



## Unit Essential Questions

How can gravitational forces affect the balance of objects?

How does proportion affect balance?

### PROJECT DESCRIPTION

In this project, students will use their knowledge of balance and unbalanced forces to design and create a Calder mobile. A Calder mobile is a mobile of 3 to 5 levels that has various materials attached to wire, that must be balanced upon completion. The material used to balance must be of various sizes including materials such as foam pieces, card stock, wire, string, paper clips, and/or beads. In completing this project, students will be using their critical thinking skills to utilize the materials to create a piece of artwork that incorporates the scientific concepts of gravitational forces, as well as balanced and unbalanced forces. Students will also write about their experience before, during, and after completion of the project.

## LEARNING TARGETS

“I Can...”

- I can identify and compare balanced and unbalanced forces
- I can create a balanced mobile using unbalanced forces
- I can analyze how forces affect balance and revise my plan as I design
- I can communicate my understanding of forces by reflecting upon my construction of my Calder mobile

[www.artsnowlearning.org](http://www.artsnowlearning.org)

Units provide differentiated ideas and activities aligned to a sampling of standards.

The units do not necessarily imply mastery of standards, but are intended to inspire and equip educators.

Produced through the U.S. Department of Education: Arts in Education—Model Development and Dissemination Grants Program  
Cherokee County (GA) School District and ArtsNow, Inc.

Project Description	Learning Targets
<p>In this project, students will use their knowledge of balance and unbalanced forces to design and create a Calder mobile. A Calder mobile is a mobile of 3 to 5 levels that has various materials attached to wire, that must be balanced upon completion. The material used to balance must be of various sizes including materials such as foam pieces, card stock, wire, string, paper clips, and/or beads. In completing this project, students will be using their critical thinking skills to utilize the materials to create a piece of artwork that incorporates the scientific concepts of gravitational forces, as well as balanced and unbalanced forces. Students will also write about their experience before, during, and after completion of the project.</p>	<p>“I Can...”:</p> <ul style="list-style-type: none"> <li>● I can identify and compare balanced and unbalanced forces</li> <li>● I can create a balanced mobile using unbalanced forces</li> <li>● I can analyze how forces affect balance and revise my plan as I design</li> <li>● I can communicate my understanding of forces by reflecting upon my construction of my Calder mobile</li> </ul>

### ESSENTIAL QUESTIONS

- How can gravitational forces affect the balance of objects?
- How does proportion affect balance?

### STANDARDS

Curriculum Standards	Arts Standards
<p><b>S4P3. Obtain, evaluate, and communicate information about the relationship between balanced and unbalanced forces.</b></p> <p>a. Plan and carry out an investigation on the effects of balanced and unbalanced forces on an object and communicate the results.</p> <p>b. Construct an argument to support the claim that gravitational force affects the motion of an object.</p> <p><b>ELAGSE4W2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</b></p> <p>a. Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.</p>	<ul style="list-style-type: none"> <li>• <b>VA4PR.1 Creates artworks based on personal experience and selected themes.</b> <ul style="list-style-type: none"> <li>b. Makes design decisions as the result of conscious, thoughtful planning and choices.</li> </ul> </li> <li>• <b>VA4PR.3 Understands and applies media, techniques, and processes of three-dimensional works of art (ceramics, sculpture, crafts, and mixed-media) using tools and materials in a safe and appropriate manner to develop skills.</b> <ul style="list-style-type: none"> <li>a. Creates 3-D artwork that demonstrates a design concept: open or closed form, proportion, balance, color scheme, and movement.</li> </ul> </li> </ul>

<p>b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>c. Link ideas within categories of information using words and phrases. (e.g., another, for example, also, because).</p> <p>d. Use precise language and domain-specific vocabulary to inform about or explain the topic.</p> <p>e. Provide a concluding statement or section related to the information or explanation presented.</p>	
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

**KEY VOCABULARY**

Content Vocabulary	Arts Vocabulary
<ul style="list-style-type: none"> <li>• Balance</li> <li>• Unbalanced</li> <li>• Gravitational force</li> <li>• Force</li> <li>• Explanatory writing</li> <li>• Reflection</li> <li>• Precise language</li> <li>• Mass</li> </ul>	<ul style="list-style-type: none"> <li>• Balance: This is a sense of stability in the body of work. Balance can be created by repeating same shapes and by creating a feeling of equal weight.</li> <li>• Proportion: This refers to the relationships of the size of objects in a body of work. Proportion gives a sense of size seen as relationship of objects, such as smallness or largeness.</li> </ul>

**TECHNOLOGY INTEGRATION**

<ul style="list-style-type: none"> <li>• <a href="https://phet.colorado.edu/sims/html/forces-and-motion-basics/latest/forces-and-motion-basics_en.html">https://phet.colorado.edu/sims/html/forces-and-motion-basics/latest/forces-and-motion-basics_en.html</a></li> <li>• <a href="http://archive.artsmia.org/artists_toolkit/encyc_balancesymmetry.htm">http://archive.artsmia.org/artists_toolkit/encyc_balancesymmetry.htm</a></li> </ul>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**ASSESSMENTS**

Formative	Summative
<ul style="list-style-type: none"> <li>• Teacher will observe the students to determine if they understand what gravitational force is.</li> <li>• Teacher will observe the students to determine if they understand what balanced and unbalanced forces are.</li> <li>• Teacher will observe the students' use of</li> </ul>	<ul style="list-style-type: none"> <li>• Project 1 Rubric</li> <li>• The teacher will check for student's communication of deeper thinking throughout the project (specifically checking for understanding of how proportion and gravitational forces affect balance).</li> </ul>

<p>proportion in relation to balance.</p>	<ul style="list-style-type: none"> <li>• The teacher will ask student reflection questions during the creation of their artwork:             <ul style="list-style-type: none"> <li>▪ How did you plan to balance your mobile?</li> <li>▪ How did you determine your number of levels?</li> <li>▪ How did you determine the material used to balance your mobile?</li> <li>▪ What did you have to rethink while attempting to balance your mobile?</li> <li>▪ How did gravitational force affect your plan?</li> </ul> </li> </ul>
-------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### MATERIALS

<ul style="list-style-type: none"> <li>• pipe cleaners</li> <li>• paper clips</li> <li>• foam sheets</li> <li>• card stock</li> <li>• beads</li> <li>• string</li> </ul>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### Activating Strategy (5- 10 min)

Choose a book to explore as a class from the below list:

- [Alexander Calder: Meet the Artist](#) by Patricia Geis
- [Sandy's Circus: A Story About Alexander Calder](#) by Tanya Lee Stone
- [Alexander Calder and His Magical Mobiles](#) by Jean Lipman

Then introduce Alexander Calder to students and use this website to introduce students to the concept of mass: <http://thekidshouldseethis.com/post/experimental-balancing-sculptures>

### Main Activity

#### PROCESS:

#### PART 1:

- Facilitate class discussion on gravitational force. <http://study.com/academy/lesson/gravitational-force-definition-equation-examples.html>

## Project 1 of 3

Approx. Duration of Project: 90 minutes

- Students can also use the websites (Technology integration) to explore gravitational forces and proportion as well to explore with balance in art. This can be facilitated independently or in small research groups.
- Announce students that they are going to be challenged with a task. The task is to: **Create a balanced mobile using unbalanced forces.**

In small groups, direct students to:

- Determine the number of levels for mobile (3-5).
- Determine the lengths of wires.
- Determine other materials for use.
- Sketch the wire levels- predict how it will balance.
- Start assembling the levels.

**PART 2:**

- Review previous day's information, more mobiles, and notes.
- Start attaching materials: foam/cardstock/beads.
- Check for balance and re-check as needed.
- Record in journal how they balanced levels - did they have to omit materials, what changed?

(Give approximately 90 minutes total to design the mobile. If this time frame sounds prohibiting, structure this project to fit your students' needs).

**Classroom Tips:**

- Review project work pledge
- Review safe work procedures
- Review classroom rules
- Review peer interaction regulations
- Teacher will be in charge of cutting wire
- Other materials can be divided into kits

**REFLECTION****Reflection Questions**

- *How did you visualize your mobile?*
- *Did your original plan work?*
- *What did you have to fix?*
- *If you positioned levels differently, how would your final product change?*
- *If you changed materials, what would have changed? Why?*

**DIFFERENTIATION**

**BELOW GRADE LEVEL:** Modify number of levels required. Provide a graphic organizer with levels for students to draw and visualize materials to attach to each level. Give sentence frames for reflection journal. Provide opportunity for peer checks so students can get feedback on their project. You could also partner them with other students if this collaborative support is needed.

**ABOVE GRADE LEVEL:** Increase number of levels, write instructions to build a mobile for a classmate.

**EL STUDENTS:** Modify number of levels, give sentence frames, include visual cues, provide extra time, and peer help.

#### ADDITIONAL RESOURCES

- <http://study.com/academy/lesson/gravitational-force-definition-equation-examples.html>
- <https://connecticuthistory.org/a-world-in-motion-artist-and-sculptor-alexander-calder/>
- [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=video&cd=14&cad=rja&uact=8&ved=0ahUKEwiDsvOLvJ\\_UAhVB0iYKHeKECrw4ChC3AggvMAM&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DFjKYmD1HHKs&usq=AFQjCNELe6fcoVaXPsjdzlmyiGX-ehslqw&sig2=1UfbCZBDcaDHVzpRWSMBxQ](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=video&cd=14&cad=rja&uact=8&ved=0ahUKEwiDsvOLvJ_UAhVB0iYKHeKECrw4ChC3AggvMAM&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DFjKYmD1HHKs&usq=AFQjCNELe6fcoVaXPsjdzlmyiGX-ehslqw&sig2=1UfbCZBDcaDHVzpRWSMBxQ)
- <http://thekidshouldseethis.com/post/experimental-balancing-sculptures>

#### APPENDIX

- Project 1 Rubric

#### CREDITS

U.S. Department of Education  
Arts in Education--Model Development and Dissemination Grants Program  
Cherokee County (GA) School District and ArtsNow, Inc.  
Ideas contributed and edited by:  
T. Renee Manuel, Edited by Jessica Espinoza

**Balancing Act: Calder Mobile**

**TASK: Create a balanced mobile using unbalanced forces.**

Task	4	3	2	1
<b>Creating Calder-Inspired Art</b>	Mobile is balanced; has appropriate number of levels	Mobile is balanced; missing one level	Mobile is unbalanced; all levels present	Mobile is unbalanced and missing more than one level
<b>Communicate</b>	Student has a fully developed plan of the construction of the artwork; student uses appropriate language skills; students can inform and explain to audience what they created	Student mostly has a clear plan for the construction of artwork; student has minimal errors in language skills, students can inform and explain to audience what they created	Student has an underdeveloped plan for the construction of artwork; student has major (more than 5) errors in language skills, students can inform and explain to audience what they created	Student does not have a plan for the construction of their artwork; language errors make understanding difficult; students do not inform/explain what they created
<b>Accuracy of Science Content</b>	Student has written about how balance and gravitational force are related and how it affected the outcome of their artwork	Student's writing demonstrates understanding of balance and force, but no relationship to the artwork is expressed	Student's writing demonstrates a minimal understanding of balance and force and relationship to the artwork is limited	The writing expresses minimal understanding of balance or gravitational force

**Teacher Commentary:** \_\_\_\_\_

**Student Commentary:** \_\_\_\_\_

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

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

**Total Score:** \_\_\_\_\_