TreesGreenville Companion Curriculum

Presented by Michelin North America

Effectively Using the Outdoor Classroom

High School Curriculum for Interdisciplinary Studies

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Introduction

The following curriculum is written with the intent to provide interdisciplinary opportunities in the use of a school's outdoor classroom or learning environment. Lessons provided are for high-school level subjects for a standard 9^{th} – 12^{th} grade system. It is a cross-curricular program aligned with South Carolina's State as well as National and Core Standards. Lessons are content specific, grade-level appropriate, and give the students and teacher a chance to go outdoors and integrate the natural environment into a unit of study. Lessons for all four core areas (English, Mathematics, Science, and Social Studies) and standard grade-level classes (for example, in Science, Biology, Physical Science, Chemistry, and Physics) are included. Each lesson is an expanded version with such components as aligned standards, unit of study, essential questions, multi-step procedures, assessment, and extensions. The primary purpose of these lessons and plans is to encourage the use of an outdoor classroom amongst all disciplines, not just environmental or earth science. It is the hope that this curriculum guide will inspire teachers to develop their own ideas of use above and beyond what is presented in order for the outdoor classroom to become an integral part to all students' learning.

Background

Teachers, this curriculum guide is intended for you to use at any point in your teaching where the lesson aligns with your unit of study. Many materials, including worksheets and rubrics, are included for your use in order to make the use of these lessons as easy and convenient as possible. All lessons are correlated to South Carolina State Standards as well as the latest National and Common Core Standards. Each lesson also includes:

A. Background information
B. Guiding Questions
C. Essential Questions
D. Materials List
E. Daily Procedure Plans
F. Assessments
G. Alternatives for students with disabilities
H. Extensions for gifted students

The following subjects are covered in this curriculum guide:

English – Levels 1, 2, 3, and 4

Mathematics – Algebra 1, Algebra 2, Geometry, Pre-Calculus

Science – Biology, Physical Science, Chemistry, Physics

Social Studies – Global Studies 1, Global Studies 2, U. S. History, Economics

Please feel free to edit and change lessons to make them more appropriate for your style, unit of study, or type of student you are working with. Again, this is to encourage you to use your school's outdoor classroom more frequently and to incorporate a more interdisciplinary approach and thinking for you and your students as they learn the required material.

English

ENGLISH

English I

"Nature and Mythology"

UNIT: Mythology
Unit Essential Question: What is the origin of ancient mythology?

LESSON: The role of nature in ancient myths
Lesson Essential Question: How did myths represent man's early explanation of natural phenomena?

STANDARDS ADDRESSED

National

NL-ENG.K-12.2 UNDERSTANDING THE HUMAN EXPERIENCE: Students read a wide range of literature from many periods in many genres to build an understanding of the many dimensions (e.g., philosophical, ethical, aesthetic) of human experience.
NL-ENG.K-12.9 MULTICULTURAL UNDERSTANDING: Students develop an understanding of and respect for diversity in language use, patterns, and dialects across cultures, ethnic groups, geographic regions, and social roles.

South Carolina

Standard E1-1: The student will read and comprehend a variety of literary texts in print and nonprint formats.
Indicator E1-3.2: Analyze the meaning of words by using Greek and Latin roots and affixes.

Guiding Questions

1. How is our modern culture influenced by Greek and Roman mythology?
2. Why is it important for students to gain a basic knowledge of ancient myths?
3. Why were myths originally created?

Background Information

Mythology started as stories told by humans to explain their natural surroundings and why certain events occurred in nature. They created stories to explain echoes, rainbows, constellations, sunsets, etc. Edith Hamilton's *Mythology* is a classic collection of stories that illustrate how ancient civilizations thought and felt centuries ago. These tales represent the history and culture of several ancient civilizations, including the Greeks and the Romans. It is a text that can constantly be referenced when teaching any literary works because of its rich allusions found in vocabulary and literature. The origins of many subjects can be linked to mythology. In this lesson, students will be introduced to how myths were created to represent man's early explanation of natural phenomenon.

Lesson Objective(s)

Students will be able to:

1. Identify symbols, names, and words associated with ancient mythology
2. Identify modern words with mythological roots
3. Gain awareness of how myths were created to explain natural phenomenon

Materials/Resource

Edith Hamilton's *Mythology* (text)
Bulfinch's *Mythology* (on the internet):
http://www.online-literature.com/bulfinch/mythology_fable/ (alternative text)
Student journal/notebook

Activating Strategy

- Present students with a variety of words, items, pictures, places, etc. and ask how these items are connected. Suggested items include Olympic rings, the Nike symbol, a thunderbolt, the trident, a picture of the Parthenon, Cupid, the owl, a chariot, words like panic, chaos, narcissistic, etc.
- After students have time to process and construct ways in which these words are related, take ideas in the form of a class discussion.
- If students do not immediately link these items to mythology, help guide their thinking by grouping similar items and things we commonly associate with these items.
- Show them the website: http://www.mythweb.com/. It is visually entertaining and presents accurate information. Go through the Gods and Heroes links and leave the rest for them to experiment with.

Procedure

DAY ONE

1. Once you have introduced students to how they are familiar with myths, explain that you will talk about how ancient myths were used to explain natural phenomenon.
2. Take the students outside to the Outdoor Classroom/Learning Garden. Tell the students they will use their surroundings to help them with the next assignment. Ask the students to explain how/why something exists in nature, using their surroundings as inspiration. Depending on the level of students, you may give them a list from which to choose. For example, students can explain 'Why the grass is green'… 'Why a plant's leaf is a certain shape' ... 'Why kudzu takes over in the South' … Prompts may be humorous or directly linked to science, nature, and creation. Ask them to write their "mini-myths" in their journal or English notebook.
3. If time allows, you may have students share some of their "mini-myths".
4. Remind students that one reason for the creation of myths was to explain how things came to be or why things existed. Use this as a lead in to the creation myths on pages 65-77 of *Mythology*.

DAY TWO

5. Continue reading the creation myths. Depending on the level of the students, time, etc. this may be done as a shared reading, homework assignment, individual reading, etc.
6. Whatever form of reading is chosen, it helps to guide their reading through the use of structured notes or guided reading questions.

Closure (Reflection)

Research another type of mythology (Egyptian, Norse, African, Hindu, etc.) and then Offer one or two similar elements found in Greek or Roman creation myths. Demonstrate to the students that the idea and purpose of creation myths was not limited to the Greeks and Romans. Ask students to take the elements you found and do their own work – finding more similar elements in the two stories, comparing and contrasting the two. Reflect on the origin and purpose of creation myths, referring back to student work.

Assessment

Multiple options exist for informal and formal assessment:

- Create a quiz for students on the information found in creation myths in the text
- In addition to the 'mini-myths' students write, have them get into groups, choose one person's story they like best, and create a short video dramatizing it
- Have students take the 'mini-myth' they created or one they read about in the text and create a book of it, complete with illustrations
- Visit www.webenglishteacher.com/myth.html for more great assignments and multiple assessment ideas.

Adaptations (for students with learning disabilities)

Make sure to integrate an hands-on approach to keep students more interested in the concept. For example, have them create the video or even a diorama in class depicting one of the myth's scenes. Assign students to work in groups rather than individually. More time can be allotted for activities.

Extensions (for gifted students)

Ask students to do the research for the closing activity (instead of you). Have students adapt a myth to dramatic format and perform it for the class. Attention to costume, dialogue, and props will be key. The performances can even be done outside at the outdoor classroom.

Possible connections to other subjects: Science, Art, Drama

ENGLISH

English II

"Visual Literacy: The nature of a photograph"

UNIT: Visual Literacy
Unit Essential Question: How is information gathered through a nonprint format?

LESSON: Using nature photography to develop visual literacy
Lesson Essential Question: How can I create a picture to share a depth of information? How do I interpret and gather information from a picture?

STANDARDS ADDRESSED

National

NL-ENG.K-12.4 COMMUNICATION SKILLS: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

NL-ENG.K-12.7 EVALUATING DATA: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

South Carolina

Standard 2: The student will read and comprehend a variety of informational texts in print and nonprint formats.

E2-2.4: Create responses to informational texts through a variety of methods (for example, drawings, written works, oral and auditory presentations, discussions, and media productions).

E2-2.6: Analyze information from graphic features

E2-6.5: Create written works, oral and auditory presentations, and visual presentations that are designed for a specific audience and purpose.

Guiding Questions

1. How is information related to an audience through pictures or photographs?
2. What skills are needed to read a photograph?
3. How can information be analyzed from graphic material?

Background Information

Readers seldom think of photographs as an informational text, but in reality "a picture is worth a thousand words." Our students are bombarded with visual images every day, yet few of them have ever thought about the skills necessary to read a photograph. This lesson can be taught independently or to develop a unit of study. Photography fits most naturally in the curriculum through historical photographs that support a text study. For instance, Dust Bowl migrant photographs to complement The Grapes of Wrath, or

Holocaust photos to support The Diary of Anne Frank. However, they can also be used in a unit on bias and propaganda, answering such questions as, "How do politicians or historians use photographs to shape public opinion?"

Lesson Objective(s)

Students will be able to:

1. Analyze information from a graphic
2. Develop visual literacy through analysis of a photograph
3. Share an informational message through their own graphic work
4. Identify the skills needed to read nonprint material

Materials/Resources

Photo Observation Chart
Sample photos for Activating Strategy
Digital camera or Flip video camera (or equivalent) for students to share
Use of computer for editing/printing/sharing photographs

Activating Strategy

Using a Photo Observation Chart:

In the beginning, students have to be taught to pay attention to details, even small details, in a photograph. The photo observation chart is designed to make them list each element they see. It also narrows their focus in the beginning. Choose several compelling pictures either on your own or from those provided and have students practice the chart approach to analysis at least three times before moving to analytical questions. Focus on the inference process and why they draw those conclusions.

Procedure

DAY ONE

Successful photo analysis (reading a photograph) involves attention to detail and a questioning mind. Aren't those the same skills we want in good readers? We are teaching a real life application to the reading comprehension skills.

All good analysis begins with a close reading. Ask students to study a selected photograph in silence for several minutes, picking out details that may even seem to be insignificant on first glance. Then guide their analysis using the question below. You might try dividing the questions between groups. However, at some point there needs to be a whole class discussion about the observations.

Analysis Questions For Photographs:

1. What clues give an indication about the time period?
2. Is there anything in the photo you cannot identify?
3. Where was the photo taken? What clues lead you to that conclusion?
4. Why do you think the photographer shot this photograph?
5. What element of the photograph's composition seems to be prominent? Why?
6. Was the composition of the photograph arranged by the photographer or was it natural?
7. If the photographer arranged the composition, why did he make those decisions?

8. How does the lighting impact the tone of the photograph? How is this similar to tone in written expression?
9. What do the facial expressions or the body language of the people in the photo indicate?
10. What do you notice about: The clothes people wear?...The way they are posed?...Their hands?
11. What might be happening outside the frame of the photo?
12. What are the people in the photo looking at?
13. What are they thinking?
14. What time of day is the photograph taken?
15. What message is the photographer trying to convey?
16. What title might you give to the photograph?

Another approach to questions: Levels 1, 2, and 3

Level I: (just state the facts)

a. Describe the colors, lines, shapes, texture, and space you see in the image.
b. What do you notice first in this picture? Where is your eye led?
c. How many faces do you see?
d. What are the people wearing? How are they posed?
e. Where are their hands resting?
f. Are you looking up or down at the people in the image?
g. When was this picture made?

Level II: (begin to analyze and interpret) In your opinion,

a. What are the people in the photograph looking at?
b. What are the expressions on their faces?
c. What are they thinking?
d. At what time of day might the photograph have been taken?
e. Where was the photograph taken?
f. What do you think they are doing?

Level III: (connect the image to historical context) Based on what you know about the time period,

a. Who are the people in the photograph?
b. What message do you think the photographer was trying to convey?
c. What is the situation of the people depicted? Point out some visual elements in the photograph that tell you about their situation.
d. If possible, how would you help the people in this photograph?
e. Might a photograph of this nature be made today? Why or why not?
f. What alternative title would you give this photograph?

DAY TWO

Photo tampering and Photo-ethics:

A study of modern photography also requires a discussion about photo-ethics. Staged photo ops, retouched photos, and digitally altered photos present the viewer with a responsibility to view with a critical eye. This level of analysis also includes an

awareness of bias and/or propaganda techniques. See sites below for more information:
http://www.cs.dartmouth.edu/farid/research/digitaltampering/
http://www.nppa.org/professional_development/business_practices/ethics.html
http://www.mediachannel.org/views/dissector/propaganda.shtml

Now students will have an opportunity to create their own photographic work and have it analyzed by their classmates. Escort students to the outdoor classroom/learning garden and explain they will use their surroundings to inspire them to take their own photograph to personally answer the question "What does nature means to me?" Their photo should relate their answer/message they want to get to across in a nonverbal form of communication. Tell students that their photo will be analyzed by their classmates for information. Depending on the level of student, have students print and/or save their photo at home or during class time. If an assessment is desired, a rubric for photographic work is included in the appendix.

Students can share their photo in small groups or whole class. Have classmates answer analysis questions on each piece, including what they believe the photographer's answer to the themed-question is. This work can also be turned in for assessment purposes. Further, photos can be shred on the teacher's website, a photo gallery of images can be displayed in the hall or inside the classroom. A competition of the work can even be done with some classes where art teachers can be invited to choose a 'Best of Show."

Closure (Reflection)

Have students respond to the following question: How have my habits in viewing photography changed because of the knowledge gained in this unit?

Assessment

Multiple options exist for informal and formal assessment, many of which were included above. Also, students from one class can examine and assess the work of students in another class (with names withheld for privacy requests).

Adaptations (for students with learning disabilities)

Make sure to allow more time for these students, especially when editing, saving, and Printing their photographic work.

Extensions (for gifted students)

Ask students to take multiple photos with a related theme that they place into an online Presentation or slideshow for sharing and assessment.

Possible connections to other subjects: Science, Art, Media/Library education

Photo Observation Chart:

List your photo observations

PEOPLE	OBJECTS	ACTIVITIES

Based on your observations, list at least three things you could have inferred from this photograph.

1.

2.

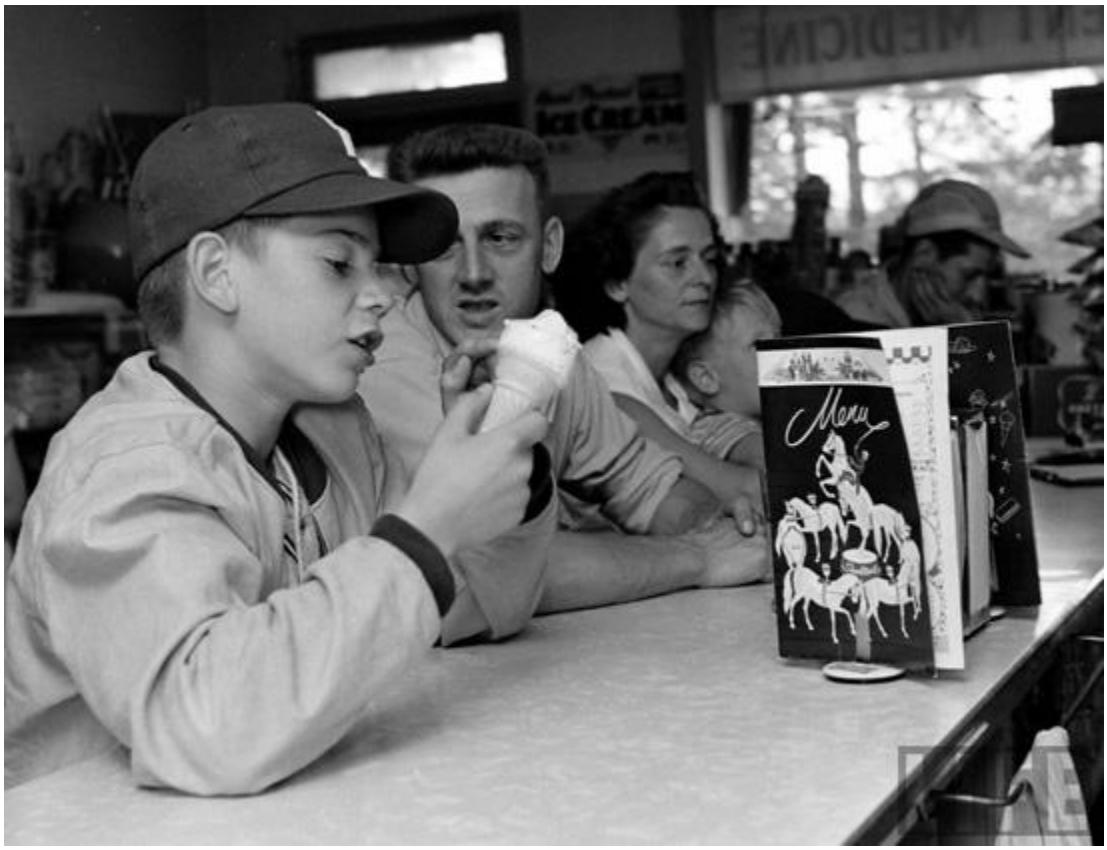
3.

SAMPLE PHOTOS:


By Any Means Necessary
Anna Myers


LIFE


Max Schleier/Black Star


Menu

ENGLISH

English III

"Letters as Primary Documents"

UNIT: Effective Letter Writing
Unit Essential Question: How can one write an effective letter?

LESSON: Letters to the Editor
Lesson Essential Question: What are the elements to writing a successful Letter to the Editor?

STANDARDS ADDRESSED

National

NL-ENG.K-12.1 READING FOR PERSPECTIVE: Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.

NL-ENG.K-12.4 COMMUNICATION SKILLS: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

NL-ENG.K-12.5 COMMUNICATION STRATEGIES: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

NL-ENG.K-12.7 EVALUATING DATA: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

South Carolina

Standard E1-5: Create persuasive pieces (for example, editorials, essays, speeches, or reports) that develop a clearly stated thesis and use support (for example, facts, statistics, and firsthand accounts).

Standard E3-5: The student will write for a variety of purposes and audiences.

Indicator E3-5.1: Create informational pieces (for example, résumés, memos, letters of request, inquiry, or complaint) that use language appropriate for the specific audience.

Standard E3.2: The students will read and comprehend a variety of informational texts in print and nonprint formats.

Indicator E3-2.3: Analyze informational texts for author bias (including word choice, the exclusion and inclusion of particular information, and unsupported opinion).

Guiding Questions

1. What is the difference between fact and opinion?
2. How do you detect author bias?
3. What are components to writing a persuasive piece of writing (such as a Letter to the Editor)?

Background Information

The opportunity to discover the flaws in newspaper letters to the editor, how to evaluate the ensuing consequences, and how to write their own letters can help beginning persuasive writing students, who have had little practice at forming arguments, begin to conceptualize for themselves the ways that principles of persuasive discourse apply in particular writing situations. The study and application of these principles can provide a point of departure from which students can advance their reading and writing to more complex forms of argument. An assignment in which the need to integrate emotions and values is essential to an argument sharpened by the students' focus on the way language functions in persuasion. Overall, the students' close attention to language will get them beneath the surface of a letter and to the motives and judgments behind the words.

Lesson Objective(s)

Students will be able to:

1. choose and research a current local or national issue.
2. review persuasive writing structure and business letter format.
3. determine the criteria for effective letters.
4. explore the ways that purpose and audience influence a message.
5. develop arguments and support ideas with evidence.

Materials/Resources

Newspaper or Computer with online access to newspapers
How to Communicate with Journalists, from FAIR (provided)
Tips on Writing Letters to the Editor, from the ACLU (provided)
Write an Opinion Piece or a Letter to the Editor for Your Local Newspaper, from NCTE (provided)
Newspaper Summary Article Questions (provided)
Persuasion Map Planning Sheet (provided)
Letter to the Editor Peer Review Questions (provided)

Preparation

Arrange for current issues of local, regional, or national newspapers for the classroom. Each student should have a newspaper for this activity. You may ask each student to bring a newspaper from home. If computer access allows, you can also use online newspaper sites. In addition to local newspaper sites, you can use resources from the Newseum collection of Today's Front Pages. Students will need to be able to print articles from online newspapers or to return to those pages throughout this lesson.

Print copies of the ‘Newspaper Article Summary Questions’, ‘Persuasion Map Planning Sheet’, and ‘Letter to the Editor Peer Review Questions.’

Activating Strategy

Using the Outdoor Classroom as Persuasive Writing Inspiration:

Take the students to the Outdoor learning environment. Ask them to bring a notebook and writing instrument with them. Once outside, tell them a fictional story (that you will share with them as though it were true at first) about this week being the last week for the school's outdoor area. For example, share with them that the Principal has decided the outdoor space is no longer important and instead, it will be bulldozed down, taken out, and turned into parking spaces. Note that you want to make the 'situation' one you know most students would disagree with. Ask them to respond how they fell about this new school decision in a one-page free writing assignment. Give them 10-15 minutes to write a page. Once done, ask them to show and share with a partner what they wrote. Next, ask partners to share with the whole group what their neighbor's feelings and opinions are of the situation and how they were able to tell that from their writing. Finally, explain to them that you shared a fictional story and their outside area is safe, but that was an exercise to have them focus their feelings and opinions on persuasive writing. They will be starting a unit on writing Letters to the Editor where knowing how to be persuasive will be important.

Procedure

DAY ONE

1. Ask students to share any experiences that they have with letters to the editor of newspapers or magazines that they read.
2. Pass out newspapers to the class, and ask students to find the letters to the editor in their papers.
3. Give students a few minutes to skim through the letters, and jot down characteristics that they see in the letters.
4. Gather the class and ask them to share the characteristics that they have noted. Record their observations on the board or on chart paper.
5. Be sure that students notice the connections between the letters and the various articles in the newspaper. Some letters directly respond to previously published articles, others respond generally to topics covered in the newspapers, and some focus on general issues of interest to the newspaper's readers.
6. Emphasize that students will have the opportunity to choose topics that interest them for their letters, based on articles that they find in a current issue of the newspaper.
7. Have students spend 15–20 minutes skimming the newspapers and reading any articles that grab their attention.
8. After students have had the opportunity to explore their newspapers, arrange the class into small groups.
9. In these groups, ask students to discuss the topics and articles that interested them with one another.
10. Ask students to choose one of the articles for their focus, and complete the 'Newspaper Article Summary Questions' for that article.
11. Collect the 'Newspaper Article Summary Questions' at the end of the session, and review the work before the next session. Provide any feedback as necessary.
12. For homework, have students read all the letters to the editor in their copy of the newspaper. Ask students to pay attention to the characteristics which the letters have in common and what features makes a letter successful.

DAY TWO

1. Begin with a review of the activities that students completed in the previous session.
2. Share any general feedback on the topics that students have chosen, based on your review of the 'Newspaper Article Summary Questions', and pass back the sheets to students.
3. Answer any questions that students have on the project at this point.
4. Ask the class to share characteristics that they noticed as they read the letters to editor for homework. Record their responses on the board or on chart paper.
5. If necessary, ask questions such as the following to guide students' observations:
    - What did you notice about the organization of the letters?
    - How were details used in the letters?
    - What kinds of details were used?
    - How do the letters persuade their readers?
    - Which letters seemed best?
    - What is the difference between an acceptable letter and a great letter?
6. Once the list is fairly complete, review the items, and make any additions or corrections.
7. Ask students to suggest general categories that fit the characteristics (e.g., formatting issues, structure, and ideas).
8. Arrange the characteristics into these general categories, creating a checklist or rubric for students' letters.
9. Pass out copies of the 'Persuasion Map Planning Sheet', and use the information to analyze a letter to the editor from one of the newspapers.
10. Demonstrate how to use the Persuasion Map to begin gathering and organizing ideas for students' letters.
11. Allow students the rest of the session to begin planning their papers with the Persuasion Map.
12. Remind students to refer their 'Newspaper Article Summary Questions' as useful.
13. As students work, circulate through the room, providing feedback and support.
14. If time allows, review the first sentences of several letters from the editor, and ask students point out the similarities between the sentences. Based on these examples, have students write their own sentences. Review the way to punctuate the titles of articles and the newspapers in these opening sentences.
15. If desired, point students to one or more of the guidelines for composing letters to the editor listed in articles provided.
16. For homework, ask students to compose a first draft of their letters. Explain that the letters will be exchanged for peer review during the next session.

DAY THREE

1. Review the criteria for effective letters to the editor that students created during the previous session, and answer any questions that students have about the project or their drafts.
2. Pass out copies of the 'Letter to the Editor Peer Review Questions.'
3. Arrange students in pairs, and ask partners to exchange and read one another's drafts.
4. After reading the drafts, have them fill out the 'Letter to the Editor Peer Review Questions' to provide feedback.
5. After students have shared and received feedback, allow time for the students to revise their drafts.

6. For homework, ask students to revise their drafts, based on the feedback that they have received. Explain that students will type their final drafts during the next class session.

DAY FOUR

1. Review the criteria for effective letters to the editor that students created, and answer any questions that students have about the project or their drafts.
2. Focus students' attention on reading their drafts for minor errors before students move to type their letters.
3. Remind students to punctuate the title of their articles in quotation marks, to italicize newspaper titles, and to place direct quotations from the article in quotation marks. If desired, use the ReadWriteThink lesson plan Inside or Outside? A Mini-Lesson on Quotation Marks and More as a mini-lesson at this point.
4. Allow the rest of the session for students to type and print their letters.
5. Collect students' letters, worksheets, and drafts at the end of the session.

Closure (Reflection)

If desired, ask students to print two copies of their letters, and mail one copy of each letter to the newspapers that students are responding to. Encourage them to do this on their own if an issue comes up that they feel passionate about in their local, regional, or national community.

Assessment

Check drafts and worksheets for completion and effort. Look in particular for indications of improvement over the series of drafts that students complete for the assignment. Assess students' final drafts using the criteria for effective letters to the editor that students created during the second session of the lesson. If you prefer a more formal rubric, use the Persuasive Letter Rubric in the Appendix.

Adaptations (for students with learning disabilities)

Make sure to allow more time for these students, especially when editing, saving, and Printing their work.

Extensions (for gifted students)

- As a book report alternative, have students write letters to the editor from the perspective of a character in a book they have read.
- After writing their letters, have students conduct research on the issues that they have chosen. The letters can serve as students' preliminary thoughts on the issue. Challenge each student to find at least 3 library resources on the issue and use those resources to expand the letter into a more formal proposal for changes that readers should consider making or actions that they should consider taking.
- Modify the lesson by assigning students topics for their letters.

Possible connections to other subjects: Science, Social Studies: Government, Media/Library education

From FAIR (Fairness and Accuracy in Reporting) 2011:

How to Communicate with Journalists

There are 101 excuses for not writing or calling the media when you see unfair, biased or inaccurate news coverage: "I don't know enough"; "I'm too busy"; "My computer crashed."

Communicating with journalists makes a difference. It does not have to be perfect; not all letters to journalists need to be for publication. Even a one-sentence, handwritten note to a reporter can be helpful. If you take the time to type a substantive letter, send copies of it to two or three places within the media outlet-perhaps to the reporter, his or her editor, as well as to the letters-to-the-editor department.

If media outlets get letters from a dozen people raising the same issue, they will most likely publish one or two of them. So even if your letter doesn't get into print, it may help another one with a similar point of view get published. Surveys of newspaper readers show that the letters page is among the most closely read parts of the paper. It's also the page policy-makers look to as a barometer of public opinion.

When you write to journalists, be factual, not rhetorical. Do not personally attack them; that's more likely to convince them that they're in the right. Address them in the language that most journalists are trained to understand: Call on them to be responsible, professional, balanced and inclusive of diverse sources and viewpoints.

Letters that are intended for publication should usually be drafted more carefully. Here are some tips to keep in mind:

Make one point (or at most two) in your letter or fax. State the point clearly, ideally in the first sentence.

Make your letter timely. If you are not addressing a specific article, editorial or letter that recently appeared in the paper you are writing to, then try to tie the issue you want to write about to a recent event.

Familiarize yourself with the coverage and editorial position of the paper to which you are writing. Refute or support specific statements, address relevant facts that are ignored, but do avoid blanket attacks on the media in general or the newspaper in particular.

Check the letter specifications of the newspaper to which you are writing. Length and format requirements vary from paper to paper. (Generally, roughly two short paragraphs are ideal.) You also must include your name, signature, address and phone number.

Look at the letters that appear in your paper. Is a certain type of letter usually printed?

Support your facts. If the topic you address is controversial, consider sending documentation along with your letter. But don't overload the editors with too much info.

Keep your letter brief. Type it whenever possible.

Find others to write letters when possible. This will show that other individuals in the community are concerned about the issue. If your letter doesn't get published, perhaps someone else's on the same topic will.

Monitor the paper for your letter. If your letter has not appeared within a week or two, follow up with a call to the editorial department of the newspaper.

Write to different sections of the paper when appropriate. Sometimes the issue you want to address is relevant to the lifestyle, book review or other section of the paper.

An increasing number of broadcast news programs (60 Minutes, All Things Considered, etc.) also solicit and broadcast "letters to the editor." Don't forget these outlets.

Please sign your letters as an individual or representative of a community group, not as a member of FAIR.

Please send us a copy of your letters (published and unpublished) to FAIR. Address them to the attention of the activist coordinator.

How to Write an Op-Ed

Op-eds are longer than letters to the editor, and there is more competition for space. You may want to call the paper for length requirements (usually 600-800 words).

Try to write on a controversial issue being covered at that time. If you can use a professional title that suggests authority, do so. If you work for an organization, get permission to sign the op-ed as a representative of that organization.

Feel free to send it to papers far from where you live, but avoid sending it to two newspapers in the same "market." (Sending to the San Francisco Examiner and the Seattle Times is OK, but not to the Examiner and the San Francisco Chronicle.) "National" newspapers like the New York Times, Los Angeles Times, Washington Post, Christian Science Monitor and USA Today generally do not accept op-eds that are also being offered to other papers. But you can easily submit the same piece to five or ten local dailies in different regions—greatly increasing your chances of being published.

Assure the op-ed editor in your cover letter that the piece has not been submitted to any other paper in their market. If, on the other hand, you sent it to only one paper, let that paper know you are offering them an exclusive.

In writing op-eds, avoid excessive rhetoric. State the subject under controversy clearly. You are trying to persuade a middle-of-the-road readership. If you rely on facts not commonly found in mainstream media, cite your sources hopefully as "respectable" as possible.

Try to think of a catchy title. If you don't, the paper will be more likely to run its own—which may not emphasize your central message. (Even if you do write your own headline, don't be surprised if it appears under a different one.)

Be prepared to shorten and re-submit your article as a letter to the editor in case it does not get accepted as an op-ed.

Tips on Writing Letters to the Editor

Letters to the editor are great advocacy tools. After you write letters to your members of Congress, sending letters to the editor can achieve other advocacy goals because they:

•reach a large audience.
•are often monitored by elected officials.
•can bring up information not addressed in a news article.
•create an impression of widespread support or opposition to an issue.

Keep it short and on one subject. Many newspapers have strict limits on the length of letters and have limited space to publish them. Keeping your letter brief will help assure that your important points are not cut out by the newspaper.

Make it legible. Your letter doesn't have to be fancy, but you should use a typewriter or computer word processor if your handwriting is difficult to read.

Send letters to weekly community newspapers too. The smaller the newspaper's circulation, the easier it is to get your letter printed.

Be sure to include your contact information. Many newspapers will only print a letter to the editor after calling the author to verify his or her identity and address. Newspapers will not give out that information, and will usually only print your name and city should your letter be published.

Make references to the newspaper. While some papers print general commentary, many will only print letters that refer to a specific article. Here are some examples of easy ways to refer to articles in your opening sentence:

•I was disappointed to see that The Post's May 18 editorial "School Vouchers Are Right On" omitted some of the key facts in the debate.

•I strongly disagree with (author's name) narrow view on women's reproductive rights. ("Name of Op-Ed," date)

•I am deeply saddened to read that Congressman Doe is working to roll back affirmative action. ("Title of Article," date)

From NCTE: National Council of Teachers of English

Write an Opinion Piece or a Letter to the Editor for Your Local Newspaper

(Last edited January 2010)

Letters to the editor and opinion pieces are very powerful advocacy tools. The editorial section of a newspaper is widely read by the public and is monitored by elected officials. In a letter to the editor or opinion piece, you can bring up information not addressed in a news article, and can create the impression of widespread support or opposition to an issue. When you write a letter to the editor, be sure to do the following.

Adhere to word count requirements. This information can usually be found, online and in print, on the same page as the letters that are published. Generally, as few as 250 words are the maximum.

Open with a strong statement, and be sure to place the most important information at the beginning. Often, letters and pieces are edited to fit the space available in that issue of the newspaper -- most often they are cut from the bottom up, so placing the important information anywhere but at the top could result in its being omitted.

Use a personal story or illustration to make your point in plain language. If at all possible, tie your letter to a recent piece of news, editorial, or a prior letter to the editor, and, if you do so, reference the title and date of the article in your letter. If you are referring to a newspaper article, send your letter as soon as possible after an article has been published in the paper.

Use email to submit your letter. Editors like email because they will not have to re-key your letter for print. An email address for the letter to the editor/opinion sections of the newspaper will likely be found on the editorial page (print or online). Send your letter or opinion piece to weekly and community newspapers as well. The smaller the newspaper's circulation, the more likely your letter will be published.

In your signature line include your name, daytime and evening telephone numbers, email address, and mailing address so the paper can verify that you wrote the letter. Some editors may write or call to confirm your information. Only your name and city will be published.

If your letter or opinion piece does run in the newspaper, please send us a clipping or a link: SLATE Responses, NCTE, 1111 W. Kenyon Road, Urbana, IL 61801-1096; fax: 217-278-3761; slate@ncte.org.

Newspaper Article Summary Questions

1. What is the title of the article you are considering?

2. What is the main idea of the article?

3. Fill in the table below to outline the main points in the article. Use the back if you need additional space.

Main Point	Connection to Main Idea

4. What is your final impression of the main points included in the article? How do they combine to support the main idea?

5. What ideas do you have for the letter that you will write in response to this article? What position will you take and why?

Persuasion Map Planning Sheet

Goal or Thesis

A goal or thesis is a statement that describes one side of an arguable viewpoint.

- What is the thesis or point you are trying to argue?

Main Reasons

You will need some good reasons to support your goal or thesis.

Briefly state three main reasons that would convince someone that your thesis is valid.

- Reason 1
- Reason 2
- Reason 3

Facts or Examples

What are some facts or examples you could state to support this reason and validate this argument?

- Fact or Example 1
- Fact or Example 2
- Fact or Example 3

Conclusion

A piece of persuasive writing usually ends by summarizing the most important details of the argument and stating once again what the reader is to believe or do.

Letter to the Editor Peer Review Questions

1. Does the letter begin with a salutation and end with a signature block?

2. What article is the letter writer discussing? Is the article named in the first sentence or paragraph?

3. In the first paragraph, what main reason does the letter writer give for responding to the article? What position is the letter writer taking on the issue?

4. What specific points does the letter writer use to support the position taken in the letter?

5. How does the letter conclude? Is the conclusion appropriate for the letter?

6. What advice would you give the author of this letter?

7. What did you like the most about this letter? Why?

ENGLISH

English IV

"*Frankenstein*: Elements of Nature v. Nurture – Character Creation"

UNIT: *Frankenstein*
Unit Essential Question: Who are the major characters and what are major elements and themes in Mary Shelley's *Frankenstein*?

LESSON: Characters of *Frankenstein*
Lesson Essential Question: What are the characteristics of and how do the other characters respond to the monster in *Frankenstein*?

STANDARDS ADDRESSED

National

NL-ENG.K-12.1 READING FOR PERSPECTIVE: Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.

NL-ENG.K-12.3 EVALUATION STRATEGIES: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).

South Carolina

Standard E4-1: The student will read and comprehend a variety of literary texts in print and nonprint formats.

Indicator E4-1.3: Evaluate devices of figurative language (including extended metaphor, oxymoron, and paradox).

Indicator E4.5: Analyze the effect of the author's craft (including tone and the use of imagery, flashback, foreshadowing, symbolism, motif, irony, and allusion) on the meaning of literary texts

Guiding Questions

1. Who are the major characters in *Frankenstein* and how do they respond to the monster?
2. What are the motivations behind the characters in *Frankenstein?*
3. What are quotes or evidence from the text that help support your ideas & opinions about the book?

Background Information

In this novel, Victor Frankenstein experiences an idyllic childhood in Switzerland, surrounded by a loving family and accompanied by his adored cousin Elizabeth. He is

fascinated by ancient philosophers whose grandiose ambitions included looking for an Elixir of Life. After the death of his mother, his first unhappy experience, he attends University in Germany where he applies his new-found knowledge of science to manufacture a human being of enormous size and strength.

When his creation comes to life, Frankenstein is so horrified by his own bizarre accomplishment that he falls into a delirious illness which last months. Meanwhile, the creature flees into the woods and disappears.

Two years later, Frankenstein returns home upon learning that his brother has been mysteriously murdered. Justine, a friend of Frankenstein, is falsely convicted and executed.

Having been hated, rejected and feared by every human encountered, the creature considers all of humanity to be his enemy. He demands that Frankenstein create a female companion for him so that he will not be lonely, and promises that with his companion he will flee to a remote corner of South America and never come into contact with humans again.

Frankenstein cannot forgive the creature for the death of his brother and Justine; he refuses to build the female companion. In desperation and rage, the creature promises to make his creator as miserable as himself. In his vengeance, the creature murders Frankenstein's friends and family one by one, including his beloved cousin Elizabeth, who he married.

When the creator and his creature are at last equally alone and family-less, Frankenstein seeks his own revenge and pursues his enemy into the Arctic northern wastes where together they meet their climatic fate.

Lesson Objective(s)

Students will be able to:

1. Read, discuss, and analyze Frankenstein characters.
2. Write about Frankenstein characters.
3. Discuss and analyze character motivation in Frankenstein.
4. Make predictions and analyze plot in Frankenstein.
5. Review major events in Frankenstein.
6. Use textual evidence to support opinions.

Materials/Resources

Construction paper of various colors
Glue, Tape, other supplies for monster assembly
Scissors
Writing instruments
Available elements from outside (i.e. blades of grass, leaves, etc.)

Activating Strategy/Preparation

Have students read at least until the part where Frankenstein brings the creature to life in chapter five. For best results, read past the point where the monster tells his story to Victor in chapter sixteen.

Procedure

1. Take students to the outdoor classroom and divide them into groups of 3-5.
2. Give each group the exact same supplies. A sample supply list would include: 2 pieces of colorful construction paper (each group can have different colors), a glue stick, a roll of tape, and a pair of scissors.
3. Tell each group that they must use the supplies given to them plus at least three different elements from nature to construct, as Victor did, their own creature. Give no instructions as to what the creature should look like; Let them be creative.
4. In addition to constructing their monster, each group should do the following:
    - ◦Write a poem about their monster. (minimum 14 lines)
    - ◦Write a poem to the monster from another character in the novel
    - ◦Write a poem from the monster to another character in the novel
    - ◦Make a characterization chart of the monster, using specific facts and quotations from the story.
    - ◦Make five predictions about what the monster will do in the remaining chapters.
    - ◦Present the monster and the poem(s) to the class.
5. Nurture the creature so he doesn't come back and ruin your life. (This ambiguous part of the assignment should spark some good whole-group discussion on what this should entail. Give them time to digest, discuss, develop, and formulate a plan as to what this will look like.

Closure (Reflection)

Have students respond to the following questions:

- How did the elements of nature play into this assignment?
- How does the book reflect the struggle of nature v. nurture?
- How did this assignment help you to better understand the characters in the novel?

Assessment

Give students participation credit for completing the assignment or, for a more formal grade, use a rubric for a project grade. Possibly ask students to put all of their poems, information, and a picture of their creature into a presentation for a more formal share with the class.

Adaptations (for students with learning disabilities)

Re-read portions of the novel to and with the students to help them remember and better interpret the assignment through their own reflections.

Extensions (for gifted students)

Ask students to do the project independently or with only one partner to ensure more involvement in the work.

Possible connections to other subjects: Science, Art

Mathematics

MATH

Algebra I

"Plant Study: Graphing and Analyzing Linear Functions"

UNIT: Graphing and Analyzing Linear Functions
Unit Essential Question: How can a list of data pairs in tabular form be represented by a linear function?

LESSON: Plant study: Data Analysis
Lesson Essential Question: How can data from a plant growth study be expressed graphically and by a linear function?

STANDARDS ADDRESSED

National

Create equations that describe numbers or relationships:

A-CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

South Carolina

EA-1.5 Demonstrate an understanding of algebraic relationships by using a variety of representations (including verbal, graphic, numerical, and symbolic).

EA-3.1 Classify a relationship as being either a function or not a function when given data as a table, set of ordered pairs, or graph.

Guiding Questions

1. What is a linear function and how is it represented graphically?
2. What does a linear function look like in tabular form?
3. How can a linear representation of data be expressed in algebraic form?

Background Information

In order to determine whether a relationship is linear, students should focus on the rate of change in the relationship. Linear relationships are characterized by a constant change in one variable associated with a constant change in the other variable. That is, for each unit change in the independent quantity, there is a constant change in the dependent quantity.

Students need more practice working with relationships given in tabular and verbal forms since linear functions are more easily recognized in the graphical and algebraic forms.

Lesson Objective(s)

The student will use problem solving, reasoning, communication, connections and representation to:

- Identify that a constant rate of change is the criteria used to determine whether or not a relationship is linear.
- Determine if a relationship given in tabular form represents a linear function.
- Determine if a relationship given in verbal form represents a linear function.

Materials/Resources

Plant seeds or seedlings of two different types of plants (suggested: Native & Non-native)
Raised bed or area in or near outdoor classroom
Gardening supplies (soil, hand shovels, water hoses or buckets, etc.)
Graph paper
Planting worksheet; Data Table and questions (provided)

Activating Strategy/Preparation

Begin by asking students to write down a definition for 'rate of change.' After a couple of minutes, ask a few students to share what they wrote. Review with students a mathematical definition for 'rate of change.' Introduce linear relationships and how rate of change relates to a linear relationship. Give the students the following scenarios, discuss, and ask them to determine if each scenario represents a linear relationship.

SCENARIOS:

- A scuba diver is 120 feet below sea level. She knows that to avoid suffering from the bends, she must come up at a rate of 7 feet per minute. (depth versus time)
- Phil is making a 3 foot by 4 foot banner for the math club. Realizing that the banner is too small, he decides to increase each side. Phil must decide how the new dimensions will affect the cost of the materials. (cost versus area)
- Your local elementary school wants to raise money to fix their playground equipment. Since balloons are popular with young children, the group decides to sell balloons as a fundraiser. You purchase a box of balloons for $10 and sell each balloon for fifty cents. (profit versus balloons sold)

*The first and third situations are linear because the rate of change is constant; the second situation is not linear because the change in area is not constant.

Procedure

1. Take students to the outdoor classroom and divide them into groups of 3-5.
2. Tell students you are going to do a science experiment in which they will test whether or not native plants will thrive better than non-native plants in a garden if given the same resources (sunlight, water, etc.) to survive. They will then take the data, represent it graphically, and analyze it.
3. Give each group the exact same supplies. A sample supply list would include: 2 packets of seeds or groups of seedlings (1 native plant & one non-native plant), hand shovel, and water bucket.
4. Tell each group that they will plant the two different species and over the next two weeks, they will visit the garden/beds and record the growth of the plants to date.

5. Over the next two weeks, have students use rulers to record the each individual plant's growth, as well as an average for each group, in a data table similar to the one supplied.
6. Remind students to nurture their plants – treating them each the same so that the only experimental variable is the types of species being tested.
7. Once the two weeks are complete, have students take collected data, graph it, and analyze it. Have students answer questions pertaining to the relationship of the data, including an analysis of the presence of a linear relationship.

Closure (Reflection)

Have students reflect on their experiment and what they learned in a journal entry, class presentation, and/or essay response on the next formal assessment.

Assessment

Give students a project grade for the planting, maintenance of plants, record of data, and final report of analysis and conclusions. Partner with a science teacher to help students use their work to write a formal lab report.

Adaptations (for students with learning disabilities)

Spend more in-class time with students on the project itself. Another option is to have students work in selected partner pairs rather than larger groups to help ensure greater participation and more involvement.

Extensions (for gifted students)

Ask students to create a presentation on their project or photograph their work through the experiment to showcase at the end of the assignment.

Possible connections to other subjects: Science

STUDY of PLANTS

Purpose:

Hypothesis:

Materials:

Procedure:

Data Table:

DAY NUMBER	Plant one growth (cm)	Plant two growth (cm)
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		

Enter the data from the 1st and 2nd column and the 1st and 3rd column into two lists in a graphing calculator. Use the data to answer the questions below.

1. What is the independent variable in this situation?

2. What is the dependent variable in this situation? Why?

3. Do you think that the graph of these data will be fairly linear? Why or why not?

4. Graph the data of day number on the horizontal axis and the plant growth on the vertical axis.
   What window did you use for your graph?
   Xmin: Xmax: Xscl:
   Ymin: Ymax: Yscl:
5. Using the data points for Day 2 and Day 7, find a linear equation that fits this data set.

6. What is the meaning of the slope in your equation?

7. What is the meaning of the y-intercept in your equation?

8. Using your equation, find an estimate of plant growth for the Day 12.

9. Using your equation, predict the day that the plant growth could triple in size.

10. Did both of your species of plants represent linear relationships? Explain.

11. Back to the original purpose of the experiment, did native species thrive better outdoors than Non-native species? Explain.
12. From this activity, what is a linear function and how is it represented graphically?

MATH

Geometry

"*The Geometry of Trees*"

UNIT: The Geometry of Circles
Unit Essential Question: How are circumference, diameter, and the relationship of Pi of a circle related?

LESSON: The Geometry of Trees
Lesson Essential Question: How can trees be used to explain the geometric concepts of circles?

STANDARDS ADDRESSED

National

Explain volume formulas and use them to solve problems:

G-GMD.1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments

Find arc lengths and areas of sectors of circles:

G-C.5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector

South Carolina

Geometry Standard IV.A.1: Find areas of circles

Geometry Standards I.D.1, IV.A.5, V.A.7: Using graphing calculators, spreadsheets and dynamic, interactive geometry software, determine and describe the resulting change in the area and perimeter when one or more dimensions is changed, and apply this idea in solving problems

Guiding Questions

1. What is the formula for the circumference of a circle?
2. What is the formula for the area of a circle?
3. What is pi (π) and how is used in the geometry of circles?

Background Information

Everyday objects can be used to explore the principles of geometry. Nature has a variety of examples for students to explore.

Lesson Objective(s)

The student will:

- Solve and explain problems involving the circumference of a circle
- Select appropriate units of measurement in a real-world context
- Explore how the circumference, diameter, and the relationship of Pi of a circle are related

Materials/Resources

String -- 1 foot per student
Cut sections of tree limbs -- 2 to 6 inches in diameter and about 1/2 inch thick
Rulers - 1 per student
Paper
Pencils

Preparation

1. Obtain sections of cut tree limbs.
2. Have needed material available for students.
3. Put the needed formulas on the board. (C= Pi * Diameter)

Procedure

1. Discuss with the students the different parts that make up a tree trunk and the seasonal growth patterns.
2. Hand out the cut tree limbs to the students.
3. Have the students determine the age of their trees by counting the summer growth rings.
4. Discuss the concept of circumference and how it is related to a circle.
5. Hand out the string and the rulers to the students.
6. Have the students measure the circumference of their tree limbs using the string and the rulers. The students will wrap the string around the tree limb and use the ruler to measure the length of the string. Use this opportunity to talk about appropriate measurement units. Ask students what measurement unit they should use in this situation.
7. Have the students then measure the diameter of the tree limbs using their ruler.
8. Discuss the concept of pi and how it is calculated. (Circumference/Diameter).
9. Have the students calculate pi using their measurements from the tree limbs.
10. Compare their calculated number for pi to 3.14.
11. Review the formula, C= pi * Diameter, and why it is not always practical to use string to measure the circumference of a circle.
12. Have the students calculate the diameter when only the circumference is known.
13. Discuss with the students why this is important when foresters measure live trees.
14. Take students outside to take measurements of various tree limbs. From these measurements, have students hypothesize on the age of the tree based on their data from cut limbs in class. Again, relating their in-class experience to their outside field work, have students measure the circumference of the trunks of trees and predict the - age of the trees.

Closure (Reflection)

Have the students review this concept by working practice circumference problems on the board, independently, with partners, and/or as a whole group.

Assessment

The students will be assessed by teacher observation and class participation. The students will also be evaluated on the review problems given at the end of the lesson. An additional assessment could be to have students exchange their tree limb pieces with a

partner and remeasure using the string and then the ruler. Each student calculates the diameter with the string measurement and then the formula measurement. Partners compare answers. Differences in measurement calculations should be discussed. Groups should be able to point out why the two partners have different measurements.

Adaptations (for students with learning disabilities)

Spend more in-class time with students on the concept; Spend more than one day on the concept to make sure that the formulas and learned.

Extensions (for gifted students)

This lesson could also be used to teach finding the area of a circle. Additionally, students could create a presentation, flyer, or poster to showcase at the end of the assignment.

Possible connections to other subjects: Science

MATH

Algebra 2

"Acid Rain & the Logarithmic Scale"

UNIT: Logarithms, Log scales, & Log Functions
Unit Essential Question: What are logarithms and log scales?

LESSON: The Log Scale of pH
Lesson Essential Questions: How are log scales used in real-world applications? And how is pH an example of a log scale?

STANDARDS ADDRESSED

National

Analyze functions using different representations:

F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Construct and compare linear, quadratic, and exponential models and solve problems:

F-LE.4. For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

South Carolina

Standard IA-1: The student will understand and utilize the mathematical processes of problem solving, reasoning and proof, communication, connections, and representation.

IA-1.1: Communicate a knowledge of algebraic relationships by using mathematical terminology appropriately.

IA-1.3: Apply algebraic methods to solve problems in real-world contexts.

IA-1.4: Judge the reasonableness of mathematical solutions.

IA-1.5: Demonstrate an understanding of algebraic relationships by using a variety of representations (including verbal, graphic, numerical, and symbolic).

IA-1.6: Understand how algebraic relationships can be represented in concrete models, pictorial models, and diagrams.

Standard IA-4: The student will demonstrate through the mathematical processes an understanding of algebraic expressions and nonlinear functions.

IA-4.6: Carry out a procedure to simplify algebraic expressions involving logarithms.

IA-4.10: Carry out a procedure to solve logarithmic equations algebraically.

IA-4.11: Carry out a procedure to solve logarithmic equations graphically.

IA-4.13: Carry out a procedure to graph logarithmic functions.

Guiding Questions

1. What is acid rain?
2. What is the pH scale and how is it an example of a log scale?
3. How are values on a log scale expressed mathematically*?*

Background Information

Everyday applications of logarithms and the log scale can help students better understand the mathematical concept. One such example is the pH scale used in science to determine the acidity or alkalinity of a substance. Students will do a short lab activity investigating the pH scale, apply it to their own environment by testing local rainwater samples, and apply the mathematical concept of log scales visually, graphically, and with technology.

Lesson Objective(s)

The student will:

- Brainstorm and share their beliefs and opinions as to what constitutes acid rain.
- Investigate the pH scale and determine the pH of substances to gain a better understanding of what constitutes as acidic, basic, and neutral.
- Apply logarithmic scales and understand it as a base ten scale.
- Determine the mean (average) of measured values on logarithmic scales.
- Develop the scientific background and terminology necessary for understanding the range of acidity of acid rain.

Materials/Resources

<u>Class Materials:</u>
Butcher Block Paper / Markers
Masking Tape
Drinking straws
2-clear wide mouth cups
Approximately 125mls of Universal Indicator solution with charts
Approximately 500 ml of:
-Lemon Juice
-Vinegar
Approximately 1 Liter of:
- Distilled water
- Tap water
One half liter container for making the baking soda solution
Baking Soda (approx. 4 Tablespoons)
Assess to sink for washing and rinsing
Optional: Battery acid, Drain Cleaner, Cola, Ammonia, Milk, Orange Juice

<u>Group Materials:</u>
1 cafeteria tray
5 clear plastic wide-mouth cups
5 medicine droppers
1 small squeeze bottle for the indicator solution
2 Styrofoam egg cartons or some reactive tray
1 Universal Indicator Color Chart
2 pH data sheets (included)
Safety goggles

<u>Student Materials:</u>
Graphing Calculator

Preparation/Activation Strategy

*Long-term advance preparation: Take the class out one or two weeks ahead of starting this lesson to place water collection containers in your outdoor classroom/learning environment. Let them know that you will use these samples in an upcoming class activity and unit of study.

Activating Strategy (Day lesson starts): Arrange students in groups to develop a list of what they know about acid-rain, what they may have heard about acid-rain and/or any questions about acid-rain. From group reports, on a large Post-it paper or poster board, compile a classroom-generated list of statements and questions about acid rain. Post this list in the classroom to serve as a useful tool for students to sort out the scientific validity of hearsay information, and, as the unit progresses, to factual information from statements more related to social values and global change. An optional extension of the posting could be to post another classroom-generated list titled: 'What We Don't Know About Acid Rain.'

Procedure

DAY ONE

1. First, students will observe a teacher demonstration to learn how to test solutions for pH levels.
2. Prepare in advance for each group a tray with a set of labeled plastic cups containing: Tap Water, Normal Rain (***Distilled water that has been exposed to the environment for at least a week***), Lemon Juice, vinegar, and Baking Soda Solution (4 tablespoons per 500 ml tap water). Additionally, each group will need a squeeze bottle labeled "Universal Indicator", Universal Indicator color chart, 2 egg cartons, safety goggles and the Lab Sheet.
3. Draw out and discuss the pH scale. Point out on the 1-14 pH scales that scientists classify chemicals into three groups according to how they react: ***acids***, ***bases (alkaline),*** and chemicals that are neither of these are called ***neutral***.
4. Discuss some of the shared properties of "acids": sour-taste, breaks-up proteins, dissolves metals, conduct electricity.
5. Discuss some of "bases": Baking Soda, Soap, Toothpaste, ammonia, drain-cleaner, and milk of magnesia. You may also mention other substances with weaker acidity and alkalinity strength to show substances can be all along the scale.
6. Explain they will be testing a variety of substances to see where the substances belong on the pH scale, but first you (the teacher) will model for the class the testing of normal rain (distilled water) to see where it belongs on the pH scale.
7. Explain and show how to use the Universal Indicator Solution and plot the pH of the normal rainwater. The directions for the students are on the lab sheet.
8. Teacher Note: pH paper is always another option in testing the pH of a substance…in the next lesson students will use pH probes and their graphing calculator to determine the pH of substances as well as examine the powers of ten on the pH scale.
9. Have students make predictions about the substances they will test and record those predictions on their lab sheet before they conduct the pH level for each substance. After they have made their predictions, have the students conduct the pH test on the various substances. If the students find the color of the test too faint, too dark or cloudy have them enter more Indicator Solution.
10. Have them read and complete the lab sheet.
11. Pool from the class groups the measured pH data from the Tap water, Baking Soda solution, Lemon Juice, Normal rain, and vinegar from groups as they finish their testing.
12. ***(Teacher Note: Save this class pooled data. You will*** *use it as part of tomorrow's* ***follow-****up assignment…to average the pH for each substance.****)***

13. When all the results are posted, ask general questions about the results:
    i. Which substances were the most acidic, basic, etc.
    ii. What substances if any varied extremely in the measured pH level? (You may also inquire if they have any questions and other personal observations)
14. Finally, poll the class for their predicted pH values of given substances on part B of the Lab-sheet. Ask students to justify their thoughts and findings. You may want to have some of these optional substances on hand to test the pH of as well. The pH levels of these substances are listed below:

    Answer Key to Part B on Lab-sheet:

Battery acid - pH 1	Drain Cleaner - pH 13	Cola - pH4
Ammonia - pH 11	Milk - pH 6.5	Stomach Acid - pH 1

    Orange Juice –pH 5 *(may vary)*

**At this point, you may start to discuss the pH scale as a Logarithmic Scale, time permitting.

DAY TWO

1. *Advance Preparation*: Locate the pH data collected during Day 1.
2. Assign groups a substance to calculate its mean pH level from data collected during Day 1.
3. Students will soon calculate and plot the mean pH for the assigned substances on the posted classroom pH scale.
4. Discuss and explain that logarithmic scales are exponential scales because it is calculated using exponents of numbers with the same base, in this case a base of ten.
5. Ask if anyone is familiar with the Richter scale and what it measures. Note the Richter scale was named after its inventor Charles Richter (1900-1985), a seismologist at the California Institute of Technology. Discuss that the Richter scale is a logarithmic scale, a base ten scale, which measures the amount of ground movement in an earthquake. For example, a tremor of 5.0 on the Richter scale is ten times more powerful than one measured at 4.0. Additionally, a tremor of 5.0 is 100 times more powerful than a tremor measured at 3.0.
6. Ask students to compare various tremor readings. For example, how much more powerful is a tremor reading of 6 than a reading of 4 or 3, etc. You may also want to ask how much weaker is a reading of 2 compared to a reading of 5? [1000 times weaker]
7. Explain and draw out the pH scale as logarithmic, a scale representing powers of ten. Have students draw along with you on their own paper.
8. Explain that the pH scale actually measures the amount of positive hydrogen ion concentration (H_3 O+) in a substance. A zero pH measure represents 10^0 and the calculated equivalent 10 to the power of zero is 1 the measured amount of positive hydrogen ion concentration (H_3 O+) in the substance. A pH measure of 1 represents ten to the power of negative one, written as 10^{-1} , or calculated is the equivalent 0.1 positive hydrogen ion concentration (H_3 O+) in the substance, and 2 represents concentration levels of 10^{-2} (or 0.01), and 3 is 10^{-3} (or 0.001), etc.
9. Reminder: Check for understanding.
10. You can then explain logarithms or you may simply at this point show common log 10 n = m. And, that n = log10 m can be used to find the exponent of ten if you know the calculated value, m. For example, from above we wanted to find the exponent in 10? = 0.000055, so calculate (using the key log on the calculator)

log 0.000055 and enter. The calculator should display -4.2596… as the pH level. Consequently, the average of pH 4 and pH 5 is not pH 4.5 but rather pH 4.2596. This will surprise students because they will expect the average of pH 4 and pH 5 to be pH 4.5 and it is not such on the logarithmic scale.

11. However, again demonstrate how to calculate the pH mean of a chosen substance. For example, perhaps for orange juice the readings recorded may have been a pH of 5, 5.5, and 6. The average pH for the juice would be:

    $(10^{-5} + 10^{-5.5} + 10^{-6}) / 3$ which equals

    $(0.01 + 0.000003162 + 0.000001) / 3$ which equals

    4.721×10^{-6} OR 0.000004721,

    which is then converted to a pH level reading by taking the common log of this number. So, log 0.000004721 is calculated to be -5.3256 or pH level 5.3256, which is between pH 5 and 6.
12. Students should be able to calculate the mean pH of the substances tested in class yesterday and after calculating them in a group setting (letting them check and discuss with their peers), post the means on the large-scale classroom pH scale.
13. Discuss and explain that logarithmic scales are exponential scales because it is calculated using exponents of numbers with the same base, in this case a base of ten. The word logarithm literally means "ratio of number". Logarithmic scales are different from linear scales. On a linear scale the units are spaced so that the differences between successive units are the same. Whereas, on logarithmic scale the units are spaced so the ratio between successive units is the same.
14. To complete this day, have students complete the Day Two worksheet.

DAY THREE

1. From Lesson 2 students should understand that the pH scale is logarithmic and differences in pH readings are a multiple of ten.
2. Conduct a class demonstration to focus on the pH of normal rainwater.
3. Ask students why rainwater is slightly acidic, as compared with 'pure water'.
4. Explain that pure water should have a pH of 7.0, which can change depending on what else the water contacts.
5. Complete the following in class demonstration showing the acidifying effect of air on water.
    a. Demonstration: Show two cups of the rainwater. (You can make your own normal water by taking distilled water you have exposed to the classroom atmosphere at least a week or two)
    b. Measure the pH of one cup.
    c. Emphasize the water in both cups are the same.
    d. Either pour them from the same container into two cups or measure the pH of both.
    e. Have a student blow through a straw for approximately fifteen seconds into the cup to yet be measured for pH. The student may take breaths as the class counts off fifteen seconds.

f. Explain that this process very roughly simulates rain falling through carbon dioxide in the atmosphere.
g. Measure the pH of this cup of rainwater that has been exposed to student blowing.
h. You may want to pose questions like, "What change took place in the water?" [It became more acidic], "Does anyone have any ideas about why this took place?", "What is in the air we breathe out that might cause water to change this way?"
i. Point out that when carbon dioxide gas dissolves in water and reacts with it, it becomes more acidic. The acid that is formed in the water is carbonic acid. Similarly, pure water raining through the sky mixes with some of the gases in the air, such as carbon dioxide, and becomes acidic. Normal rain is therefore slightly acidic and has a pH of 5.6. Point out that this small amount acidity in rainwater is good, since 5.6 is acidic enough to react with minerals from rocks and soils so they dissolve. These minerals trickle down to nourish the roots of plants. You may record the range of normal rain as 5.6-6.0 on the class pH chart. Explain that, while normal rain is slightly acidic, it is not what is referred to as "acid rain". Explain that scientists have defined acid rain as anything below pH 5.6. Acid rain is formed when the atmosphere is filled with gases and particles that come from factories, power-generating plants, and cars. These human-made pollutants in the air react with sunlight and moisture to form acids. These acids dissolve into the rainwater as it falls, and make it more acidic than carbon dioxide by itself does. How acidic the rain becomes as it falls depends on how much of each of these pollutants there are.

6. Mark the class chart showing acid rain range of pH 5.6 and below.
7. Students will now measure the pH level of pre-collected rainwater from varied local spots to determine the acidity of local rainfall.
8. The students will hypothesis why rainfall from different locations has different acidity.

Closure (Reflection)

Have students choose to complete one of the following explorations as homework and be prepared to discuss their results tomorrow when they return to class.

1. Determine the carbon footprint for their family. The web site: http://safeclimate.net/calculator/
2. Determine the Number of trees your family needs to plant to offset the negative effects your family has on the climate. The web site: http://www.americanforests.org/resources/ccc/index.php
3. Determine the Emissions/ Pollution your family contributes to the atmosphere. The web site: http://www.airhead.org/Calculator/

Assessment

The students will be assessed by teacher observation, class participation, and completed worksheets.

Adaptations (for students with learning disabilities)

Spend more in-class time with students on the concept; Spend more than days allotted to make sure that the formulas and learned.

Extensions (for gifted students)

The following are two suggestions of personal projects you may develop and present to the class for extensions or extra credit: 1) Conduct your own experiment to determine the effects low pH / Acid Rain has the environment, 2) Explore the graph of temperature verses pH readings for rainfall collected from varied storm fronts.

Possible connections to other subjects: Science, Language Arts

pH Scale Lab Sheet / Day 1

Name_____ Date_____

A. Testing pH of Substances

1. Choose a test solution.
2. Record your prediction of that solution's pH on this sheet.
3. Squirt a small amount of test solution into a compartment in test tray.
4. Carefully add 2 drops of Universal Indicator to the liquid in the tray and gently swirl the mixture.
5. Match each color of the mixture to the pH chart and decide the pH of the test solution.
6. Record your test result (pH number) on this sheet.
7. Repeat this procedure until you have tested all five solutions.
8. When you have finished, go on to predict the pH of the other substances listed below.

TEST SOLUTIONS

Test Solutions	Prediction	Result
Tap water		
Baking soda solution		
Lemon juice		
Normal rain		
Vinegar		

OTHER SUBSTANCES

Substances	Prediction	Result
Drain cleaner		
Battery Acid		
Stomach Acid		
Milk		
Ammonia		
Orange Juice		
Cola		

B. Recording the pH of Substances

Write the name of each solution you tested where it belongs on the pH scale below:

Very Acidic			Slightly Acidic				Neutral				Slightly Basic			Very Basic
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

pH Scale Additional Practice / Day 2

Name_____ Date_____

Directions: Complete the following questions justifying any calculations.

1. A logarithmic scale is a scale calculated using what numbers?

2. An increase of one unit on the Richter scale corresponds to multiplying the energy of a quake by what number?

3. To what factor does an increase of two units on the Richter scale correspond?

4. How many times more intense is an earthquake with a Richter magnitude of 6.7 than one with a magnitude of 4.2?

5. What is the major difference between a linear scale and a logarithmic scale?

6. How are the Richter-Scale and pH-scale alike?

7. What does the pH scale measure?

8. Why is a logarithmic scale better than a linear scale for illustrating the data below?
$4x10^{-34}\,kg$; $1.89x10^{-24}\,kg$; $10^{-19}\,kg$; $3.64\,kg$; $1.42x10^{6}\,kg$

9. Find the average of the following pH values.
a.) pH measures of 4 and 5.
b.) pH measures of 3 and 6.5.
c.) pH measures of 2.5, 4, and 5.
d.) pH measures of 5, 6, and 7.

10. An acidic solution is increased in strength from pH 5 to pH 1. How many times more concentrated is the solution?

MATH

Pre-Calculus

"Fibonacci Sequence in Nature"

UNIT: Series & Sequences
Unit Essential Question: What are examples of various series and sequences?

LESSON: The Fibonacci Sequence
Lesson Essential Questions: What is the Fibonacci Sequence and where are there examples in nature?

STANDARDS ADDRESSED

National

A-SSE: Seeing Structure in Expressions

Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.
2. Use the structure of an expression to identify ways to rewrite it.

F-IF: Interpreting Functions

Understand the concept of a function and use function notation

3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.

F-BF: Building Functions

Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities.
   a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

South Carolina

IA-6.1 Categorize a sequence as arithmetic, geometric, or neither.
IA-6.7 Carry out a procedure to determine consecutive terms of a sequence that is defined recursively.
IA-6.8 Carry out a procedure to define a sequence recursively when given four or more consecutive terms of the sequence.
IA-6.9 Translate between the explicit form and the recursive form of sequences.

Guiding Questions

1. What are sequences and series?
2. What are the characteristics of a recursive sequence?
3. How is the Fibonacci Series an example of a recursive sequence and what are examples in nature*?*

Background Information

The Fibonacci sequence is not an arithmetic or geometric sequence, as required to learn by many state and national standards. It is not an arithmetic sequence as the difference between consecutive terms is not constant. It is not a geometric sequence as the ratio between two consecutive terms is not constant. It is, instead, considered a "recursive" sequence, meaning that its next term depends somehow on the previous term(s). In this case, it's the sum of the last two terms. This lesson is an introduction to the Fibonacci sequence and how it is another type of sequence one can come in contact with, especially in nature.

Lesson Objective(s)

The student will:

- Understand the Fibonacci sequence (numerically, algebraically, and geometrically).
- Understand how the Fibonacci sequence is expressed in nature.

Materials/Resources

Discovery School video on unitedstreaming.com: "Patterns, Symmetry, and Beauty"
Search for this video by using the video title (or a portion of it) as the keyword.
Selected clips that support this lesson plan: "The Fibonacci Sequence in Nature"
Copies of the Creating the Fibonacci Spiral handout (provided)
Quarter-inch grid paper
Ruler
Compass
Camera/Video Camera, Computers with Internet access (optional)

Preparation/Activation Strategy

Download or find the video on 'Patterns…' provided for by Discovery Education. Show the entire video or the clip on "The Fibonacci Sequence" to introduce the lesson.

Procedure

1. Begin by discussing the Fibonacci sequence, which was first observed by the Italian mathematician Leonardo Fibonacci in 1202. He was investigating how fast rabbits could breed under ideal circumstances. He made the following assumptions:
    1. Begin with one male and one female rabbit.
    2. Rabbits can mate at the age of one month, so by the end of the second month, each female can produce another pair of rabbits.
    3. The rabbits never die.
    4. The female produces one male and one female every month.
2. Work with the class to see if students can develop the sequence themselves.
3. Remind them that they're counting pairs of rabbits (the number in parentheses), not individuals.
4. Walk them through the first few months of the problem:
    (1.) Begin with one pair of rabbits. (1)
    (2.) At the end of the first month, still only one pair exists. (1)
    (3.) At the end of the second month, the female has produced a second pair, so two pairs exist. (2)
    (4.) At the end of the third month, the original female has produced

another pair, and now three pairs exist. (3)

(5.) At the end of the fourth month, the original female has produced yet another pair, and the female born two months earlier has produced her first pair, making a total of five pairs. (5)

5. Write the pattern that has emerged in step 2 on the board: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233...
6. Discuss the sequence.
7. Help students understand that to get the next number in the sequence, you add the previous two numbers. This is the Fibonacci sequence.
8. The term that mathematicians use for the type of rule followed to obtain the numbers in the sequence is algorithm (It is also known as a recursive sequence).
9. As a class, continue the sequence for the next few numbers.
10. Tell students that the Fibonacci sequence has intrigued mathematicians for centuries. What's more, mathematicians have noticed that these numbers appear in many patterns in nature, often creating the beauty.
11. Tell students that they are going to look for Fibonacci numbers in objects from nature. Make sure that students understand that they are looking for specific numbers that appear in the sequence, not for the entire sequence.
12. Before they go and investigate, they are going to create their own Fibonacci Spiral (worksheet included). Walk students through activity, have them share with their peers, and show them the key when they are finished. For more information, go to http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html
13. Once students are familiar with the Fibonacci Sequence, through lecture, class demonstration, and their own work, discuss how rectangles with Fibonacci dimensions are used in art and architecture. You may use an example from artist Piet Mondrian, who used three- and five-unit squares in his paintings. Also, the ancient Egyptians used Fibonacci dimensions in the Great Pyramid at Giza, and the Greeks used them in the Parthenon. Brainstorm with students to name animals that have spiral shapes, such as snail and nautilus shells. (Some scientists think the spiral protects an animal inside its shell.)
14. Explain they will now go outside to find examples in nature. Divide students into groups and provide each group a camera or video camera. Aided with their newly constructed Fibonacci Spiral, ask student groups to go to the outdoor classroom/learning environment on campus, look for, and then photograph examples of the Fibonacci Sequence in nature. Students will then give their photos to you in order for a presentation to be put together of the class collection of photos. This can be shared with other classes, colleagues, and even put in the teacher or school website.

Closure (Reflection)

Share a complete presentation with all photographs for a 'Fibonacci Sequence Art Collection.'

Assessment

The students will be assessed by teacher observation, class participation, and the completed worksheet. A grade can also be given for the photographs themselves and/or the teamwork used in the nature investigation.

Adaptations (for students with learning disabilities)

Spend more in-class time with students on the concept.

Extensions (for gifted students)

Finding Ratios:

Suggest that students measure the length and width of the following rectangles:

- a 3" x 5" index card
- an 8.5" x 11" piece of paper
- a 2" x 3" school photo
- a familiar rectangle of their choice

Have students find the ratio of length to width for each of the rectangles. Then have them take the average of all the ratios. What number do they get? (1.61803). Tell students that this ratio is called the golden ratio and that it occurs in many pleasing shapes, such as pentagons, crosses, and isosceles triangles, and is often used in art and architecture.

An Algebraic Rule:

Encourage students to try to develop an algebraic formula that expresses the Fibonacci sequence. The formula is described below.

Represent the first and second terms in the sequence with x and y. Then the first few terms would be expressed as follows:

First term = x
Second term = y
Third term = (x + y)
Fourth term = (x + y)+ y = 1 x + 2 y
Fifth term = (x +2 y) + (x + y) = 2 x + 3 y
Sixth term = (2 x +3 y) + (x +2 y) = 3 x + 5 y
Seventh term = 3 x +5 y + 2 x +3 y = 5 x + 8 y

Ask the students whether they notice anything familiar about the coefficients. (They're numbers in the Fibonacci sequence.)

Creating the Fibonacci Spiral

Name: Date:

Materials

- sheet of quarter-inch grid paper
- ruler
- compass

Follow the directions and watch the spiral emerge.
(Each successive square will have one edge with a length the sum of the two squares immediately preceding it.)

(1.) Draw a 1-inch square. Draw a second 1-inch square to its left, making sure the squares touch.

(2.) Draw a 2-inch square above the two 1-inch squares, touching the lower squares.

(3.) Draw a 3-inch square to the right of the three existing squares; its left side should touch the other squares.

(4.) Draw a 5-inch square below these squares.

(5.) Draw an 8-inch square to the left of the existing five squares.

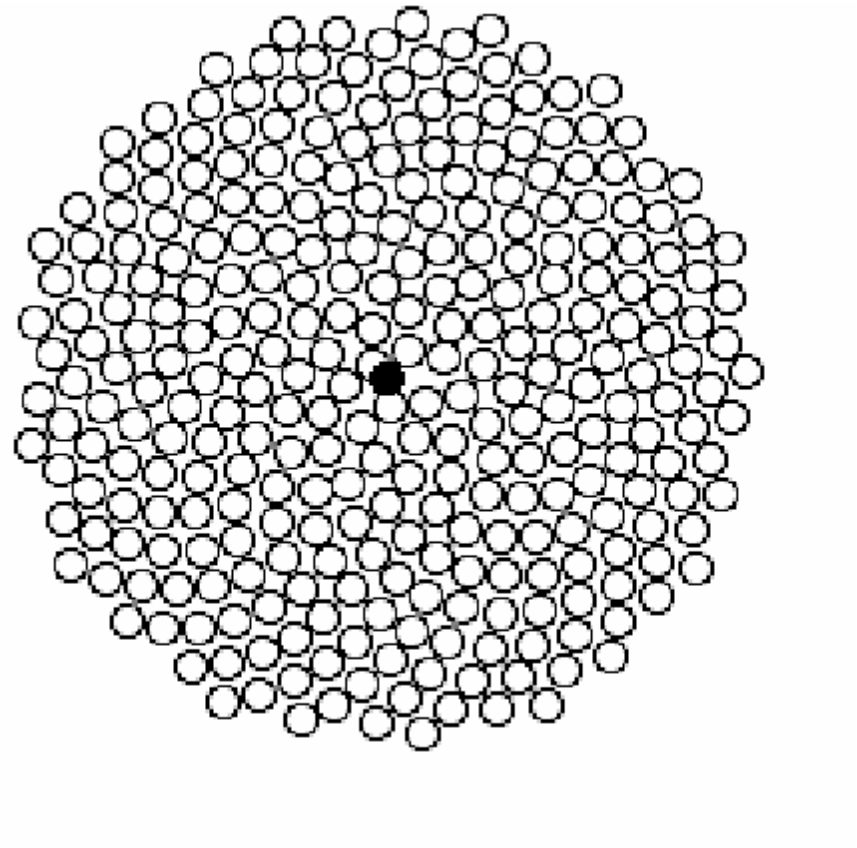
(6.) Draw a 13-inch square above the six squares.

(7.) Use a compass to complete the drawing. Within each square of your drawing, draw an arc from one corner to the opposite corner. (Each arc will have a radius equal to the length of one side of its square.) Connect each arc to the next. To begin, place your pencil in the upper-right corner of the original 1-inch square and draw an arc toward the lower-left corner. In the second square, draw an arc from that point (the lower-right corner) to the upper-left corner of the second square. Continue drawing arcs in each square, starting each arc at the point where the last one ended.

(8.) You will create a logarithmic spiral. What forms in nature reflect this shape?

Creating the Fibonacci Spiral

KEY:



Science

SCIENCE

Physical Science

"*Nature Metric Scavenger Hunt*"

UNIT: Scientific Inquiry
Unit Essential Question: How can one apply knowledge of metric units to measuring objects outside?

LESSON: Metric Measurement and Conversions
Lesson Essential Questions: How are metric measurements converted? How can knowledge of metric unit measurements aid in finding objects of a certain size?

STANDARDS ADDRESSED

National

NS.9-12.1 SCIENCE AS INQUIRY: As a result of activities in grades 9-12, all students should develop
- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

South Carolina

Standard PS-1: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

PS-1.2 Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.

PS-1.3 Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.

PS-1.5 Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas and dimensional analysis), graphs, models, and/or technology.

Guiding Questions

1. How are metric units converted?
2. What are the appropriate units used to measure certain objects?
3. How can metric units be used to measure objects in nature*?*

Background Information

The metric system is ideally suited to scientific pursuits because in it everything is based on 10's and powers of 10. This makes the math within an experiment easy. For instance, if you need to go from centimeters to meters, you simply multiply by 100. When a student becomes familiar with the sizes of these units, they will be able to make estimations in metric units. Being able to estimate them will help them judge whether they have done unit conversions properly and more adequately choose the correct measurement unit for measuring various objects.

Lesson Objective(s)

The student will:

- Be able to convert metric units
- Understand the appropriate unit used to measure certain objects

Materials/Resources

Ruler
Meter Stick
"Metric Scavenger Hunt" worksheet (provided)

Preparation/Activation Strategy

Review with students the process of metric conversions. If more review is needed, one website with "how-to" steps: http://www.purplemath.com/modules/metric.htm

Procedure

1. Begin by explaining to students that they will get the opportunity to participate in a scavenger hunt outdoors. To be successful, they will need to use their skill converting metric units and estimating metric sizes. Optionally, you may use this activity as a competition and award the individual or group who finishes first or finds the most.
2. Distribute worksheets and have students convert the length measurements in class before traveling outdoors.
3. Once conversions are done – have students check with their neighbors on their answers or discuss answers as a whole group.
4. Remind students that accuracy is also important. Students cannot be more than 0.005 m (5 mm) off in total difference. However, encourage creativity in finding solutions.
5. Take students to the outdoor classroom/learning environment and allow them 20 minutes to "hunt" for their measurements.
6. After time has elapsed, stay outside and have some students show or share the objects they recorded measurements for on their worksheet. Optionally, recognize the winner(s).

Closure (Reflection)

With objects that can be taken from the outdoor garden (for example, a piece of mulch or blade of grass), create a 3-D class poster or bulletin board reference chart on metric measurement values (Example, a small pebble for 1mm, width of blade of grass for 1 dm, etc.)

Assessment

The students will be assessed by teacher observation, class participation, and the completed worksheet. A grade can also be given for the 'metric measurement value' poster if given as an individual or small group project.

Adaptations (for students with learning disabilities)

Spend more in-class time with students on conversions to make sure there is full understanding before going outside. Pair students up to help with greater success in the Scavenger Hunt.

Extensions (for gifted students)

Ask students to create a 3-D ‘Metric Measurement Value’ poster to show visually the difference in each metric increment of length.

Possible related subjects: Mathematics, Art

Metric Scavenger Hunt

Name: Date:

Materials: Meter stick, Ruler, Pen/pencil

Directions: You must try and find as many items in and around our school outdoor classroom that measure *as close as possible* as the measurements listed below. You want to try to be exact! If you get stuck, you can be slightly off, but can have no more than 0.005m (_____mm) of difference. To receive full credit, you must find at least 10 measurements. If you find more than anyone-else in the class, you will be rewarded! (Items cannot be listed more than once.)

Original Measurement	**Converted Measurement**	**Object Description (What & Where found)**	**Actual Measurement**	**Difference**
0.001 m	_____ mm			
0.003 m	_____ mm			
0.005 m	_____ mm			
0.015 m	_____ mm			
0.01 m	_____ cm			
0.03 m	_____ cm			
0.05 m	_____ cm			
0.15 m	_____ cm			
0.1 m	_____ dm OR _____ cm			
0.3 m	_____ dm OR _____ cm			
0.5 m	_____ dm OR _____ cm			
1.5 m	_____ dm OR _____ cm			
100cm	_____ m			
3000mm	_____ m			
50dm	_____ m			

SCIENCE

Biology

"Food Webs in Nature"

UNIT: Energy Flow in an Ecosystem
Unit Essential Question: How does energy flow in a food chain and food web in an ecosystem?

LESSON: Food Chains & Food Webs
Lesson Essential Questions: What are examples of local food webs?

STANDARDS ADDRESSED

National

NS.9-12.3 LIFE SCIENCE: As a result of their activities in grades 9-12, all students should develop understanding of

- Interdependence of organisms
- Matter, energy, and organization in living systems
- Behavior of organisms

South Carolina

Standard B-3: The student will demonstrate an understanding of the flow of energy within and between living systems.

B-3.6 Illustrate the flow of energy through ecosystems (including food chains, food webs, energy pyramids, number pyramids, and biomass pyramids).

Standard B-6: The student will demonstrate an understanding of the interrelationships among organisms and the biotic and abiotic components of their environments.

B-6.1 Explain how the interrelationships among organisms (including predation, competition, parasitism, mutualism, and commensalism) generate stability within ecosystems.

Guiding Questions

1. What are producers and consumers? What are some local examples?
2. What is a food chain/food web?
3. How does energy flow through a food chain/food web?

Background Information

Everything in nature is interconnected. One of the best examples of this in food chains and food webs. In these connections, one can find almost all types of organisms and life on the planet – from plants, to animals, fungus, and bacteria that decompose material back into the earth.

Lesson Objective(s)

The student will:

- Understand the flow of energy through a food chain/food web
- Be able to define producers and consumers and give local examples
- Draw or describe an example of a food chain and or food web

Materials/Resources

Each student:
Clipboard with paper
Each group:
Box of markers (8-count)
Set of blank index cards
Poster board

Preparation/Activation Strategy

Take students to the outdoor classroom. Begin the lesson with the question: "What did you eat for dinner last night?" Break responses down into individual ingredients (separate lasagna into pasta, beef, tomatoes, and cheese) and ask students to write them on their paper. Once you have a broad sampling, begin categorizing the ingredients into producers, and consumers. Use questions such as:

- Which of these foods come from plants?
- Which of these foods don't come from plants? (If mushrooms are on the list, remember that technically mushrooms are fungi not plants!)

At this point, introduce the idea of producers as plants, or more scientifically, as organisms that make their own food through photosynthesis. Introduce the idea of consumers as animals, or more scientifically, as organisms that eat producers or other consumers.

Break down the consumer category further into herbivore, carnivore, omnivore, and detritivore (or decomposer). Use questions such as:

- Of the consumers, which are animals that eat plants?
- Which are animals that eat other animals?
- Which eat both?
- Are there any decomposers? (Mushrooms, crab, shrimp, and lobster are likely to be the only decomposers.)

Introduce the vocabulary words herbivore, carnivore, omnivore, and detritivore at this point and give the formal definitions, having students copy these down.

Ask students to describe a food chain. As part of this discussion, try to follow one or more of the foods discussed (written on the students' paper) through the food chain. For example, sun → corn → cow → people. Make students understand that many food chains have the sun as the initial energy source, although you may want to briefly mention the existence of other food chains that do not depend on the sun.

Procedure

1. Introduce today's activity. Students should break into pairs or small groups and receive a box of markers and a set of index cards. Their first task is to create a color key to color code organisms by their role in the food chain. For example: green = producers, yellow = herbivores, red = carnivores, orange = omnivores, blue = detritivores.
2. When students begin to finish color coding, instruct students to take 10-15 minutes, walk around the outdoor classroom/learning environment and find examples (local) of each of these type of organisms – either by being present or where their presence can be observed indirectly (for example, bird droppings as a sign that a bird had been there). Encourage students to brainstorm on organisms not visible but that would be a part of this local

habitat or ecosystem. Using their color coding system, students should write the names of these organisms on their cards (one per card).

3. Next, have students get back with their partner or group and begin to organize their cards into food chains/webs. Definitely tell them that there are multiple food chains – encouraging them to make food webs maybe instead of one or several food chains. When students have identified a complete chain, have them glue it down on a piece of poster paper.
4. With 10 minutes before the end of class, have students stop and clean up. Any work they have remaining can be assigned as homework or finish the following day in class. Envelopes can be used to contain any cards that have not been glued down yet. If at least 50% of the groups have finished the activity at this point, it may be a good idea to have the remaining 50% bring their work home to finish.
5. The following class day, put a local food pyramid up on the board or overhead and ask students what they think the picture represents. They should recognize some of the examples or pictures from their food chain activity. Ask the students why there are more producers than consumers (herbivores) and more herbivores than carnivores (for example, grasses than rabbits and why there are more rabbits than bobcats). Discuss the transfer of energy from one level of the food chain to the next, focusing on how any one organism can't transfer the energy it gets from its food directly to the next organism in the food chain because it needs to use some of that energy itself to grow, reproduce and survive.

Closure (Reflection)

Have students share their poster presentation of a local food chain/web.

Assessment

The students will be assessed by teacher observation, class participation, and the completed poster presentation.

Adaptations (for students with learning disabilities)

Spend more in-class time with students on the concept; systematically pair stronger students with weaker students to encourage success.

Extensions (for gifted students)

Have students research local food chains/webs on their own and create a report or presentation the information they find.

SCIENCE

Chemistry

"Soil pH"

UNIT: Nature & Properties of Chemical Solutions
Unit Essential Question: What are examples of properties of chemical solutions?

LESSON: Acids, Bases, & the pH Scale
Lesson Essential Questions: What are properties of acids and bases? What is the best pH for soil and growing plants?

STANDARDS ADDRESSED

National

NS.9-12.2 PHYSICAL SCIENCE: As a result of their activities in grades 9-12, all students should develop an understanding of

- •Structure of atoms
- •Structure and properties of matter
- •Chemical reactions

South Carolina

Standard C-6: The student will demonstrate an understanding of the nature and properties of various types of chemical solutions.

C-6.5 Summarize the properties of salts, acids, and bases.
C-6.6 Distinguish between strong and weak common acids and bases.
C-6.7 Represent common acids and bases by their names and formulas.

Guiding Questions

1. What are acids, bases, and properties of each?
2. What is the pH scale?
3. How is the pH of soil important to vegetative growth?

Background Information

Many of the foods we enjoy have an acidic or basic nature. Citrus fruits contain acid, which give them a desirable tart or sour taste. Many common household products are basic in composition, such as cleaners and soaps. Weak bases found in bath soaps help create a slippery effect on surfaces; this is experienced when washing your hands. Bases have a bitter taste that we may have experienced as young children when we accidentally got a little soap solution in our mouth when we washed our face. Basic solutions are sometimes called alkaline. Acids, weak and strong, have important industrial uses. Sulfuric acid is important in petroleum refining, steel processing as well as in the process of fertilizer production. Weak acids are found in saliva and gastric juices.

Chemically, acids are defined as substances when mixed with water form hydronium ions, H_3O^+. Bases are defined as substances which form hydroxide ions, OH^-, when mixed with water. A color reaction with a special paper (called litmus paper) physically defines a solution as acidic or basic. Blue litmus paper turns red when exposed to an acidic solution

and red litmus paper turns blue when in contact with a basic solution. To more specifically define an acidic or basic substance, scientists devised a numerical scale, called a pH scale, to categorize substances as an acid or base. Numerically, the scale is from 0 to 14, with 7 being the midpoint. Any solution or substance having a pH value of less than 7 is known as an acid and above 7 is considered a base. Seven is considered neutral. A special test paper, pH Hydrion, is used to numerically measure pH. Depending on the acidic or basic nature of the test solution, the paper turns a specific color which can be matched to a standard color chart correlated with pH values. A pH meter can also be used to measure the pH of a solution or substance. The meter consists of a probe, which is placed in the solution and the meter displays a digital readout of the pH.

0 ——————7——————14

ACID———NEUTRAL———BASE

Agriculturally, the pH value of soil is an important factor or consideration for farmers. Particular crops and plants require a specific pH to thrive and produce high yields. The pH of the soil can even affect the color of leaves or flowers. Whether it is growing tomatoes in a small garden or soybeans over many hundreds of acres, knowing and maintaining the correct soil pH is a must. By conducting the following experimentation, one can gain a better understanding of acids and bases and how pH is measured.

Lesson Objective(s)

The student will:

- Understand the importance of a soil's pH
- Be able to identify the differences between an acid and a base

Materials/Resources

For each lab group:

Lab notebook
Ziploc plastic bags
Electronic balance
100 mL Beaker
100 mL graduated cylinder
Stirring rod or spoon
Distilled water
pH Hydrion paper
Computer lab access

Preparation/Activation Strategy

Review with students the pH scale – values of Acids and Bases and strong v. weak acids and strong v. weak bases.

Procedure

1. Explain to students they will be investigating the pH scale and its importance in growing food with an outdoor experiment. Have the students do the following:
    a) Select 5 different soil-testing sites from the outdoor garden and around the school building; make observations of the surroundings, which may lend to the possible

resulting differences in pH of the soils tested. In addition, include in the observations, any plants growing in the soil you are collecting from.

b) Vertically dig 6 inches into the site and place the sample retrieved at that depth into the plastic bag and label.
c) Weigh out approximately 10 grams or measure about 1 tablespoon of the soil and place into a plastic cup or beaker.
d) Add 60 ml or 1/4 cup of distilled water.
e) Swirl the soil and water mixture 3 times; use a clean stirring rod or spoon to thoroughly mix the water and soil.
f) Place the edge of a 2-inch piece of pH Hydrion paper into the mixture.
g) Observe the color change of the pH paper.
h) Try to match the resulting color to the colors listed on the outside of the pH Hydrion paper package.
i) The colors match with a correlated pH number. This number is the pH value of the soil.
j) If the number is less than 7, the soil has an acidic nature; If the number is more than 7, the soil has a basic nature.
k) Repeat the procedure or test by completing steps 3 through 11 using the other soil samples.
l) Compare your results to see if there are any differences in the pH of different areas tested.

2. Once the experiment is complete, have students put their results into an introduction slide for a presentation on the Soil pH connection. Ask students to research and relate their data results to the following:
    a) What are the results of the experiment?
    b) How do the results of your experiment relate to soil pH typically found in your local area?
    c) What type of vegetation does this soil pH support?
    d) What can account for the pH differences, if any, between your experiment and actual soil pH?
    e) What conclusions can be drawn from this experiment?
3. Students/Student groups should present their findings in class in a research conference style format.

Closure (Reflection)

Students share presentations in class with the audience of their peers asking questions pertaining to their research at the close of their presentation.

Assessment

The students will be assessed by teacher observation, class participation, and the completed presentation. The presentation rubric included in the Appendix can be used in grading the student work.

Adaptations (for students with learning disabilities)

Spend more in-class time with students on the concept and/or systematically pair/group students.

Extensions (for gifted students)

Have students research the following acid/base theories: Research the following acid/base theories: (a) Bronsted-Lowery, (b) Arrenhius, and (c) Lewis

SCIENCE

Physics

"Speed of Sound"

UNIT: Sound
Unit Essential Question: What is sound and what factors contribute to its speed?

LESSON: The Speed of Sound
Lesson Essential Questions: What is the speed of sound in an outdoor environment?

STANDARDS ADDRESSED

National

NS.9-12.2 PHYSICAL SCIENCE: As a result of their activities in grades 9-12, all students should develop an understanding of

•Motions and forces
•Interactions of energy and matter

South Carolina

Standard P-6: The student will demonstrate an understanding of the properties and behaviors of sound.

P-6.1 Summarize the production of sound and its speed and transmission through various media.
P-6.2 Explain how frequency and intensity affect the parts of the sonic spectrum.
P-6.3 Explain pitch, loudness, and tonal quality in terms of wave characteristics that determine what is heard.
P-6.4 Compare intensity and loudness.
P-6.5 Apply formulas to determine the relative intensity of sound.

Guiding Questions

1. What is the speed of sound?
2. Does temperature affect the speed of sound?
3. Does loudness affect the speed of sound*?*

Background Information

Sound travels at different speeds through different medium. In this exercise, students will be able to experiment with this principle, along with if sound intensity, or loudness, also has an effect on the speed of sound.

Lesson Objective(s)

The student will:

- Practice calculating the speed of sound
- Understand how various factors can affect the speed of sound

Materials/Resources

For each group:

Metric tape measure
Digital stopwatch
Thermometer
Drum and drumstick (or empty coffee can and metal spoon) OR various percussion instruments so that the different sounds are distinguishable for each group; For example, in addition to a drum, a triangle, cowbell, wood block, maracas, rain sticks – these may be easily obtained/ borrowed from the school band teacher
'Speed of Sound' worksheet (provided)

Activation Strategy

Ask students to think about sound. Ask them if sound needs a material (medium) to travel through. Make sure they understand that sound waves require a medium to travel. Next, discuss the different mediums that sound travels through – for example, ground, water, and air. Through Socratic questioning, ask students questions related to the mediums of sound travel:

For Example:

- What are examples of when sound travels through the ground? Water? Air?
- Have they every experienced hearing sound travel through different mediums? If so, what?
- Does sound seem to travel faster in different mediums?

Finally, explain they will test their thoughts and ideas in an outdoor lab.

Procedure

1. Take students to your outdoor classroom and split into groups with at least three people per group. Distribute worksheets to each group. Explain to the students that one person will record the group's answers, but they all must collaborate.
2. Have students record the outdoor air temperature in °C. (on worksheet)
3. Ask students to answer on their sheet: How long do you think it should take for a sound to travel the 100 m? (on worksheet)
4. Explain to the groups their experimental procedure: (It may help to demonstrate this with a few students before they disperse).
    a. Each group should measure a distance of 100 meters in a straight line.
    b. One group member should stand at one end of the measured distance with their instrument. This member is the "musician."
    c. The remaining two teammates should go to the other end of the 100 meter distance with a stopwatch.
    d. One teammate, the "watcher," should watch the "musician" while the other student, the "listener," should face away and listen for the sound.
    e. The "musician" should make a short, loud noise by striking the instrument. As the instrument is struck, shaken, etc., the watcher should start the stopwatch.
    f. When the listener hears the sound, he or she should immediately say "stop."
    g. Then the watcher stops the watch and records the time to one tenth of a second.
5. The procedure will be repeat Steps 4–6 five times.

6. Students will answer the questions: How consistent are your times? What might account for any differences?
7. Students will then switch roles. The experiment will be repeated at least two other times with different students striking the instrument, watching, and listening in order for the students to calculate an average time and avoid individual bias.

Closure (Reflection)

Student groups will share in class the results of their experiment. Teacher should lead class on a discussion of any similarities, differences, and trends. Ask the whole group to think about and discuss the following: Another way to measure the speed of sound would be to stand near a tall building, shout, and wait to hear the echo. To use the echo method, what adjustments would you have to make to the procedure in this lab?

Assessment

The students will be assessed by teacher observation, class participation, and the completed worksheet.

Adaptations (for students with learning disabilities)

Spend more in-class time with students on the concept. Give students their own worksheet so that each of them may see, write, and work with the data and concept.

Extensions (for gifted students)

Ask students to design an experiment on the following:
"How could you find out the effect of changing air temperature on the speed of sound? Write a set of procedures you could use to conduct such an experiment."

Possible connections to other subjects: Math, Band

Speed of Sound

Name: Date:

Before the Experiment:

1. Record Outdoor Air Temperature: _____ °C
2. How long do you think it should take for a sound to travel the 100 m?
3. Name of instrument used:

During the Experiment:

DATA TABLE (Remember units!)

Trials	Time for Student 1: _____	Time for Student 2: _____	Time for Student 3: _____
1			
2			
3			
4			
5			
6			
Average:			

After the Experiment:

4. How far did the sound travel?

   _____

5. How long did it take? (Calculate the average of the measured times.)

   _____

6. To calculate the speed of sound in air, use this formula: Speed=Distance/Time. Calculate the speed of sound from your experiment using an average of all student times.

   _____

7. How well does your result compare with the prediction you made in Question 2? Make a list of reasons to account for any differences.

   _____

8. What could you do to improve the accuracy of your measurements?

   _____

9. Do you think air temperature affects speed of sound? Explain.

   _____

Research: Use the speed you calculated in Number 6 and compare that to the speed of sound found in your textbook or online. How does it compare? What factors contribute to this speed?

Social Studies

Effectively Using the Outdoor Classroom
High School Curriculum for Interdisciplinary Studies

SOCIAL STUDIES

Global Studies 1

"The Connection between Indigenous Populations and their Environment"

UNIT: The Americas
Unit Essential Question: What were the origins, characteristics, and economic, social, political and technological achievements of indigenous peoples in the Americas?

LESSON: Nature's Connection to Culture
Lesson Essential Question: How did geography and climate affect cultures in the Pacific Northwest, Southwest, Great Plains, and Eastern Woodlands of North America?

STANDARDS ADDRESSED

National

NSS-G.K-12.1 THE WORLD IN SPATIAL TERMS:
All students should understand how to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.

NSS-G.K-12.2 PLACES AND REGIONS:
All students should understand how culture and experience influence people's perceptions of places and regions.

NSS-G.K-12.4 HUMAN SYSTEMS:
All students should understand the characteristics, distribution, and migration of human populations on Earth's surface, and understand the processes, patterns, and functions of human settlement.

NSS-G.K-12.6 THE USES OF GEOGRAPHY:
All students should understand how to apply geography to interpret the past.

South Carolina

Standard GS-2: The student will demonstrate an understanding of the social, political, geographic, and economic changes that took place in Africa, Asia, Europe, and the Americas from the time of the Byzantine Empire through the Middle Ages.

Indicator: GS-2.4: Compare the origins and characteristics of the Mayan, Aztecan, and Incan civilizations, including their economic foundations, their political organization, their technological achievements, and their cultural legacies of art and architecture. (H, G, P, E)

Guiding Questions

1 Who were the Native Americans and where did they live in what is currently the United States?
2. How did various Indian Cultures live in what is currently the United States?
3. How were tribe cultures affected by the terrain and climate of their native region?
4. How did geography and climate affect the way American Indian (First American) groups met their basic needs?

Background Information

1. Inuit inhabited present-day Alaska and northern Canada. They lived in Arctic areas where the temperature is below freezing much of the year.
2. Kwakiutl inhabited the Pacific Northwest coast, characterized by a rainy, mild climate.
3. Sioux inhabited the interior of the United States, called the Great Plains and characterized by dry grasslands.
4. Pueblo inhabited the Southwest in present-day New Mexico and Arizona, where they lived in desert areas and areas bordering cliffs and mountains.
5. Iroquois inhabited northeast North America, and the Eastern Woodland, which is heavily forested.

Lesson Objective(s)

Students will be able to:

1. Identify North American Cultures living in what is currently the United States.
2. Identify various tribes within each of the cultures.
3. Describe the characteristics of the four cultures by creating a visual representation.
4. Use the outdoor learning environment to create a 'Tribe Totem Pole' for a tribe that would have inhabited their local area (i.e. upstate South Carolina).

Materials/Resources

Textbook with associated Chapter
Encyclopedias/Books on tribes
Native American Music (optional)
Worksheet on Mapping Tribes (provided)
Poster Board
Colored Pencils/Markers/Crayons

Activating Strategy

"Stone Age Survival Guide" - In small groups, students will explain how early humans survived by using their surroundings. They will create a survival guide providing practical advice for acquiring sufficient food water and shelter for a group of 15-40 people. Their assignment should contain travel tips, first aid, acquiring food, water and shelter, materials for clothing and tools and ways of making these items they think would be realistic for the time period. The students should discuss forms of social organization to achieve these goals. (In order to help students brainstorm on what resources are available in their surroundings, this initial activity would also be an opportunity to take the class outside to the provided outdoor learning environment).

Procedure

A. Activity: Identifying characteristics and culture of major Native American tribes
   Directions:
   1) Ask students to use their textbook and encyclopedia (or other print materials) to identify the five major historical Native American cultures (Inuit, Kwakiutl, Sioux, Pueblo, and Iroquois) and complete the "Early Civilizations of America" worksheet, 'Part 1: Geography and Climate Influence.'
   2) Once worksheet is complete, review answers with the class.
   3) Ask students to pair up. Pass out "Early Civilizations of America" worksheet, 'Part 2: Latitude and Longitude' to each partner pair.
   4) Ask students to use the coordinates given to identify the locations of tribes within the major Native American cultures.
   5) Using a scanned copy of the key on a projector or document camera or an overhead projector with a copy of the worksheet as a transparent copy, review answers with class.

B. Transition: Explain to class that they will now use their knowledge of how climate and geography affected tribal culture to create their own tribal culture.

C. Activity: Tribe of the Tree Garden
Directions:
1) Inform students that partner pairs from working on the previous worksheet will now need to pair up to create groups of four. These new groups of four are now their own "Tribe."
2) All tribes will head to the Learning Garden/Outdoor Classroom space – this is the location of the tribe's new home. Each tribe will need to examine their surroundings (just as the tribes of the past) and uncover ways that they can provide shelter, find food, and develop a unique tribal custom based solely on the geography around them.
3) Each tribe must first select a tribal name that reflects their surroundings.
4) Next, each tribe must create a visual demonstration on poster board explaining how their tribe will use the climate and geography to their advantage for: (1) shelter, (2) food, and (3) customs. (Alternately, Tribes could develop a poem or design their own totem pole reflecting these ideas). If time allowed, a further option could include having "tribes" present their 'culture' developed and demonstrated on poster board with the rest of the class.

Closure (Reflection)

Reflect on what has been learned for the day. Ask students to answer the following question on an exit slip as they leave class: "Explain the importance of using natural surroundings to your advantage if you were a tribe living every day outside."

Assessment

Completed worksheets can be used as a daily grade assessment. Depending on the time given for groups to develop their poster board (with optional oral presentation), this assignment can be used for a larger assessment grade, such as a project or quiz grade. A rubric for poster projects is included in the Appendix for use.

Adaptations (for students with learning disabilities)

1) Pair students up for first worksheet, as well as the second one.
2) Give students extra time on assignments, especially the poster board assignment.
3) Guide students more on the poster board assignment, chunking the assignment into three parts, first introducing them to look for clues in their environment for their tribe's shelter, then give them 5-10 minutes as a group to discuss and draw, then re-group and introduce the second facet. Continue in that pattern until all three tenets of the assignment have been introduced.

Extensions (for gifted students)

Instead of assigning a poster board assignment, ask students to take notes in the outdoor area and discuss ideas with their tribe. Then, have students create a multimedia presentation showcasing their tribe's 'culture.' A further extension could include providing a digital camera or video camera for students to take photos or short videos to embed in their presentation relating their images to their ideas.

Possible connections to other subjects: Visual Art

Name: _____ Global Studies 1 – Worksheet 1

EARLY CIVILIZATIONS of AMERICA

PART ONE: Geography and Climate Influence

The earliest civilizations in the Americas were influenced by the geography and climate of the areas in which the people lived. All of these civilizations developed different customs and traditions.

The Pacific Northwest
Words to Know: barter, clan, harpoon, totem pole

Define the above terms in your own words:

_____
_____
_____
_____

The rich natural resources of the Pacific Northwest helped create a society focused on hunting and gathering and trade. Many people in this society became very wealthy. They displayed this wealth in expensive ceremonies.

How did the geography and climate of the Pacific Northwest affect the American Indians there?

_____
_____
_____

The Desert Southwest
Words to Know: adobe, ceremony, division of labor, staple

Define the above terms in your own words:

_____
_____
_____
_____

The American Indians of the desert Southwest found ways to build successful communities in their dry, rocky environment. They divided work between men and women and their main crop was corn. Religion was an important part of their everyday lives.

How did the geography and climate of the Desert Southwest affect the American Indians there?

_____
_____
_____

(continued)

The Plains Global Studies 1 – Worksheet 1

Words to Know: council, lodge, sod, tepee, travois

Define the above terms in your own words:

_____

_____

_____

The Plains Indians lived in a large region that stretched across the middle of North America. The Plains Indians were made up of many different groups. However, different groups lived in similar types of shelters, relied on the same sources of food, and shared certain religious beliefs.

Why did the Great Plains Indians live as nomads instead of farmers?

_____

How did the geography and climate of the Plains affect the American Indians there?

_____

_____

The Eastern Woodlands

Words to Know: confederation, palisade, wampum, wigwam

Define the above terms in your own words:

_____

_____

_____

The people of the Eastern Woodlands relied on trees for food, shelter, and transportation. The two main language groups of the Eastern Woodlands were the Iroquois and the Algonquians.

Why was fish an important food source for the Algonquian peoples?

_____

Why did American Indians in the same region often develop different ways of life? Explain. How did the geography and climate of the Plains affect the American Indians there?

_____

_____

_____

The Arctic

Words to Know: kayak, igloo

Define the above terms in your own words:

_____

_____

The cultures of the Aleut and the Inuit were shaped by the harsh environment in which they lived. They adapted to their difficult surroundings, and the members of each community worked together to survive. How might limited resources affect the ways in which people live?

Name: _____ Global Studies 1 – Worksheet 2

EARLY CIVILIZATIONS of AMERICA

PART TWO:
"Mapping Tribes": Latitude/Longitude Worksheet

Directions: On the U.S. map provided for you below, find the following tribes using the Latitude and Longitude coordinates you are given and label each tribe on your map. For homework, look up one of the tribes and write a one paragraph summary, describing what you found and citing your references.

1) The Makah Tribe lived in 45N and 122W. Find this location on your map and label it with the tribe name.

2) The Erie Tribe lived in 42N and 78 W. Find this spot on your map and label it with the tribe name.

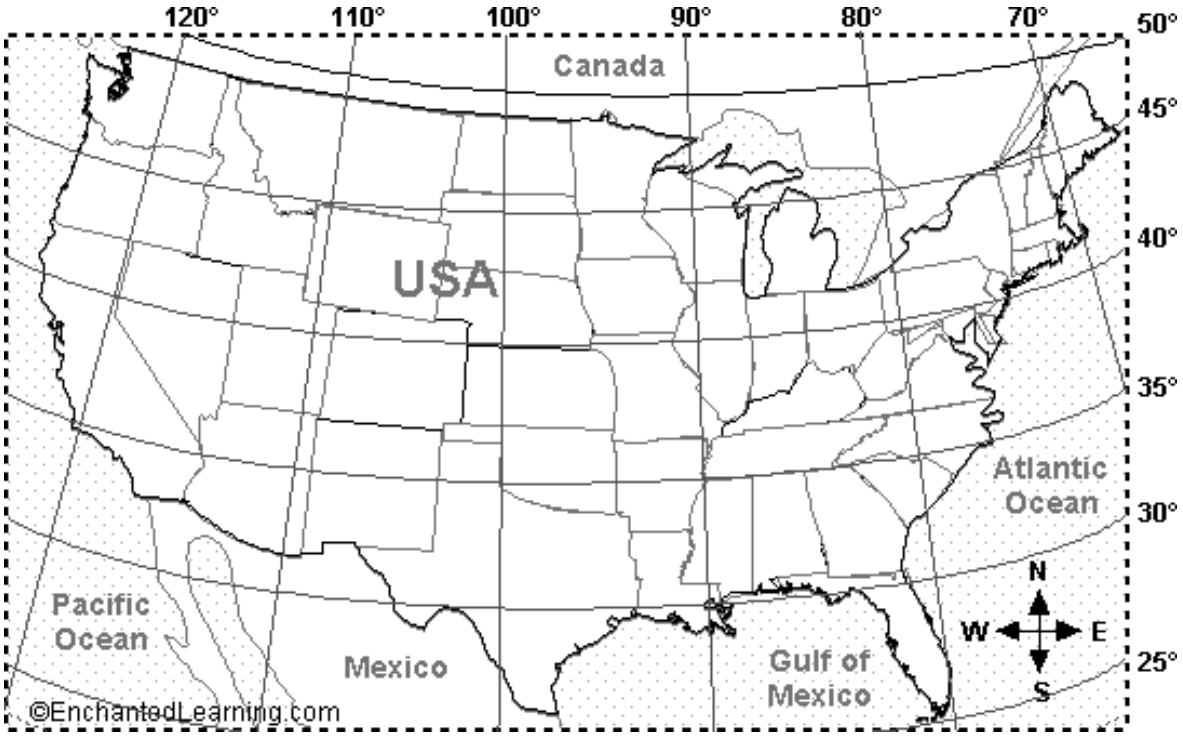
3) The Hopi Tribe lives in 35N and 113W. Find this spot on your map and label it with the tribe name.

4) The Cherokee tribe lived in 35 N and 83W. Find this spot on your map and label it with the tribe name.

5) The Salish Tribe lived in 48N and 121W. Find this spot on your map and label it with the tribe name.

6) The Massachuset Tribe lived in 42N, 71W. Find this spot on your map and label it with the tribe name.

7) The Wichita Tribe lived in 38N 97W. Find this spot on your map and label it with the tribe name.



SOCIAL STUDIES

Global Studies 2

"The Connection between Nature and the Age of the Enlightenment"

UNIT: The Enlightenment: A Revolution in Science, Thought, and Ideas of Freedom
Unit Essential Question: How did the scientific and intellectual movements of the 16th through the 18th centuries challenge and change old assumptions about science, religion, and politics?

LESSON: Foundations of Enlightenment Thought
Lesson Essential Question: How did nature relate to the foundations of Enlightenment thought?

STANDARDS ADDRESSED

National

NSS-WH.5-12.6 ERA 6: EMERGENCE OF THE FIRST GLOBAL AGE, 1450-1770
The student should understand how European society experienced political, economic, and cultural transformations in an age of global intercommunication, 1450-1750 and major global trends from 1450 to 1770.

NSS-WH.5-12.7 ERA 7: AN AGE OF REVOLUTIONS, 1750-1914
The student in grades 5-12 should understand the causes and consequences of political revolutions in the late 18th and early 19th centuries and major global trends from 1750 to 1914.

NSS-USH.5-12.2 ERA 2: COLONIZATION AND SETTLEMENT (1585-1763)
The student understands how political, religious, and social institutions emerged in the English colonies

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NSS-USH.5-12.3 ERA 3: REVOLUTION AND THE NEW NATION (1754-1820s)
Understands the causes of the American Revolution, the ideas and interests involved in forging the revolutionary movement, and the reasons for the American victory

South Carolina

Standard GS-3: The student will demonstrate an understanding of the influence of the Western world in the spread of new ideas that took place from the Renaissance through the eighteenth century.

Indicator GS-3.2: Explain the long-term effects of political changes that occurred in Europe during the sixteenth, seventeenth, and eighteenth centuries, including the emergence of a strong monarchial form of government and the changes in the governments of England and France (H, G, P, E)

Guiding Questions

1. Who were the Americans associated with the Age of Enlightenment?
2. How did Enlightenment thinkers perceive nature?
3. How did American Enlightenment thinkers use their perception of nature as a founding principle for historic documents, such as the Bill of Rights and the Constitution?
4. Where can we find evidence of order and machine-like systems in nature?

Background Information

The 18th century is often associated with the Age of Enlightenment, characterized by the work of Sir Isaac Newton. In America, Thomas Jefferson and Benjamin Franklin drew upon the Enlightenment premise that "viewed science as a God given instrument for rationalizing human institutions on behalf of individual liberty and social progress." "Reason" and "Nature" were their slogans. Science was the supreme example of reason in action, yielding useful knowledge. Nature, in their view, was the atomistic world of invisible particles of matter, moving inexorably in accordance with wisely ordained laws, a world epitomized in Newton's mathematical model of the solar system. Thus nature was a perfect symbol for those who viewed society as a collection of individuals seeking their own enlightened self-interest in a divinely ordained "system of natural liberty," as Adam Smith called it. Out of the competition of ideas and opinions truth would emerge.

In essence, the age of Franklin, Jefferson and Thompson can be characterized by the idea that nature (social and physical) was seen as orderly and machine-like. If one will "tinker" with this machinery, then socially useful and practical applications will arise for the benefit of human-kind. The foundation of the principles is reflected in the US Constitution and the Bill of Rights. In this philosophy, one has a world in which society and science work hand in hand for the liberty and betterment of humankind, within a "natural" world.

"There is nothing that can better deserve our patronage than the promotion of science and literature. Knowledge is in every country the surest basis of public happiness."
-George Washington (Address to Congress, January, 8, 1790)

Lesson Objective(s)

Students will be able to:

1. Identify American politicians, scientists, and authors associated with the Enlightenment movement.
2. Identify the five core principles of the Enlightenment movement.
3. Explain the connection between the Enlightenment's view on nature and how it served as a basis for social contracts, such as the Bull of Rights and the Constitution.

Materials/Resources

Textbook with associated Chapter
Encyclopedias/Books/Internet Resources on American Enlightenment Individuals
Copies of the Declaration of Independence
Digital camera –or- Flip video camera
Photos/Slideshow of patterns/order in nature

Activating Strategy

"Finding order in nature": Introduce students to the Enlightenment thinkers' views on nature by writing/sharing on the board the following definition: "The Enlightenment began from the belief in a rational, orderly and comprehensible universe and included the idea of uniform laws for governing natural phenomenon." Ask them either for homework the day before the lesson or as a five to ten minute exercise at the beginning of the lesson to put the definition into their own words.

Procedure

Activity: To connect the students to how Enlightenment thinkers used concepts of nature and science as the foundation for government ideology.

Directions:

a. Divide students into 5 or 6 groups depending on how you wish to discuss the Declaration. Assign the groups the following questions:

Group I: Why Are the Colonies Fighting?
Group II: Why Are Governments Established?
Group III: What Do People Have The Right To Do If A Government Does Not Carry Out Its Duties?
Group IV: What Did the King Do to the Colonists?
Group V: Why are the Colonies Now Free?

Group I: Why was the Declaration Written?
Group II: Statement of Basic Human Rights.
Group III: Government Must Safeguard Human Rights.
Group IV: Abuses of Human Rights by the King.
Group V: Colonial Efforts to Avoid Separation.
Group VI: The Colonies Declare Independence.

b. Each group will explain and discuss with the class how his/her part of the Declaration of Independence refers to what is "natural".
c. Encourage groups to use audio-visual aids to further their case as well as show a precise flow of reasons for the colonies' separation from Britain.
d. Encourage groups to use audio-visual aids to demonstrate how Mr. Jefferson, in clear, concise language, states the ideals of American government, and ask them to search for scientific principles in the Declaration of Independence.

Transition: Explain to the students that now you will allow students to discover for themselves how Enlightenment thinkers developed the idea that nature, just like the ideal society and its institutions, was an example of reason and order. Depending on time and whether this is an-hour long or block class period, this can be done in the middle of the class or the end of the class, setting up for tomorrow's activity.

Activity: Using prepared photos/slideshow in addition to their own personal experience in an outdoor classroom/learning environment, allow for students to find examples of patterns and order in nature.

Directions:

e. Read the students the following poem as you show them a photo of a shell, an example of patterns and order in nature (photo included):

THE SHELL
A spiral shell lay on the tide-washed sands
A conch with polished marble walls
That echo not the sounds
Of a silent mollusk
But the rhythms of my heart
A cherished prize from the salty brine
A gift of beauty
A jewel to the eyes
A mystery to the mind
-by Elizabeth Santos

Share with students additional photos or a short slideshow of photos where there are examples of patterns or order demonstrated in nature (Examples are included). Tell students they are going to have an opportunity to uncover their own examples of patterns and order in nature.

f. Take the students outside to the outdoor classroom/learning environment at your school and arm them with either a video camera or digital camera. Ask them to break up into their groups from the previous activity. In their groups, instruct them to document examples where they see patterns in the natural environment using the equipment provided. Give them the remainder of the period to complete this task (30-40 minutes), allowing them time to explore the environment.
g. Options after students have taken video and/or pictures are to have them simply title and share their observations with the class the following period or assign them a group project where they are to turn their video or pictures into a short movie or presentation. A rubric for a photographic-based presentation is included in the index. To continue with the connection between order of nature and order in society, a further extension would be to have students juxtapose each of their photos from outside with a still image they find exemplifying order of society and institution, favored by Enlightenment thinkers.

Closure (Reflection)

Review and reconnect the students' thoughts back to the basic principles of the philosophies of Enlightenment thinkers.

Assessment

Informal assessment of the student understanding of the foundation of Enlightenment thinking can be assessed throughout this lesson. A formal project grade can be given for the photographic work done outside wit the second activity on finding examples in nature. Another idea is to have the students to select their favorite photograph taken, mount the work in the classroom, hall, or a place in school and hold a photography exhibit. This will be a great event art event from the Social Studies department!

Adaptations (for students with learning disabilities)

Groups can be purposefully, rather than randomly, assigned to make sure certain students are placed in groups where they can receive help from their peers. For students who struggle to find examples of natural order in the Declaration of independence, from the first activity, an example or two may need to be given by the teacher to aid student analysis. Additional time can also be given to these students. This lesson can be exceptional for hearing impaired students who can really appreciate and focus on the visual element in the second activity.

Extensions (for gifted students)

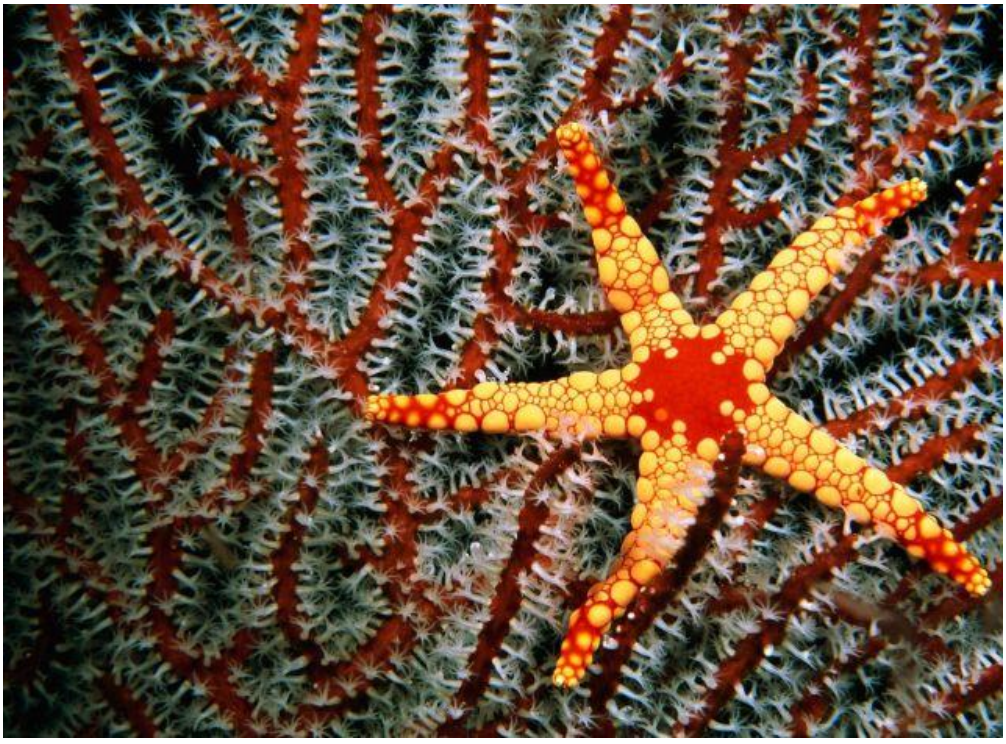
Without giving these students a slideshow introduction of patterns in nature, have them discover and inquire independently order they can find outside. Keep the students on a shorter time frame, keeping them challenged with the introduction of the next undertaking and not allowing for them to become complacent in between activities.

Possible connections to other subjects

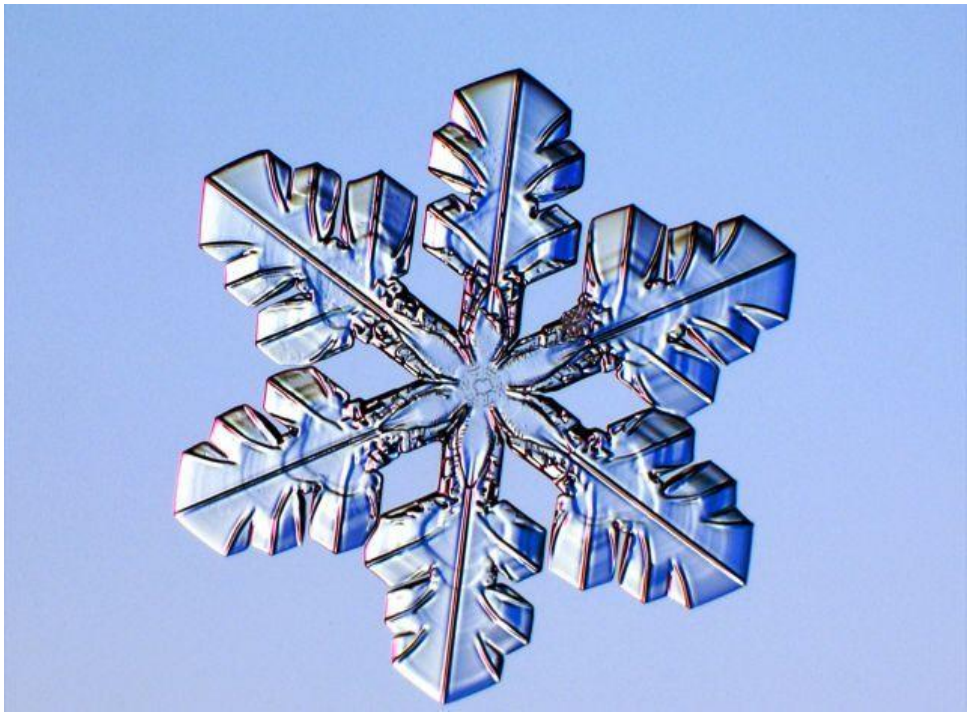
This lesson is connected to photography, art, math, and science. Before the activity outside, introduce the students to photography after a brief lesson from the art teacher or invite the science teacher to come in and share their experience in the different patterns found in nature, from microscopic DNA to the constellations in the sky.

SAMPLE PHOTOS (Examples of order and patterns found in nature):

Nautilus Shell



Sea Star



Snowflake

Romanesque Cauliflower

Spider Web

SOCIAL STUDIES

U.S. History*

"Conservation of Nature: Progressive Reform at the Turn of the Nineteenth Century"

UNIT: Social, Economic and Political Developments of the late 19th and early 20th centuries
Unit Essential Question: What were the social, political, and economic effects of progressive reform in the United States at the turn of the century?

LESSON: Focus on Conservation; Reforms Introduced by President Theodore Roosevelt
Lesson Essential Question: How did President Roosevelt change the political landscape with his focus on environmental conservation?

(*This lesson includes an optional activity focusing on the Reintroduction of Wolves in Yellowstone National Park)

STANDARDS ADDRESSED

National

NSS-USH.5-12.7 ERA 7: THE EMERGENCE OF MODERN AMERICA (1890-1930) Understands how Progressives and others addressed problems of industrial capitalism, urbanization, and political corruption

Geography Standard 1: Understand how to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.
Geography Standard 5: Understand how human actions modify the physical environment; and understand the changes that occur in the meaning, use distribution, and importance of resources.
Geography Standard 6: Understand how to apply geography to interpret the past.
History Standard 1-A: Explain how Progressives drew upon the American past to develop a notion of democracy responsive to the distinctive needs of an industrial society (Explain historical continuity and change).

South Carolina

Standard USHC-5: The student will demonstrate an understanding of major social, political, and economic developments that took place in the United States during the second half of the nineteenth century.

USHC-5.5: Explain the causes and effects of urbanization in late nineteenth-century America, including the movement from farm to city, the continuation of the women's suffrage movement, and the migration of African Americans to the North and the Midwest. (H, G, E, P)
USHC-5.7: Compare the accomplishments and limitations of the progressive movement in effecting social and political reforms in America, including the roles of Theodore Roosevelt, Jane Addams, W. E. B. DuBois, and Booker T. Washington. (H, P, E)

Guiding Questions

1. What are the environmental effects of increased urbanization?
2. What are characteristics of the Progressive movement at the turn of the century in America?
3. How did President T. Roosevelt instigate reform in terms of nature conservation?

Background Information

The Progressive movement in America (late 19th century through the early decades of the 20th century) believed that government must become involved in the "spiritual" development of its citizens -- not, of course, through promotion of religion, but through protecting the environment ("conservation"), education, and spiritual uplift through subsidy and promotion of the arts and culture. Generally, Progressivism sought to address the economic, political, and cultural questions that had arisen in the context of the rapid changes brought with the Industrial Revolution and the growth of modern capitalism in America. The Progressives believed that these changes marked the end of the old order and required the creation of a new order appropriate for the new industrial age.

One such Progressive was President Theodore Roosevelt. Earning his place on the face of Mount Rushmore, one of Roosevelt's most important actions as president came in the area of conservation policy. At the urging of Gifford Pinchot, a college-trained forester who argued that the natural resources of the West required scientific management to prevent their depletion by private developers, Roosevelt seized on the 1891 Forest Reserves Act, which empowered the president to set aside public lands as national forests, and used it to increase federal land reserves from approximately 40 million acres when he took office to nearly 200 million acres by the end of his second term. In 1905, Roosevelt gave Pinchot responsibility for administering this vast domain, as head of the newly organized U.S. Forest Service, and ushered in the modern era of western land management, which aims at sustained efficient use of natural resources rather than exploitation and development.

Roosevelt also extended federal control over the scenic wonders of the West, using the 1906 Antiquities Act, which had been intended to preserve historic landmarks, to set aside 800,000 acres in Arizona as the Grand Canyon National Monument. All told, he created 16 national monuments, 51 wildlife refuges and five new National Parks, including Crater Lake in Oregon and the Anasazi ruins at Mesa Verde, Colorado, helping to pave the way for eventual recognition of such "national treasures" as natural resources requiring federal management to sustain their use by the West's growing tourist industry into the future.

Lesson Objective(s)

Students will be able to:

1. Become familiar with the scope of TR's contribution to conservation in America.
2. Gain skill in mapping with special attention to designating a variety of items describes in the map key.
3. Explore a variety of viewpoints regarding the use and preservation of resources.
4. Build an argument and support that argument in class presentations.

Materials/Resources

Textbook with associated Chapter
Map of the United States, including Alaska, Hawaii, and Puerto Rico (provided)
Map Key (provided)
Access to the internet for research purposes
Cookie dough & M&M's (optional)

Activating Strategy

"Finding beauty in nature": Introduce students to the personal connection President T. Roosevelt had to nature by first taking them outside to the outdoor classroom/learning environment and

having them find a comfortable spot to sit. Tell them that they are to remain quiet for ten minutes. During those ten minutes each student is to journal or free write. The focus of the journal entry/free write is: how nature makes you feel or how does nature impact you personally. Encourage students to look at and observe the natural world around them before starting to write. After the time has elapsed, ask if there is anyone willing to share an excerpt from what they wrote. After students share, explain that President Theodore Roosevelt was quite moved by the natural environment and it was this connection to nature that spurred environmental political reform (which was also a tenet of the Progressive Movement).

Procedure

1. Activity: To create a map reflecting the work of Theodore Roosevelt.
2. Directions:
   Make A Map (Option A):
   In order to give students a visual tool illustrating Teddy Roosevelt's (TR) achievements in conservation, provide each student with a map of the US (including Alaska, Hawaii, and Puerto Rico). Using the map key below, have each student fill in the states with letters representing lands/projects set aside by TR.

Map Key:

B = Federal Bird Preserve	**F** = National Forest
G = Federal Game Preserve	**M** = National Monument
P = National Park	**R** = Reclamation Project

Where projects were located on the boundaries of two states, the site is listed in the first state.

STATE	Bird Pres.	Nat'l Forest	Game Pres.	Nat'l Mon.	Nat'l Park	Recl. Proj.
Alaska:	B=6	F=2	G=1			
Arizona:	B=1	F=12	G=1	M=5		R=2
Arkansas:		F=2				
California:	B=2	F=20		M=4		R=2
Colorado:		F=17		M=1	P=1	R=1
Florida:	B=10	F=2				
Hawaiian Islands:	B=1					
Idaho:	B=2	F=19				R=2
Kansas:		F=1				

Louisiana:	B=4					
Michigan:	B=2	F=2				
Minnesota:		F=2				
Montana:	B=1	F=17	G=1	M=1		R=4
Nebraska:		F=1				R=1
Nevada:		F=4				R=1
New Mexico:	B=2	F=8		M=3		R=2
North Dakota:	B=2	F=1			P=1	
Oklahoma:		F=1	G=1		P=1	
Oregon:	B=4	F=12			P=1	R=1
Puerto Rico:	B=1	F-1				
South Dakota:	B=1	F=1		M=1	P=1	R=1
Utah:	B=1	F=10		M=1		R=1
Washington:	B=8	F=8		M=1		R=2
Wyoming:	B=3	F=7		M=1		R=1
TOTALS	51	150	4	18	5	21

Make an Edible Map (Option B): For added fun, create an edible map. Assign students to teams. Each team uses sugar cookie dough and the outline of one of the states listed above (determine a good, estimated uniform size). Before baking, fill in the selected state with M&M's to designate lands/projects set aside by TR: yellow for Federal Bird Preserves; green for National Forests; brown for National Game Preserves; red for National Monuments; orange for National Parks; blue for Reclamation Projects.

When placed side by side to create a full map including the entire west plus Puerto Rico, Florida, Michigan, Minnesota, Arkansas and Louisiana, students will get a dramatic (and delightful) image of Roosevelt's conservation achievements and a visual marker for 230 million acres. As each team places their state on the map, ask them to provide a Roosevelt quote on conservation. The giant cookie map can be shared with other students in the school, along with a class lunchtime presentation on TR and conservation.

3. Transition: Explain to the students that now that they have seen where President Roosevelt has had an impact, it is now up to them to think about the issue of land use.
4. Activity: "Rethinking the American West": Students will research and debate one side of the land use issue.

5. Directions:
    a. Background Information to share:
    While many historians discuss the effect of technology (industrialization) and population shifts (urbanization) on America at the dawn of the 20th century, less attention has been given to the effects of technology and population on the American West. But as a former rancher and active hunter, Theodore Roosevelt saw first-hand the effects of humanity on the changing face of the American West. Manifest Destiny was a reality and historians bemoaned the death of the frontier. In building his conservation policies, Roosevelt kept before him an American frontier ideal while addressing the realities of the changing face of the west. What TR witnessed was the over-cutting of forests, over-grazing by herds, efforts to control water sources, the dramatic decrease in animal populations (dramatically personified by the near-extinction of the buffalo), mounting violence between open-range proponents vs. ranchers who wanted to fence their property, the movement of Indian populations onto reservations, the expansion of mining and timber industries, and the rapid expansion of railroads bringing to an end the dramatic cattle drives of the past and building or destroying communities with the selection of railroad routes.
    b. Ask students to select a position:
        i. a western rancher concerned with water rights, free-range grazing, and the potential with the coming of the railroad of selling logging or mineral rights or
        ii. a conservationist who supports Roosevelt's goals for reclamation and setting aside extensive public lands for future generations.
    c. Students should carefully build a case to support their argument. Select several student "ranchers" and several student "conservationists" to reenter the early twentieth century by debating the issue of land use. A creative option is to have students dress in period costumes. Allow the rest of the class to judge the presentations.

Closure (Reflection)

Remind the students of the thoughts they had when they started this lesson outside and reflected on their feelings of nature. Review how it was President Roosevelt's connection to nature that pushed him towards conservation reform. Remind them of the expanse of his reform experienced all over the country. Explain the importance of the reform on America at the time and still today.

Assessment

Informal assessment of the student understanding can be assessed throughout this lesson. A daily or project grade can be given for the map activity as well as the class debate.

Adaptations (for students with learning disabilities)

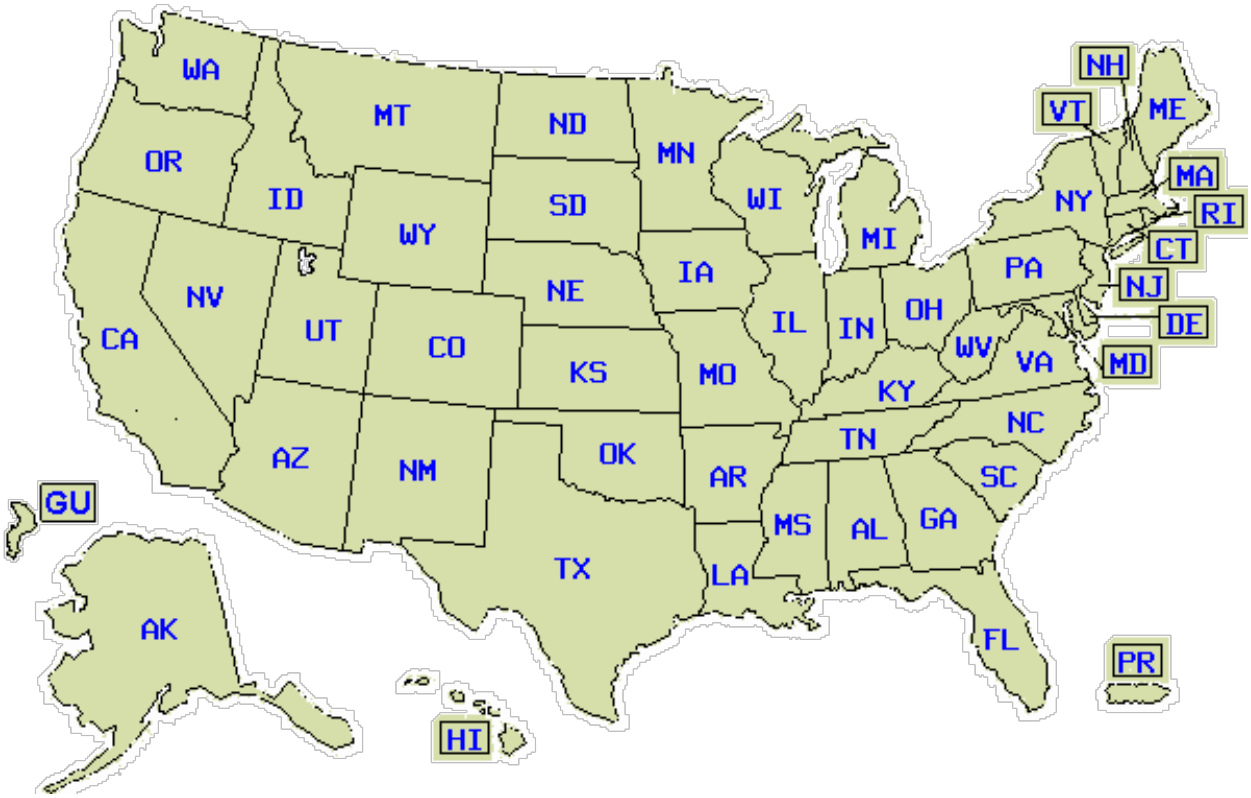
Assign students to work in groups rather than individually. More time can be allotted for activities.

Extensions (for gifted students)

For the map activity, have students research names and descriptions of the Federal Bird Preserves, National Forests, etc. A lesson extension is also provided (following map).

Possible connections to other subjects: Geography, Science, Culinary Arts, Speech & Debate

United States Map:



Map provided by NOAA.

*LESSON EXTENSION: Reintroduction of Wolves in Yellowstone National Park

Background

President Roosevelt hoped that an effect of designating federal reserves would be the protection of the animals within its boundaries. Unfortunately, due to social pressures since his time, increased development, pollution, and the like, many animals have still seen sharp declines in their populations. One significant use of reserves and national parks today is to serve as an area for animal reintroduction, in the hope to see some of these animals' numbers rise again.

The case of the wolf is such an animal. The following lesson provides an opportunity for students to learn more about such an animal and see how this animal's social network is not that much different from us humans.

Objectives

Students will understand the following:

1. Wolves are social animals that live in packs with highly organized, complex social systems.
2. Some important similarities exist between a wolf pack and a human family or social group.

Materials

- Research materials on wolves
- Computer with Internet access

Procedures

1. Initiate a class discussion about wolves. What do your students know about wolves and wolf behavior? Have they read books about wolves? If so, what have they learned?
2. In discussion, make sure students understand that wolves are social animals that live in packs with complex, highly organized social systems. Go on to let students know that, in some important ways, wolf-pack society is similar to human society.
3. Divide your class into research teams to learn about wolves. Instruct students to focus on finding ways in which the wolf pack is both similar to and different from a human family or social group.
4. Provide students with a list of words and phrases to guide their research: Teamwork and cooperation, Alpha and omega, Family devotion, Group loyalty, Hierarchy (or status in society), Child (pup) rearing, & Sharing of wealth (food)
5. After teams complete their research, have team members create a comparison-and-contrast chart showing what they have learned from their research about the similarities and differences between a wolf pack and a human social group.

Adaptations

Have students research and report on actual studies done on wolves and wolf-pack behavior.

Discussion Questions

1. Discuss how wolves have been portrayed in literature and mythology. How might these portraits have affected our current beliefs about wolves?
2. Compare and contrast the wolf pack family and community with the human family and community. What characteristics do they have in common, and how do they differ?

3. Compare and contrast the characteristics of wolf pups and dog pups. What observable traits of the wolf pups are indicators of adult wolf behavior? Do wolf pups make good pets? What about hybrid pups (half wolf and half dog)?
4. Describe how positions may change in a wolf pack hierarchy. Compare this to human behavior. Consider family, school, and work situations.
5. Analyze the impact the near destruction of wolf populations in North America has had on its prey populations (e.g., deer, elk, antelope), and other related species in their environment. (For example, historically, in Yellowstone National Park, the removal of wolves increased the elk, antelope, and deer populations, increasing the destruction of vegetation and habitat—thereby decreasing other herbivorous species such as beaver and rabbit. [source: Playing God in Yellowstone by Alston Chase, 1987]).
6. Discuss the role of human intervention in deciding whether and how to reestablish wolf populations in the wild.

Evaluation

You can evaluate your students on their comparison-and-contrast charts using the following three-point rubric:

Three points: chart reflects thorough, in-depth research; all information accurate; chart carefully prepared, clear, and easy to read

Two points: chart reflects adequate research; most information accurate; chart adequately prepared and readable

One point: chart reflects inadequate research; chart contains significant inaccuracies; chart carelessly prepared and difficult to read

You can ask your students to contribute to the assessment rubric by determining a minimum number of comparisons and contrasts to be shown between wolves and humans.

Further Extensions:

The Wolf Is Back!

Have students research work being done to relocate wolves or reintroduce them into wilderness areas (such as in Yellowstone National Park). Then have students act out, through research and role-playing, the relocation or reintroduction of wolves into an area. Assign students to represent and express the views of scientists, wolf conservation groups, farmers, environmental agencies, local citizens, and reporters.

Progress Report

Challenge students to find out what advantages being listed as an "endangered species" has afforded the wolf. What progress has been made in reintroduction programs? How do wolf protection programs compare to those for other animals? Students can contact and conduct a survey of wolf conservation groups for wolf population statistics and present their findings.

SOCIAL STUDIES

Economics

"The Environment's Role in the Economic Choices We Make"

UNIT: Economic Concepts
Unit Essential Question: How do scarcity and choice impact the economic activity of individuals, families, communities, and nations?

LESSON: The environment's role in the economic choices we make
Lesson Essential Question: What is the relationship between scarcity and the economic choices we make?

STANDARDS ADDRESSED

National

NSS-EC.9-12.1 SCARCITY: Productive resources are limited. Therefore, people cannot have all the goods and services they want; as a result, they must choose some things and give up others.

South Carolina

Standard ECON-1: The student will demonstrate an understanding of how scarcity and choice impact the economic activity of individuals, families, communities, and nations.

Indicator ECON-1.1: Illustrate the relationship between scarcity—limited resources and unlimited human wants—and the economic choices made by individuals, families, communities, and nations, including how families must budget their income and expenses, how people use psychological and intellectual resources to deal with scarcity, and how local political entities as well as nation-states use scarce resources to satisfy human wants.

Guiding Questions

1. How does scarcity affect the decisions we make concerning environmental issues?
2. What is the relationship between scarcity and the economic choices we make?

Background Information

In a world of unlimited goods and services, everyone would be able to buy as much as they wanted without any need to think about what they could really afford. In the real world we are forced to make economic choices every day of our lives. For most of us these are trivial issues while for others they can be a matter of life and death.

The unimportant decisions:

1. Can we afford to buy breakfast at McDonald's today?
2. Can we afford to stop off at Starbucks and buy an expensive coffee drink and cake?
3. Can we justify spending $70.00 for a ticket to see our favorite band in concert?

The important decisions: (We must always remember that for other people in the world these decisions are much more important.)

1. Should a pensioner on a low income spend his last $15.00 this month on electricity to heat the home or on food?
2. Should a family in sub-Saharan Africa risk drinking water that is highly polluted?

Lesson Objective(s)

Students will be able to:

5. Define economic scarcity
6. Explain the relationship between economic scarcity and choice
7. Detail examples of scarcity and choice found in environmental issues

Materials/Resources

Pen or Pencil
Paper
Lapboard/ Clipboard (for students' writing)

Activating Strategy

First, take students outside to the Outdoor Classroom/Learning Environment for the entirety of this lesson. Have students bring with them the materials listed above.

To get students thinking about the day's lesson, have them list the things they would have to give up if they worked every day after school (opportunity costs). Use this activity to start a discussion about the relationship between scarcity and the economic choices we make on a regular basis. Explain the reason you are outside today is to put students in the 'element' as they learn about economic choices through environmental case studies.

Procedure

1. Activity: To allow student to reflect on their own personal choices regarding the environment, keeping economics in mind.
2. Directions:
   Distribute the information below showing the 'Values that Affect Environmental Decision Making':

Values that Affect Environmental Decision Making	Value Definition
Aesthetic	What is beautiful or pleasing
Economic	Gain or loss of money or jobs
Environmental	Protection of natural resources
Educational	Accumulation and use of knowledge
Ethical/Moral	What is right or wrong
Health	Maintenance of human health
Recreational	Providing for human leisure activities
Scientific Knowledge	Gained by scientific research
Social/Cultural	Respecting values and traditions

Tell students you are going to give them a scenario and after they have thought about the scenario, choose values that would affect their decision and write them down.

For each scenario, you will divide the outdoor classroom space into two sides and ask students to choose one side to walk to depending on their opinion. For example, the first topic is 'The Arctic National Wildlife Refuge, a fragile ecosystem in Alaska, should be explored and drilled for much needed oil.' After a few minutes of thought and writing, ask students who agree to stand on one side and those who disagree to stand on the opposite side.

After students have moved, ask for a few volunteers to share why they made their

decision. Whether or not a student brings up the value of economics, discuss with each scenario, the issue of scarcity and economic decision making.

Continue with activity until all scenario topics have been discussed. Topics are:

1. The Arctic National Wildlife Refuge, a fragile ecosystem in Alaska, should be explored and drilled for much needed oil.
2. Dams on the Colorado River interfere with Salmon migration and so they should be removed.
3. Although it is expensive for the company, all factories should purchase and place scrubbers in their smokestacks to prevent harmful chemicals from accumulating in the atmosphere.
4. National parks should allow recreational four-wheelers in all areas even though it could create habitat disturbance.
5. Any company that spills oil in a marine environment should pay for all costs directly or indirectly related to the clean-up.
6. Endangered species should be protected even if it costs some people to lose their job.
7. Local communities in precious tropical rainforest biomes should not sell their land to timber or grazing companies although they could earn enough money to support their family for a year.
8. Due to the decreasing amount of space available for new landfills, trash should be dumped into the ocean.

(More or different topics can be generated by the teacher)

Closure (Reflection)

Review with students the concept of economic scarcity and the economic decisions affected by it. Ask students to summarize what they learned from the day's discussion in a half-page writing assignment.

Assessment

Informal assessment of the student understanding can be assessed throughout this lesson. A daily grade can be given for participation or the closing writing assignment.

Adaptations (for students with learning disabilities)

Assign students to work in groups rather than individually. More time can be allotted for activities.

Extensions (for gifted students)

Ask students to choose one of the scenarios discussed in the day's activity and write an opposing viewpoints essay comparing both sides of the issue.

Possible connections to other subjects: Science, Speech & Debate

APPENDIX A

Flyer or Poster Rubric

	Exceeds Expectations	Meets Expectations	Does Not Meet Expectations	Score
Points Earned	**3**	**2**	**1 or 0**	**/30**
Colors and Patterns	Enhance readability	Support readability	Detract from readability	
Layout	Creatively enhances information	Balanced, uncluttered, adequate white space	unbalanced, cluttered, insufficient white space	
Graphics/ Photos	All graphics are engaging, enhance text	Graphics enhance text	Graphics do not enhance text	
Titles And Subtitles	All titles and subtitles are clear, readable	Most titles and subtitles are clear, readable	Few or no titles or subtitles to clarify text	
Text Size And Color	All text is clear and readable; size and color enhance understanding	Text is clear; changes in size and color enhance understanding	Some text is clear; frequent changes do not enhance understanding	
Writing	Well written and organized, clear, easy to follow	Adequately written and organized, reasonably easy to follow	Poorly written and organized, unclear, hard to follow	
Quality of Information	The content description is clear, complete, concise	Content description is mostly clear, could be more concise	Content description is not clear, incomplete, not concise	
Grammar and Spelling	No grammar or spelling errors	One grammar or spelling error	Many grammar and spelling errors	
References	Listed in proper format	Listed with no format	Not listed	
Name	Name on project on back	Name on project on front	No name on project	

Additional Comments: **Total Points: ____/30**

APPENDIX B

Photographic Presentation Rubric

CRITERIA	0 poor	1 moderate	2 good	3 excellent
TECHNICAL QUALITIES	Poorly executed, little regard for print quality	Technique may be erratic with little sense of challenge	Most technical aspects are successful; materials generally well handled	Excellent print quality; well-executed
COMPOSITION & LAYOUT	Composition is poor, little consideration – little to no regard for layout	In contrast to work that receives a score of 1, there is at least some sense of decision making and purpose	Composition/Presentation is generally with purpose	Excellent. Composition is purposeful
CONTENT	Subject material tends to be trite/unoriginal/ unimaginative	Shows a sense of effort and some decision making in the subject of the photograph	The level of work may be somewhat inconsistent, but the work is strong enough to offset it's weaknesses and it has aspects of creativity and originality in content	Shows a sense of inventiveness or imagination, a sense of style or engagement with the subject of the photos
COMMUNICATIVE PROPERTIES	There is little, if any, evidence of thinking and communicating the photographer's subject material with his/her audience	Work shows a real sense of effort, but problems with fully communicating themes and subject are not successfully resolved	There is successful engagement with some aspects of project with audience – the theme, thoughts, and subject of the photographer is relatively clear	Shows obvious evidence of thinking, it may address fairly complex visual or conceptual ideas, the image/theme is presented in an effective way to communicate

Additional Comments: **Total Points: ____x5 =____/60 pts**

APPENDIX C

Rubric for Writing a Persuasive Letter

CATEGORY	5 Points	4 Points	3 Points	2 Point
Audience	In addition to 3 - Anticipates reader's questions and provides thorough answers appropriate for that audience.	Demonstrates a general understanding of the potential reader and uses vocabulary and arguments appropriate for that audience.	Demonstrates some understanding of the potential reader and uses arguments appropriate for that audience.	It is not clear who the author is writing for.
Goal or Thesis Statement	The goal or thesis provides a clear and strong statement of the author's position on the topic.	The goal or thesis provides a clear statement of the author's position on the topic.	A goal or thesis is present, but does not make the author's position clear.	There is no goal or thesis.
Reasons Supporting Goal or Thesis Statement	In addition to 3 - The writer anticipates the reader's concerns, biases or arguments. and has provided at least 1 counter-argument.	Includes 3 or more reasons (facts, statistics, examples, real-life experiences) that support the goal or thesis statement.	Includes 2 reasons (facts, statistics, examples, real-life experiences) that support the goal or thesis statement.	Includes 1 or fewer reasons (facts, statistics, examples, real-life experiences).
Facts and Examples	All of the facts and examples are specific and relevant, and explanations are given that show how each piece of evidence supports the author's position.	Most of the facts and examples are specific and relevant, and explanations are given that show how each piece of evidence supports the author's position.	At least one of the facts and examples is relevant and has an explanation that shows how that piece of evidence supports the author's position.	Facts and examples are not relevant and/or are not explained.
Sequencing	Arguments and support are provided in a logical order that makes it easy and interesting to follow the author	Arguments and support are provided in a fairly logical order that makes it reasonably easy to follow the author	Support details or arguments are not in a logical order, distracting the reader, making the letter seem confusing.	Many details or arguments are not in an expected or logical order, distracting the reader; letter is very confusing.
Letter Format	Complies with all the requirements for a business letter.	Complies with almost all the requirements for a business letter.	Complies with several of the requirements for a business letter.	Complies with fewer than 75% of the requirements for a business letter.

Additional Comments: **Point Total: ____/30 x 3.3 = ____/99 SCORE**

APPENDIX D

Rubric for Presentation

PRESENTATION STYLE

Length of Presentation	Between 5-7 slides *3 points*	More than 7 slides *2 points*	Between 3-4 slides *1 point*	Less than 3 slides *0 points*
Organization & Preparation	Very *3 points*	Mostly *2 points*	Somewhat *1 point*	Not organized *0 points*
Relevance of Information	Very *3 points*	Mostly *2 points*	Somewhat *1 point*	Not relevant *0 points*
Volume & Presence	Loud and Clear *3 points*	Quiet and Clear *2 points*	Loud and unclear *1 point*	Quiet and unclear *0 points*
Creativity & Level of Interest	Very *3 points*	Mostly *2 points*	Somewhat *1 point*	Not *0 points*
Sources	At least 3 sources *3 points*	Only 2 sources *2 points*	Only 1 source *1 point*	No sources listed *0 points*

INFORMATION PROVIDED

Information on topic	Extensive & detailed *3 points*	General information *2 points*	Very little & not focused *1 point*	No information *0 points*
Photos/Graphics	Detailed/Relevant *3 points*	General/Relevant *2 points*	General/unrelated *1 point*	Few-no photos *0 points*
Questions answered	All; *3 points*	Most ; *2 points*	Some; *1 point*	None; *0 points*
Able to answer audience questions	Yes, in detail *3 points*	Yes, in general *2 points*	Somewhat *1 point*	No *0 points*

Additional Comments:

Point Total: ____/30 x 3.3 = ____/99 SCORE
(+1 if student introduces themselves) = _____

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ADDITIONAL RESOURCES

Arbor Day Foundation, "What tree is that?":
http://www.arborday.org/trees/whattree/?TrackingID=908

Project Learning Tree, Secondary Modules: http://www.plt.org/cms/pages/26_29_9.html

SC Forestry Commission, "What tree is this?": http://www.state.sc.us/forest/reftree.htm

TreesGreenville Nonprofit Organization: www.treesgreenville.org