

INSPIRE GK12 Lesson Plan



Lesson Title	Intro. to Motion and Forces
Length of Lesson	Two (50 minute) class periods
Created By	Deb Pounders
Subject	General Science
Grade Level	8 th grade
State Standards	8 th : 1 b,c,d (Inquiry) & 2 c,f (Physical Science)
DOK Level	DOK 3
DOK Application	Investigate, Compare, Construct, Cite Evidence, Hypothesize
National Standards	5-8: A (Inquiry); B (Physical Science)
Graduate Research Element	N/A

Student Learning Goal:

MS 8th Grade:

(Inquiry – 1) b. Make inferences based on observations. c. Summarize data to show the cause and effect relationship between qualitative and quantitative observations (using standard, metric, and non-standard units of measurement). d. Analyze evidence that is used to form explanations and draw conclusions.
(Physical Science – 2) c. Distinguish the motion of an object by its position, direction of motion, speed, and acceleration and represent resulting data in graphic form in order to make a prediction. f. Recognize Newton’s 3 Laws of Motion and identify situations that illustrate each law.

National Science Education Standards of Content 5-8:

(Inquiry - A) Think critically and logically to make the relationships between evidence and explanations; Develop descriptions, explanations, predictions, and models using evidence; Recognize and analyze alternative explanations and predictions; (Physical Science - B) Properties and changes of properties in matter; Motion and forces

Materials Needed:

Tape or String; Meter Stick or Measuring Tape; Stopwatch; Notebook paper; Pens/Pencils; Calculators; Board and Markers or Computer and Projector; Sports Illustrated magazines



Lesson Performance Task/Assessment:

The students will perform two separate tasks: (1) Measuring, calculating and graphing speed (2) Identifying forces and classifying them as balanced or unbalanced.

****See teacher notes for options to divide learning tasks between days one and two****

Task 1:

Students will be timed as they run a distance of ten meters. Each student will calculate his/her own speed using the formula $\text{Speed} = \text{Distance} / \text{Time}$ (m/s), and then convert it to kilometers per hour. In a large group setting, students will combine all the speed data and find a class average. The instructor will then provide the average speed for a snake, elephant, and cheetah. The students will create a bar graph to represent the class's average speed compared to the three animals. ****See teacher notes for speeds and conversions.****

Task 2:

Students will work in pairs and use copies of Sports Illustrated Magazine to locate 10 different examples of forces. They will write the sentences containing the forces and be prepared to justify their choices to the class. Students will also locate two pictures of forces; one must represent a balanced force and the other an unbalanced force. They must also justify these choices to the class. After written work is complete, student pairs will present their results in large group.

Lesson Relevance to Performance Task and Students:

Students will learn to measure and calculate speed. Students will distinguish between balanced and unbalanced forces. Students will read for content. Students will practice math and graphing skills. Students will relate motion and forces to common activities in sports.

Anticipatory Set/Capture Interest:

The instructor will ask the following questions:

- Can you run faster than a snake can slither?
- Can you out run an elephant?
- How about running faster than a cheetah?

After students have an opportunity to answer, and possibly debate, the instructor will tell students they have an opportunity to support their answers with evidence gained from a scientific investigation they will complete as a class.

Guided Practice:

Task 1: The instructor will define speed, provide the formula for calculating speed and work a few examples on the board. The instructor will draw an example of a bar graph for students to use as a reference.

Task 2: The instructor will define and provide examples of forces, balanced forces and unbalanced forces.



Independent Practice:

Task 1: Each student will run the 10 meters, record the time and then calculate speed. As a group, students will present individual speeds and calculate a class average. Each student will construct a bar graph that includes the speeds of the animals as well as the average speed of the class. The graph should contain a title, labels and units for each axis, and color-coded, accurate data.

Task 2: Student pairs will read magazine articles, locate and record examples of forces, and identify two photos, one with a balanced force and one with an unbalanced force. Students will discuss justification of the choices with their partners and then present the results to the large group/class.

Remediation and/or Enrichment:

Remediation – Individual IEP; Resource teacher will assist with pairing of students and guide students through reading and math skills.

Enrichment – Students can create a new sport that demonstrates both balanced and unbalanced forces.

Check(s) for Understanding:

Task 1: The instructor will check student speed results for accuracy and monitor the class as they average the group results. The students' graphs will be graded by the instructor.

Task 2: The instructor will circulate among the pairs as they work and check for understanding. As pairs present to the large group, the instructor will provide feedback regarding the examples chosen.

Closure:

Task 1: Students will revise the answers they gave during the anticipatory set.

Task 2: Oral review – Students will be asked to recite the formula for calculating speed, define force, and distinguish between balanced and unbalanced forces.

Possible Alternate Subject Integrations:

7th Grade General or Integrated Science

Physical Science

General Math

Reading

Teacher Notes:

Request used copies of Sports Illustrated from a school library, local public library or coaches at your school.

Average speeds for comparison:

Snake – 3 km/h

Elephant – 40 km/h

Cheetah – 120 km/h

Conversion – to change from m/s to km/h, multiply by 3.6

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Activities can run concurrently or during different class periods, depending on time and work space. Suggestions:

Day 1 – Measure and calculate individual student speeds while others read and locate forces in magazines

Day 2 – Compile and analyze all student speed data as a class; Students present force examples found using magazines

OR

Day 1 – Measure, compile and analyze all speed data

Day 2 – Read, identify and present force examples

Two students may be designated as “research assistants” during the collection of speed data. These students can mark off the 10 meter distance as well as record data and operate the stop watch.