

ARTS IMPACT LESSON PLAN

Theater and Science, Technology, Engineering Infused Lesson

Energy and Force

Authors: Dave Quicksall Grade Level: Pre-kindergarten

Enduring Understanding

The weight of an object effects how much energy is needed to force it to move.

Lesson Description (Use for family communication and displaying student art)

In this Early Learning Science, Technology, and Engineering lesson, students use theater concepts of action, movement, gesture, and facial expressions to explore the interactions of energy and force upon an object at rest.

Learning Targets and Assessment Criteria

Target: Understands opposites.

Criteria: Uses body, voice, movements, and gestures to communicate the difference between opposing words.

Target: Understands the opposing forces of pushing and pulling.

Criteria: Uses body, posture, and movement to communicate the difference between two opposite actions.

Target: Analyzes the opposing energies needed to move different items.

Criteria: Uses body, movement, and facial expressions to communicate the ease/difficulty in moving light/heavy objects.

Target: Understands the effects of different strengths of pushes and pulls on an object.

Criteria: Conducts an investigation on pushing/pulling a light/heavy chair.

Vocabulary

Arts Infused:

Action
Interaction
Movement

Science/Engineering:

Energy
Force
Motion

Arts:

Body
Facial Expression
Gesture
Movement
Neutral

Materials

**Museum Artworks or Performance
Seattle, WA**

Seattle Children's Theatre

Tacoma, WA

Broadway Center for the Performing
Arts

Materials

An office-style chair with wheels; Class
Assessment Worksheet

Learning Standards

WA Arts State Grade Level Expectations

For the full description of each WA State Arts Grade Level Expectation, see:

<http://www.k12.wa.us/Arts/Standards>

- 1.2.1 Skills and Techniques: Movement, Facial Expression
- 1.2.2 Skills and Techniques: Voice
- 2.1.1 Creative Process
- 2.2.1 Performance Process
- 2.3.1 Responding Process
- 3.1.1 Communicates through the Arts

Early Learning Guidelines

For a full description of Washington State Early Learning and Child Development Guidelines see:

<http://www.del.wa.gov/development/guidelines/>

- (Age 4-5) 3. Touching, seeing, hearing and moving around: Using the large muscles (gross motor skills): Move with purpose from one place to another using the whole body.
- (Age 4-5) 6. Learning about my world: Science: Ask questions and identify ways to find answers; try out these activities and think about what to do next to learn more. Arts: Show creativity and imagination.

continued

Next Generation Science Standards

<http://www.nextgenscience.org/next-generation-science-standards>

Topic:

Forces and Interactions: Pushes and Pulls

Disciplinary Core Ideas:

PS2.A: Forces and Motion

PS2.B: Types of Interactions

PS3.C: Relationship Between Energy and Force

Science Kits Addressed:

1: Balls and Ramps

Performance Expectations:

K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Crosscutting Concepts:

Cause and Effect

Science and Engineering Practices:

1. Asking Questions and Defining Problems
3. Planning and Carrying Out Investigations
6. Constructing Explanations
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating and Communicating Information

ICON KEY:

 = Indicates note or reminder for teacher

 = Embedded assessment points in the lesson

Pre-Teach

The Arts Foundations lesson of “Expressive Body” (steps 1-4) should be taught before this infusion lesson.

Lesson Steps Outline

PART ONE

1. Warm up students by introducing the concept of opposites using the “Oo Shoo Bee Doo Bee” chant.

 Criteria-based teacher checklist: Uses body, voice, movements, and gestures to communicate the difference between opposing words.

2. Lead students in a physical exploration of actions. The final action is that of pushing a heavy object.

 Criteria-based teacher checklist: Uses body, movement, and facial expressions to communicate the difficulty in moving heavy objects.

3. Lead students in a physical exploration of the action of pushing a light object.

 Criteria-based teacher checklist: Uses body, movement, and facial expressions to communicate the ease in moving heavy objects.

4. Lead a reflection on the differences between pushing a heavy object and a light object.

 Criteria-based teacher checklist and group reflection: Uses body, posture, and movement to communicate the difference between two opposite actions. Uses body, movement, and facial expressions to communicate the ease/difficulty in moving light/heavy objects.

5. Lead students in a physical exploration of the action of pulling a heavy object.

 Criteria-based teacher checklist: Uses body, movement, and facial expressions to communicate the difficulty in moving heavy objects.

6. Lead students in a physical exploration of the action of pulling a light object. Then contrast the energies of pulling something light and pulling something heavy.

Criteria-based teacher checklist: Uses body, posture, and movement to communicate the difference between two opposite actions. Uses body, movement, and facial expressions to communicate the ease/difficulty in moving light/heavy objects.

PART TWO

1. Lead the students in predicting the different energies needed to push an empty chair and an occupied chair across the space.

Criteria-based teacher checklist and group reflection: Conducts an investigation on pushing a light/heavy chair.

2. Conduct the investigation by having the volunteer push the unoccupied chair, followed by pushing the occupied chair. Lead reflection.

Criteria-based teacher checklist and group reflection: Conducts an investigation on pushing/pulling a light/heavy chair.

3. Repeat STEPS 7 and 8 while pulling the chair, using a different volunteer.

Criteria-based teacher checklist and group reflection: Conducts an investigation on pushing/pulling a light/heavy chair.

LESSON STEPS

PART ONE

1. Warm up students by introducing the concept of opposites using the “Oo Shoo Bee Doo Bee” chant.

▣ Arrange students in a large, standing circle and repeat the chant until they are familiar with the words and rhythm and can join in.

▣ The movements should be simple bouncing in rhythm, gestures, and (possibly) snapping fingers.

- *I want you to listen to this chant I will do, and then I want you follow along using your voice and body the same way I do.*

Oo Shoo Bee Doo Bee, oo, oo.

Continue with chant until all the students are able to chant and move along. Begin to substitute opposite or directional words to the chant and show simple movements that demonstrate the action (such as stretching up for “up” and squatting down for “down.”

Oo Shoo Bee Doo Bee, up, up.

Oo Shoo Bee Doo Bee, down, down.

Oo Shoo Bee Doo Bee, in, in.

Oo Shoo Bee Doo Bee, out, out.

▣ Examples of other opposites can be: forward/backward, left/right, loud/soft, big/small. The final ones should be:

Oo Shoo Bee Doo Bee, push, push.

Oo Shoo Bee Doo Bee, pull, pull.

☑ Criteria-based teacher checklist: Uses body, voice, movements, and gestures to communicate the difference between opposing words.

2. Lead students in a physical exploration of actions. The final action is that of pushing a heavy object.

▣ Arrange the students in a way that they have space around them to move without touching another student.

- *Today, we are going to show different actions with our bodies. When I say “go”, I would like you to WALK around the room in neutral, without bumping into anyone else. Remember, “neutral” means just being yourself, not a character. WALK nice and easy. WALK is our first action. Go.*

▣ Guide students’ movement as the move through the room.

- *Now, show me HOPPING. Now, show me CRAWLING.*
- *Now, standing in your own self-space, I would like you to show me what PUSHING looks like.*

▣ Remind students that they are using their imaginations and pushing the air, not pushing other objects or other students.

- *I see many of you stretching your arms out in front of you. What happens if you use your whole body to do the pushing? Pretend that you are pushing open a very heavy door. How can you use your arms? Your legs? Your shoulders? What does your facial expression look like when you are pushing something heavy? Really push that door!*
- *Now, I want you to pretend that you are pushing a very heavy object – let’s say a car! It is able to roll, but it is very, very heavy. I want you to move through the room pushing your car, staying aware of your self-space and the other people pushing their cars. How can you show me that you are pushing a heavy object that slowly moves across the room?*

Criteria-based teacher checklist: Uses body, movement, and facial expressions to communicate the difficulty in moving heavy objects.

3. Lead students in a physical exploration of the action of pushing a light object.

- *Let’s continue pushing but now I want you to change the object. Now, pretend that you are pushing an empty baby carriage. It is very light and delicate. You must push it with care. Move through the room, making sure you don’t bump into the other baby carriages moving around the room.*
- *Remember to continue using your whole body as you push the lighter object.*

Criteria-based teacher checklist: Uses body, movement, and facial expressions to communicate the ease in moving light objects.

4. Lead a reflection on the differences between pushing a heavy object and a light object.

- *What happens to your body when it pushes something heavy? What do you have to do to make a heavy object move? You must push with more STRENGTH. You have to use more ENERGY to FORCE an object to move when it is heavy than when it is light.*
- *Did you use the same force to push the baby carriage?*
- *What do you think would happen if you used the same strength that you used to push the car on the baby carriage? Would it move faster or slower? Let’s find out. Find a spot in the room so that you can move.*
- *First, show me how you pushed the car. (they move) Now, show me what will happen if you push the baby carriage that hard. (they adjust their movement)*
- *What happened? Right, the bay carriage moved very fast. Why? Yes, because it’s very light.*

Criteria-based teacher checklist and group reflection: Uses body, posture, and movement to communicate the difference between two opposite actions. Uses body, movement, and facial expressions to communicate the ease/difficulty in moving light/heavy objects.

5. Lead students in a physical exploration of the action of pulling a heavy object.

▮ Arrange the students in a way that they have space around them to move without touching another student.

- What is the opposite of PUSHING? PULLING.
- *Standing in your own self-space, I would like you to show me what PULLING looks like.*
- *I see many of you stretching your arms out in front of you and pulling them in towards your body. What happens if you use your whole body to do the pulling? Pretend that you are pulling a wagon full of very large and heavy rocks. How can you use your arms? Your legs? Your back? What does your facial expression look like when you are pulling something heavy? Really pull the wagon.*
- *Now, I want you to move through the room pulling your heavy wagon, staying aware of your self-space and the other people pulling their wagons the room?*
- *How can you pull while moving forward? How can you pull while moving backwards?*

Criteria-based teacher checklist: Uses body, movement, and facial expressions to communicate the difficulty in moving heavy objects.

6. Lead students in a physical exploration of the action of pulling a light object. Then contrast the energies of pulling something light and pulling something heavy.

- *Let's continue pulling but now I want you to pretend that your wagon is empty. How does that change the amount of strength you need to use? Is it easier? Move through the room, making sure you don't bump into the other wagons moving around the room.*
- *Remember to continue using your whole body as you pull your lighter, empty wagon.*

▮ Lead students as they apply the strength of pulling a heavy wagon to that of pulling a lighter, empty wagon.

- *When I say "go" I want you to pull your empty wagon with the same ENERGY that you used to pull the heavy wagon. Go. Stop.*
- *What happened? Why did you move faster?*

Criteria-based teacher checklist: Uses body, posture, and movement to communicate the difference between two opposite actions. Uses body, movement, and facial expressions to communicate the ease in moving light objects.

PART 2

▣ For part two a chair that can roll will be needed. A simple rolling office chair would be optimal.

1. Lead the students in predicting the different energies needed to push an empty chair and an occupied chair across the space.

▣ Many (if not all) the students may want turns pushing the chair. Use best judgment to determine how many times the investigation can be repeated.

- *We are now going to be scientists and conduct an investigation. An investigation is when you have an idea of how something will work and then test it out. We have a rolling chair that we are going to push across the space. First, I need a volunteer to do the pushing.*
- *We are going to push the chair across the space two times: first, with no one sitting in it; second, with me sitting in it. Now, thinking like a scientist, which one will require more energy? The empty chair? The chair with me sitting in it? Why?*

▣ A possible tally could be made if there are some students predicting one way, and some the other. It could be written on the board.

☑ Criteria-based teacher checklist and group reflection: Conducts an investigation on pushing a light/heavy chair.

2. Conduct the investigation by having the volunteer push the unoccupied chair, followed by pushing the occupied chair. Lead reflection.

- *Did you predict right? Which one took more energy? Why?*
- *Will it work the same way when pulling the chair? Let's find out.*

☑ Criteria-based teacher checklist and group reflection: Conducts an investigation on pushing/pulling a light/heavy chair.

3. Repeat STEPS 7 and 8 while pulling the chair, using a different volunteer.

- *Now, we will repeat our investigation, but this time, we will be pulling the chair.*
- *What did we discover?*

☑ Criteria-based teacher checklist and group reflection: Conducts an investigation on pushing/pulling a light/heavy chair.

▣ POSSIBLE EXTENSIONS

The investigations in PART TWO of this lesson can be extended in several ways:

1. Have more than one student push/pull the chair and observe how that changes the energy to move the chair.
2. Move the chair onto an incline or ramp and observe how the slope effects movement both up and down the grade.
3. Push/pull different actions and observe how friction might effect an object without wheels.

ARTS IMPACT LESSON PLAN Theater and Science Infusion

Energy and Force

CLASS ASSESSMENT WORKSHEET

Disciplines	THEATER	THEATER/SCIENCE	THEATER/SCIENCE	SCIENCE	Total 4
Concept	Opposites	Actions/Forces	Actions/Forces	Investigation	
Criteria	Uses body, voice, movements, and gestures to communicate the difference between opposing words.	Uses body, posture, and movement to communicate the difference between two opposite actions.	Uses body, movement, and facial expressions to communicate the ease/difficulty in moving light/heavy objects.	Conducts an investigation on pushing/pulling a light/heavy chair.	
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29.					
30.					
Total					
Percentage					

What was effective in the lesson? Why?

What do I want to consider for the next time I teach this lesson?

How could I connect the concepts in this lesson with other disciplines?

Teacher: _____ Date: _____

THEATER and SCIENCE LESSON: *Energy and Force*

Dear Family:

Today your child participated in an **Arts and Science, Technology, Engineering** lesson. We talked about how different strengths are needed to push or pull an object and that the strength depends upon the weight of the object being moved.

- We discovered how to use our bodies to push and pull imaginary objects that are both light and heavy.
- We experimented with the interactions between energy and force.
- We created conducted an investigation on energy and force by pushing and pulling an occupied and an empty rolling chair.

At home, you could conduct your own investigations by pushing and pulling objects of varying weights.

Enduring Understanding

The weight of an object effects how much energy is needed to force it to move.