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Walk This Way (Force and Motion) [6th grade]

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UNDERSTANDING BY DESIGN

Unit Cover Page

Unit Title: Walk This Way (Force and Motion)

Grade Level: 6

Subject/Topic Area(s): Science/Force and Motion

Designed By: Anne Cowell

Time Frame: 3 weeks

School District: Northside ISD

School: Rawlinson Middle School

School Address and Phone: 14100 Vance Jackson
San Antonio, TX 78249

Brief Summary of Unit (Including curricular context and unit goals):

The goal of this unit is for students to understand:

An object's motion is dependent on the forces that are acting or have acted on it.

An object's motion can be pictured in a graph or be determined from a graph.

The unit addresses balanced and unbalanced forces, types of forces, speed, and reviews graphing to address the understandings and the district expectations.

Unit: Walk this Way (Force and Motion)

Grade: 6

Stage 1: Desired Results

Understandings

Students will understand that...

An object's motion is dependent on the forces that are acting or have acted on it.
An object's motion can be pictured in a graph or be determined from a graph.

Essential Questions

- How does force cause change? When does motion occur?
- In what ways can motion be represented?

Knowledge & Skill

Identify and describe the changes in position, direction, and speed of an object when acted upon by force. (6.6A)

Students will be able to recognize, demonstrate, and explain how they know a force is being applied.

Demonstrate that changes in motion can be graphically represented. (6.6B)

Students will be able to read and create graphs that represent an objects motion.

Stage 2: Assessment Evidence

Performance Task:

Task #1: Forced Photograph

You must bring a photograph, of yourself in action, to Ms. Cowell. After our study of forces you will examine your photograph and identify the forces involved (at least 4 forces must be identified in your picture).

To show the forces acting in your picture:

- Draw arrows representing each force pictured. (Arrow size must relate to the force of the arrow and show the direction the force is being applied).

For each arrow explain:

- the strength of the force
- the type/cause of the force
- what motion the force causes or why no motion happens

Task #2: Middle School Walk

You walk down the C hallway almost everyday. Think about how fast or slow you walk and how often you stop as you are walking. Why does your motion change as you move down the hallway? Your task is to explain a graph you are given of “your” walk down the hallway.

- ❖ Give the graph an appropriate title
- ❖ Identify the beginning and ending locations of the walk.
- ❖ Explain 3 points of the graph.
- ❖ In your explanation of each point be sure to include:
 - *What motion is taking place at that point?*
 - *Why is that motion occurring?*
 - *What is the speed of the motion?*

Other evidence:

(quizzes, tests, academic prompts, self-assessments, etc.

note – these are usually included where appropriate in Stage 3 as well)

Velcro activity, exit slips, labs, worksheets

Stage 3: Learning Activities

(Steps taken to get students to answer Stage 1 questions and complete performance task)

Day 1: What is a force? Quick demo of push and pull w/student volunteer. Class discussion and notes of situations, identifying the pushes and pulls.

Day 2: **How does force cause change?** Students close eyes and then have to identify what changed (I move an object in the room). How do you know the object was moved? (Define motion in notes.) Do forces always cause movement? Go outside and play tug-o-war. Discuss and draw the results of each match. Lead students to define balanced and unbalanced forces in notes.

Day 3: Push on wall intro. Watch power point

<http://www.engineeringinteract.org/resources/parkworldplot/flash/concepts/balancedandun.htm>

Each student gets one strip w/ balanced, unbalanced, change in motion, or no change in motion and they must come Velcro it to a proper free body diagram picture.

Day 4: Types of forces notes (focus on friction, tension, air resistance, weight, normal, and applied forces). Pizza table with pictures that include all these forces. Velcro pics again adding type of force.

Day 5: Friction lab (Students slide an object down different surfaces.)

Day 6: Friction lab

Day 7: Friction lab

Day 8: Nickel and index card inertia mini lab. Discuss and draw free body diagram. Define inertia and predict how it will effect other situations (pulling paper out from under a book, a car coming to a sudden stop without people in seat belts, hard boiled vs raw egg).

Day 9: Quiz-Quiz-Trade and inertia WS.

Day 10: Performance task #1

Day 11: Order animals by their speeds. Notes on calculating speed. Practice with speed calculations. In groups of 4 one student writes the first step of the problem, and passes the white board, students continue working one step and passing the board until they have completed all of the assigned problems. Exit slip.

Day 12: Speed lab (Students are timed walking a prescribed distance.)

Day 13: **In what ways can motion be represented?** Speed lab calculations and graphing.

Day 14: Volunteers come to the front of the room and are instructed how to move. The class matches the students' movement to a graph. Students match pictures to speed graphs.

Day 15: Performance task #2

Forced Photograph



You must bring a photograph, of yourself in action, to Ms. Cowell. After our study of forces you will examine your photograph and identify the forces involved (at least 4 forces must be identified in your picture).

To show the forces acting in your picture:

- **Draw arrows representing each force pictured. (Arrow size must relate to the force of the arrow and show the direction the force is being applied).**

For each arrow explain:

- **the strength of the force**
- **the cause of the force**
- **what motion the force causes or why no motion happens**

Rubric: Forced Photograph

Teacher Name: **Ms. Cowell**

Student Name: _____

CATEGORY	Weight for Each Category	4	3	2	1
Title	X1 (up to 4 points available)	Title is informative, centered, and larger than other text.	Title is informative and larger than other text.	Title is informative and centered.	The title is incomplete and does not clearly indicate what is pictured.
General Formatting	X3 (up to 12 points available)	Unlined paper is used. Student name, class, and date are in the top right hand corner. It is immediately clear which explanation corresponds to which arrow. Page is neat and not smudged. Color is used carefully to enhance the final product.	Unlined paper is used. Student name, class, and date are in the top right corner. It is clear which explanation corresponds to which arrow. There are a few smudged lines or stray marks on the paper, but they do not greatly detract from the final product. Color is used.	Unlined paper is used. Student name, class, and date are in the top right corner. It is possible to determine the explanation that corresponds to the arrow. There are a few smudged lines or stray marks on the paper, which detract from the drawing OR color is not used carefully. Overall, the quality of the product is fair.	Lined paper is used. It is possible to determine which explanation corresponds to which arrow. There are several erasures, smudged lines or stray marks on the paper, which detract from the drawing. Overall, the quality of the product is poor.
Drawing - details	X5 (up to 20 points available)	Arrow size relates to the force of the arrow and shows the direction of the force being applied for all force arrows.	Arrow size relates to the force of the arrow and shows the direction of the force being applied for all force arrows with no more than 2 mistakes.	All force arrows size or direction is repeatedly misrepresented.	Includes force arrows but some are missing/the direction and size are incorrect.
Content - Accuracy	X15 (up to 60 points available)	Explanation of force arrow is clear and specific. Explanation includes strength of force, cause of force, and motion caused by force.	A clear and specific explanation of 2 of the 3 items below is included. Strength of force, cause of force, and motion caused by force.	A clear and specific explanation of 1 of the 3 items below is included. Strength of force, cause of force, and motion caused by force.	An explanation of the force arrow is included.

Middle School Walk



You walk down the C hallway almost everyday. Think about how fast or slow you walk and how often you stop as you are walking. Why does your motion change as you move down the hallway? Your task is to explain a graph you are given of "your" walk down the hallway.

- ❖ Give the graph an appropriate title
- ❖ Identify the beginning and ending locations of the walk.
- ❖ Explain 3 points of the graph.
- ❖ In your explanation of each point be sure to include:
 - *What motion is taking place at that point?*
 - *Why is that motion occurring?*
 - *What is the speed of the motion?*

Rubric: Middle School Walk

Teacher Name: **Ms. Cowell**

Student Name: _____

CATEGORY	Weight for Each Category	4	3	2	1
Title	X3 (up to 12 points available)	Title is informative, centered, and larger than other text.	Title is informative and larger than other text.	Title is informative and centered.	The title is incomplete and does not clearly indicate what is pictured.
Explanation of walk	X4 (up to 16 points available)	School location for beginning and end of walk is clearly identified in complete sentences.	School location for beginning and end of walk is suggested in complete sentences.	School location for beginning or end of walk is identified in complete sentences or school location for beginning and end of walk is identified but not in complete sentences.	School location for beginning or end of walk is suggested.
Content - Accuracy	X15 (up to 60 points available)	The speed, motion and its cause are clearly stated for each point including the details that make it your walk.	The speed, motion and its cause are stated for each point with some detail.	The speed, motion and its cause are stated for most points.	There was an attempt to explain the speed, motion or its cause.
General Formatting	X3 (up to 12 points available)	Unlined paper is used. Student name, class, and date are in the top right hand corner. It is immediately clear which explanation corresponds to which point. Page is neat and not smudged. Color is used carefully to enhance the final product.	Unlined paper is used. Student name, class, and date are in the top right corner. It is clear which explanation corresponds to which point. There are a few smudged lines or stray marks on the paper, but they do not greatly detract from the final product. Color is used.	Unlined paper is used. Student name, class, and date are in the top right corner. It is possible to determine the explanation that corresponds to each point. There are a few smudged lines or stray marks on the paper, which detract from the drawing OR color is not used carefully. Overall, the quality of the product is fair.	Lined paper is used. It is possible to determine which explanation corresponds to which point. There are several erasures, smudged lines or stray marks on the paper, which detract from the drawing. Overall, the quality of the product is poor.