

4th Grade STEM Unit:

The Ironclad CSS Georgia and Simple Machines



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Objective: Students will learn about the history of the CSS Georgia and use knowledge about simple machines to engineer a weapon launcher.

Georgia Standards of Excellence (GSE) Addressed:

Science- *S4P3. Students will demonstrate the relationship between the application of a force and the resulting change in position and motion on an object.*

- a. Identify simple machines and explain their uses (lever, pulley, wedge, inclined plane, screw, wheel and axle).
- b. Using different size objects, observe how force affects speed and motion.

Social Studies- *SS4H6 The student will explain westward expansion of America between 1801 and 1861.*

- b. Describe the impact of the steamboat, the steam locomotive, and the telegraph on life in America.

SS4E1 The student will use the basic economic concepts of trade, opportunity cost, specialization, voluntary exchange, productivity, and price incentives to illustrate historical events.

- f. Give examples of technological advancements and their impact on business productivity during the development of the United States (such as the steamboat, the steam locomotive, and the telegraph).

ELA- *ELAGSE4W2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.*

Gifted Goals Addressed:

- GT 1 Develop and practice higher order and critical thinking skills
- GT 2 Develop and practice creative thinking and problem solving skills

- GT 3 Develop advanced research and study skills
- GT 4 Develop and practice skills in the utilization of advanced technology
- GT 5 Strengthen communication skills (verbal, nonverbal, and written) using various forms of media
- GT6 Develop leadership and social skills
- GT7 Encourage students to develop “can-do” attitudes, positive self-concept, and respect for others

Length of Unit: 6-8 sessions

HOOK: Foil Boat Engineering Challenge

Aluminum Foil Boats: An Engineering Activity – (credit- United States Air Force Academy)

<http://www.usafa.edu/df/dfe/dfer/centers/stem/docs/AluminumFoilBoats.pdf>

Building aluminum foil boats is fun for kids of all ages. It is an easy activity for kids as young as 5 years old and teaches them the basics of design. Given a set amount of aluminum foil, each person must design and build a boat to hold as many pennies as possible before sinking.

Materials Needed: □ Aluminum foil □ Ruler □ Pennies □ Scissors

Safety Considerations: None

Instructions:

1. If you are doing this activity with a lot of kids, you’ll want to decide on a uniform size of aluminum foil square. Anything from 10 x 10 cm (4” square) to 15 x 15 cm (6” square) is a good size to choose. If you start to choose larger sizes (12” square, for example), it will require a lot of pennies to sink the boat, if it’s designed correctly.
2. We prefer to do this activity by forming the boat shape by hand; no tape or molds. You may wish to give each person two or more pre-cut pieces so that they can try different designs.
3. Once the boats are completed, they may be floated in a sink, bath tub, bucket, or kiddie pool. It is recommended that you start by putting the pennies, one at a time, in the middle of the boat first, then work your way towards the outsides.
4. Optional: Before adding any pennies, try to predict how many pennies your boat can hold before it sinks! Here are a few websites that can give you additional information on making aluminum foil boats.

Some sites also give hints with respect to the best design:

http://wiki.answers.com/Q/What_is_the_best_design_for_an_aluminum_foil_penny_boat

<http://pbskids.org/zoom/activities/sci/boatsafloat.html>

http://www.ehow.com/how_5895045_make-shapes-aluminum-foil-boats.html



Ironclad Introduction: Introduce Ironclad ships by reading *Duel of the Ironclads: The Monitor VS. The Virginia* by Patrick O'Brian. Discuss why these war ships would have been useful in the Civil War.

Extension: To further explore this new invention and the importance it played in the Civil War, read and discuss *Mr. Lincoln's High-Tech War: How the North Used the Telegraph, Railroads, Surveillance Balloons, Ironclads, High-Powered Weapons, and More to Win the Civil War* by Thomas B. Allen and Roger MacBride Allen. Discussion points: include the engineering processes used to develop the inventions. Were they all successful? Did we use these earlier inventions to create new and improved inventions?

History of CSS Georgia: Using various news articles, powerpoint presentations, and other resources, introduce and discuss the history of the CSS Georgia- a confederate ironclad that was scuttled in the Savannah River channel in 1864.

CSS Georgia Web Page: <http://1.usa.gov/1G6S2Hn>

SHEP (Savannah Harbor Expansion Project) Web Page: <http://1.usa.gov/1fhPEb3>

Museum of Underwater Archaeology Web Page: <http://www.themua.org/cssgeorgia>

CSS Georgia (ironclad) – Wikipedia Page: [https://en.wikipedia.org/wiki/CSS_Georgia_\(ironclad\)](https://en.wikipedia.org/wiki/CSS_Georgia_(ironclad))

CSS Georgia site photos - Civil War Album Page: (includes cannon on wheels at Fort Jackson)
www.civilwaralbum.com/misc7/css_georgia1.htm

Discussion points to lead to STEM activity using Simple Machines:

- *How many guns (cannons) were on the CSS Georgia?*
Guns of the CSS Georgia-<https://markerhunter.wordpress.com/2009/11/30/guns-of-the-css-georgia/> and Wikipedia [https://en.wikipedia.org/wiki/CSS_Georgia_\(ironclad\)](https://en.wikipedia.org/wiki/CSS_Georgia_(ironclad))
- *How heavy were these guns?*
http://antietam.aotw.org/weapons.php?weapon_id=17
- *How did the soldiers load and maneuver the cannons?*
Students brainstorm ideas... these discussions should lead to the discussion of Simple Machines

Simple Machines and Civil War Weapons:

What are Simple Machines? Pass out Worksheet Poster of the 6 Simple Machines.

Students complete Simple Machines Internet Scavenger Hunt. *** You may purchase this activity for \$1.50 @ <https://www.teacherspayteachers.com/Product/Simple-Machines-Internet-Scavenger-Hunt-1731807>

Discussion: students discuss how each simple machine may or may not be used in maneuvering Civil War Weapons. ** show PowerPoint of various forts using simple machines to help maneuver heavy weapons.

Explore *Simple Machines for a Complex Job – Fort Pulaski* Page:

<https://www.nps.gov/fopu/learn/education/classrooms/simplemachines.htm>

Moving a Cannon lesson (substitute Sutter's Fort with Fort Jackson)-

<http://lessons.ctaponline.org/~bmcquerr/#activities>

Maritime Machines: (background information and lesson plans)-

<http://www.lcmm.org/education/resource/maritime-machines/Maritime%20Machines%20-%20Educator%20Resources.pdf>

Simple Machines STEM Activity: The Great Marshmallow Launch

*** This activity can be purchased for \$2.75 @

<https://www.teacherspayteachers.com/Product/Simple-Machine-Activity-Marshmallow-Launch-167738>

This is an engaging way to reinforce the concepts students have learned about simple machines. This activity is a great way for students to put what they know into action. Given limited materials, students are challenged to create a marshmallow launcher to relate to weapons used on the *CSS Georgia*.

This packet includes:

- teacher instructions
- a handout with student instructions and a place to record data
- a graphing activity
- exit slip for assessment
- certificate for completing launch

In addition to helping students learn about simple machines and levers, this also is a great group work activity and helps the students build their collaboration skills.

Culminating Writing Activity:

Students should be keeping an ongoing journal to record information learned as well as any questions they have about topics discussed. This includes a diagram of the marshmallow launcher they invented and any improvements they would make if they created another launcher. Students may share journals with other classmates as well as with the teacher.

Sample Journal Entries:

Entry #1 Foil Boat Engineering Challenge

Entry #2 Ironclads

Entry #3 CSS Georgia

Entry #4 Simple Machines

Entry #5 Simple Machines and Civil War Weapons

Entry #6 Marshmallow Launcher

Students will work with a partner to complete a newspaper review activity for one of the journal entries listed above. See attachment made by HappyRock Creations on <https://www.teacherspayteachers.com/Product/Newspaper-Activity-End-of-the-Year-Review-or-Assessment-Project-2452333>

**Student Instructions –
Review of a Unit**

Unit: _____

This newspaper activity is a chance for you to review what we have learned in this unit.

1. Create 1 drawing/map/Chart/diagram that shows 1 thing you learned in this unit. Use the space under the drawing to explain it.
2. Pick 3 vocabulary words that you have learned, and explain what they mean.
3. Pick 3 concepts (ideas) that you have learned in this unit, and write about each one in the boxes. Above each box, write the name of the concept/idea you are explaining.

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Unit/Topic

Your Name	Give your drawing a title
3 Vocabulary Words	Picture/ diagram/map/ chart
Explain the vocabulary words	Explain your drawing/ diagram/map/chart

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What did you learn?

Explain 1 big concept (idea) from this unit.

What did you learn?	What did you learn?
Explain a concept (idea) from this unit	Explain a concept (idea) from this unit

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Evaluation Rubric

The attached rubric will be used to evaluate students throughout the entire unit. Students should also be given a copy in order to self-evaluate and become aware of the content they will be scored on throughout the unit's completion.

*We will create some multi-media presentations when we receive the resources on July 29th.