

UNIT OVERVIEW

Introduction

This unit bundles Student Expectations addressing the relationship between force and motion. Unbalanced forces cause change in the motion of an object that can be measured and calculated. Speed is a ratio of distance traveled to time taken. Acceleration is the rate at which an object changes its velocity. Velocity is the change in position over the amount of time traveled.

Prior to this Unit

- Grade 6
 - [6.8B](#) – Identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces.
 - [6.8C](#) – Calculate average speed using distance and time measurements.
 - [6.8D](#) – Measure and graph changes in motion.
- Grade 6 Mathematics
 - [6.3E](#) – Multiply and divide positive rational numbers fluently.
 - [6.10A](#) – Model and solve one-variable, one-step equations and inequalities that represent problems, including geometric concepts.
 - [6.12A](#) – Represent numeric data graphically, including dot plots, stem-and-leaf plots, histograms, and box plots.
 - [6.13A](#) – Interpret numeric data summarized in dot plots, stem-and-leaf plots, histograms, and box plots.
- Grade 7 Mathematics
 - [7.3A](#) – Add, subtract, multiply, and divide rational numbers fluently.
 - [7.3B](#) – Apply and extend previous understandings of operations to solve problems using addition, subtraction, multiplication, and division of rational numbers.

During this Unit

Students use scientific practices and a variety of tools to investigate, demonstrate (using models), and calculate how unbalanced forces change the speed or direction of an object's motion. Students calculate how a change in force affects the motion of an object. They also calculate the total net force acting upon an object by adding forces acting in the same direction or subtracting forces acting in opposite directions. Students also differentiate between speed, velocity, and acceleration. Furthermore, they are introduced to the relationship between force, mass, and acceleration ($F=ma$). Students manipulate the formula $F=ma$ to understand how a change in force affects the acceleration (change in motion or direction) of an object. Students investigate and describe applications of Newton's law of inertia, law of force and acceleration, and law of action-reaction. Students discuss their observations and record and organize data in their notebooks. Additionally, they analyze data to formulate reasonable explanations, communicate valid

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SUGGESTED DURATION : 25 days

conclusions supported by the data, and predict trends. Students continue to demonstrate safe practices as outlined in the Texas Education Agency-approved safety standards and consider environmentally appropriate and ethical practices with resources during investigations.

Note: Students will be allowed the use of calculators on the Grade 8 Science STAAR Assessment.

Other considerations: Reference the [Science COVID-19 Gap Implementation Tool Grade 8](#).

Streamlining Note

There are no revisions to 8.6A and 8.6B. TEKS 8.6C revised language to “Newton’s three laws of motion” vs. specific laws. See the *Science TEKS Streamlining Side by Side Grade 8* (link in System Resources below).

After this Unit

In a subsequent unit, students will describe the applications of Newton’s laws in the context of Earth’s tectonic activities. Students will further their study concepts of force and motion in the High School Integrated Physics and Chemistry (IPC) or Physics course.

Additional Notes

STAAR Note

The Grade 8 Science STAAR will directly assess Student Expectations in the following Reporting Categories:

- Reporting Category 2: Force, Motion, and Energy
 - [8.6A](#) – Readiness Standard
 - [8.6B](#) – Supporting Standard
 - [8.6C](#) – Readiness Standard

Research

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The force / motion relationship can be developed more fully now and the difficult idea of inertia be given attention. Students have no trouble believing that an object at rest stays that way unless acted on by a force; they see it every day. The difficult notion is that an object in motion will continue to move unabated unless acted on by a force. Telling students to disregard their eyes will not do the trick—the things around them *do* appear to slow down on their own accord unless constantly pushed or pulled. The more experiences the students can have in seeing the effect of reducing friction, the easier it may be to get them to imagine the friction-equals-zero case.

“By the end of 8th grade, students should know that:

- An unbalanced force acting on an object changes its speed or direction of motion, or both. 4F/M3a”

American Association for the Advancement of Science. (2009). *Benchmarks on-line*. Retrieved from <http://www.project2061.org/publications/bsl/online/index.php?chapter=4#F3>.