will create a forecast for the next day using weather forecasting sites and your knowledge of weather. This forecast is critical for you to provide for the local farmers and whether or not they can start planting their crops in the spring. Please make sure to include if it is safe to begin planting or not based on if the temperatures will be below 32 at any point. Use the following sites as good sources for accurate weather information. DO NOT USE ANY OTHER SITES. [www.accuweather.com](http://www.accuweather.com), [www.weather.com](http://www.weather.com), [www.noaa.gov](http://www.noaa.gov).

You and your team are responsible for **filling out the weather forecast sheet provided, filling out the weather tracker in the front of the room, drawing the current weather conditions on a map provided, and either creating a poster of your entire forecast OR creating a video of your forecast that will go on the morning announcements.**

The date of your forecast \_\_\_\_\_

#### **To do list:**

\_\_\_\_\_ Complete the forecast sheet for the correct date of your forecast

\_\_\_\_\_ \_ Fill out the weather tracker in the front of the class

\_\_\_\_\_ Draw fronts, clouds, precipitation on the map provided

\_\_\_\_\_ Video of your forecast using Accuweather professional graphics

USE THE FOLLOWING SITES: [www.weather.com](http://www.weather.com)      [www.noaa.gov](http://www.noaa.gov)  
[www.accuweather.com](http://www.accuweather.com)

#### **The details:**

- Forecast sheet:
- Weather tracker in the front of the class:
  - Fill out the entire board and map using stickers and dry erase markers. Use sites above for

information

- Map Provided drawing
  - Draw the current high and low pressure centers on the map
  - Any fronts listed
  - Shade where there is clouds and precipitation
  - Place a station model on the map at Springville that shows forecast conditions for Springville
  - Create a key at the bottom that explains the symbols you used
- Video
  - Create a weather forecast that is 30 seconds long and includes graphics from Accuweather professional.
  - Video should include forecast high temperatures, low temperatures, sky conditions, if it will rain and why we are receiving those conditions

### Forecast Sheet

Current Date: \_\_\_\_\_ Forecast Date [tomorrow]: \_\_\_\_\_

**Your forecast High temperature:** \_\_\_\_\_

**Your forecast Low temperature:** \_\_\_\_\_

Did the forecast temperatures for high and low go up or down?

\_\_\_\_\_

Why did the forecast temperatures change? [Warm front, cold front, rain cloud etc?]

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Pressure trends [using the barometer at front of room]:

Has the pressure gone up or down?

\_\_\_\_\_

What does this pressure trend indicate [rising pressures indicate better weather etc?]

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Your forecast for rain [reason there is or isn't rain in the forecast. Ex. High pressure or low pressure etc]

\_\_\_\_\_  
\_\_\_\_\_

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Your forecast for clouds [how much and possible reason for those clouds]:

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Forecast for Winds [direction, speed and possible reason for the direction and speed]:

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Active weather watches or warnings? [If so state them]

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### WebQuest

**1. Use the following websites located on my teacher website under climate links to research a specific climate of the world. Options include: Desert, Tundra, Tropical, Temperate, etc**

- <http://www.blueplanetbiomes.org/climate.htm> (climates of the world)
- [http://www.ecn.ac.uk/Education/factors\\_affecting\\_climate.htm](http://www.ecn.ac.uk/Education/factors_affecting_climate.htm) (factors affecting climate)
- <http://images.google.com/imghp?hl=en&tab=wi> (Google images)
- <http://en.wikipedia.org/wiki/Climate> (definitions)
- More information on your specific type : <http://www.google.com/> , <http://www.yahoo.com/>

**2. The information that should be included that can guide your research:**

- Where is the location? Find a specific location on the earth
- What does it look like? Google image and Google earth help!
- What types of geographical features are in the region?
- What are the characteristics of the climate? Temperature, precipitation, wind, humidity. Are these characteristics year round?
- What factors contribute to the climate type? (altitude, topography, proximity to large bodies of water, ocean currents, wind patterns, latitude)
  - i. Explanation of the factors that contribute/ how they lead to the characteristics.
- Pictures that relate to the information/ characteristics given.
- What does your climate region look like? Vegetation? Land features?
- What animals are present?

**3. After you have all this information, you need to put the information into a Magazine format created by you. The magazine should have a cover page with a picture of your climate type and the name followed by a few pages with the information and pictures**

- The final product should include many pictures.
- It should be colorful and organized.
- It should have all the information from step two included somewhere.

Example cover names: Tundra Today, Rainforest Now etc.

#### Chapter 4 Conclusions and Recommendations

Upon completion of the project *A Compilation of Literacy Strategies to be used in science and earth science units*, it is clear that there are many applications for literacy in science as well as some limitations. The strategies presented that include science journalism, literacy circles, reading infusion, using authentic text, technology web quests and blogs can really help to enhance instruction. The strategies can be used to implement the common core state standards into science curriculum in order to make students more college and career ready.

The project presented a number of ways that these strategies can be implemented into the content with a rationale. The limitations of the project include but are not limited to the number of ways the strategies can be implemented. There could be many other ways that educators can implement these and other strategies into their curriculum to meet the common core standards. There are also many other strategies not mentioned in

this project that can be used and are effective to help students become more college and career ready.

The goal of the project is not to say this is all that can be done to meet the common core state standards, but to provide a start and a blue print for science teachers teaching these topics to use in order to begin the process of making their content more aligned with the common core state standards.

#### References

- Baker, W., Barstack, R., Clark, D., Hull, E., Goodman, B., Kook, J., Kraft, K., & Ramakrishna, P. (2008). Writing to learn in the inquiry-science classroom: Effective strategies from middle school science and writing teachers. *The Clearing House*, 81(3), 105-108.
- Casteel, C., & Isom, B. (1994). Reciprocal processes in science and literacy learning. *The Reading Teacher*, 47(7), 538-545.
- Dennis, D., Parker, A., Kiefer, S., & Ellerbrock, C. (2011). "I can read this!" promoting developmentally responsive literacy practices in a middle school science classroom. *Journal of Reading Education*, 36(2), 15-22.
- Devick-Fry, J., & Lesage, T. (2010). Science literacy circles: big ideas about science. *Science Activities*, 47(2), 35-40.

- Driver, R., Newton, P., & Osborne, J. (2000). Establishing the norms of scientific argumentation in classrooms. *Science Education*, 84, 287-312.
- Duplichan, S. (2009). Using Web Logs in the Science Classroom. *Science Scope*, 33-37.
- Fang, Z., & Wei, Y. (2010). Improving students' science literacy through reading infusion. *The Journal of Educational Research*, 103, 262-273.
- Foster, S., Rolle, N. (2011). Building Scientific Literacy through Summer Science Camps: A Strategy for Design, Implementation and Assessment. *Science Education International*, 22(2), 85-98.
- Guzzetti, B., & Bang, E. (2011). The influence of literacy- based science instruction on adolescents' interest, participation, and achievement in science. *Literacy Research and Instruction*, 50, 44-2011.
- Guzzetti, B. (2009). Thinking like a forensic scientist: Learning with academic and everyday texts. *Journal of Adolescent & Adult Literacy*, 53(3), 192-203.
- Ikpeze, C., & Boyd, F. (2007). Web-based inquiry learning: Facilitating thoughtful literacy with webquests. *The Reading Teacher*, 60(7), 644-654.
- Jarman, R., & McClune (2012). Space Science News: Special Edition, a resource for extending reading and promoting engagement with newspapers in the science classroom. *Space Science News*, 1-9.

Johnson, C. (2007). Technical, Political and Cultural Barriers to Science Education Reform. *International Journal of Leadership in Education*, 10(2) 171-190.

Montelongo, J., & Herter, R. (2010). Using technology to support expository reading and writing in science classes. *Science Activities*, 47, 89-102

McNeill, K.L. & Krajcik, J. (2007). Middle school students' use of appropriate and inappropriate evidence in writing scientific explanations. In M. Lovett & P. Shah (Eds.), *Thinking with data* (pp. 233-265).

Owens, T. (2009). *Improving Science Achievement through Changes in Education Policy*  
*Science Educator*, 18(2), 49-55

National Research Council. (1996/2000). *National science education standards*.  
Washington, DC: National Academy Press.

Osborne, J., Erduran, S., & Simon, S. (2004). Enhancing the quality of argumentation in school science. *Journal of Research in Science Teaching*, 41(10), 994-1020.

Poleman, J., Newman, A., Farrar, C., & W., Saul, (2012). Science Journalism. *The Science Teacher*, 44-48

Radcliff, R., Caverly, D., Hand, J., & Frank, D. (2008). Improving reading in a middle school science classroom. *Journal of Adolescent & Adult Literacy*, 51(5), 398-408.

Thier, M. (2010). Developing persuasive voices in the science classroom. *Science and Children*, 70-75.

Wilson, A. (2008). Moving beyond the page in content area literacy: Comprehension instruction for multimodal texts in science. *The Reading Teacher*, 62(2), 153-156.

Yule, J., Wolf, W., & Young, N. (2010). Emphasizing the "literacy" in "scientific literacy": A concise blueprint for integrating writing into biology classes. *Scientific Literacy*, 36(2), 15-21.