

## Alignment with Massachusetts' Science Standards

This document evaluates the state's Education Standards for Science to determine alignment with content found in Cogno board games. Grades 3-8 were analyzed.



### Highlighting Key

Indicates a significant amount of material addresses the standard

Indicates a moderate amount of material is present to develop student understanding of the standard

## Earth and Space Science, Grades 3–5

LEARNING STANDARD	IDEAS FOR DEVELOPING INVESTIGATIONS AND LEARNING EXPERIENCES	SUGGESTED EXTENSIONS TO LEARNING IN TECHNOLOGY/ENGINEERING (Technology/Engineering standards for grades 3–5 are on page 86.)
<b>The Earth in the Solar System</b>		
<p>1. <b>Recognize that the earth is part of a system called the “solar system” that includes the sun (a star), planets, and many moons. The earth is the third planet from the sun in our solar system.</b></p>	<p>Create a proportional model of the solar system starting on the school playground and extending as far as possible. Demonstrate the size of objects (use a pea for the smallest planet, and different-sized balls for the others) and the distance between them.</p>	

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<p>2. <b>Recognize that the earth revolves around (orbits) the sun in a year’s time and that the earth rotates on its axis once approximately every 24 hours. Make connections between the rotation of the earth and day/night, and the apparent movement of the sun, moon, and stars across the sky.</b></p>	<p>Observe and discuss changes in length and direction of shadows during the course of a day.</p>	<p><i>Design and build a sundial and use it to determine the time of day. Explore how accurate it is over time. Determine the conditions under which the sundial does and does not work. (T/E 1.1, 1.2, 2.3)</i></p>

LEARNING STANDARD	IDEAS FOR DEVELOPING INVESTIGATIONS AND LEARNING EXPERIENCES
<b>Earth's Structure</b>	
<p>3. Describe the layers of the earth, including the lithosphere, the hot convecting mantle, and the dense metallic core.</p>	<p>Use a Styrofoam ball and paint to construct a cross-section model of the earth.</p>
<b>Heat Transfer in the Earth System</b>	
<p>4. Explain the relationship among the energy provided by the sun, the global patterns of atmospheric movement, and the temperature differences among water, land, and atmosphere.</p>	<p>Note the relationship between global wind patterns and ocean current patterns.</p>
<b>The Earth in the Solar System</b>	
<p>5. Recognize that gravity is a force that pulls all things on and near the earth toward the center of the earth. Gravity plays a major role in the formation of the planets, stars, and solar system and in determining their motions.</p>	<p>Observe the speed at which objects of various mass drop from a common height. Use a chronometer to accurately measure time and plot the data as mass versus time necessary to reach the ground.</p>
<p>6. Compare and contrast properties and conditions of objects in the solar system (i.e., sun, planets, and moons) to those on Earth (i.e., gravitational force, distance from the sun, speed, movement, temperature, and atmospheric conditions).</p>	<p>Using light objects such as balloons or basketballs, and heavy objects such as rocks, make models that show how heavy a 1 kg pumpkin would seem on the surfaces of the moon, Mars, Earth, and Jupiter.</p>
<p>7. Recognize that the universe contains many billions of galaxies, and that each galaxy contains many billions of stars.</p>	<p>Count the number of stars that can be seen with the naked eye in a small group such as the Pleiades. Repeat with low-power binoculars. Repeat again with telescope or powerful binoculars. Research the number of stars present. Discuss the meaning of the research and its results.</p>

**Life Science (Biology), Grades 3–5**

LEARNING STANDARD	IDEAS FOR DEVELOPING INVESTIGATIONS AND LEARNING EXPERIENCES	SUGGESTED EXTENSIONS TO LEARNING IN TECHNOLOGY/ENGINEERING (Technology/Engineering standards for grades 3–5 are on page 86.)
<b>Characteristics of Plants and Animals</b>		
<p>1. <b>Classify plants and animals according to the physical characteristics that they share.</b></p>	<ul style="list-style-type: none"> <li>Sort plant and animal pictures based on physical characteristics.</li> <li>Use a dichotomous key to identify plants.</li> </ul>	<p><i>Create a simple chart to classify plants and animals that are common to the school's geographical area. (T/E 2.2)</i></p>

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<b>Adaptations of Living Things</b>		
<p>2. <b>Give examples of how inherited characteristics may change over time as adaptations to changes in the environment that enable organisms to survive, e.g., shape of beak or feet, placement of eyes on head, length of neck, shape of teeth, color.</b></p>	<p>Compare and contrast the physical characteristics of plants or animals from widely different environments (e.g., desert vs. tropical plants, aquatic vs. terrestrial animals). Explore how each is adapted to its environment.</p>	<p><i>Discuss how engineers design things by using their knowledge of the ways that animals move (e.g., birds and wings influence airplane design, tails and fins of aquatic animals influence boat design). (T/E 2.4)</i></p>
<p>3. <b>Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration).</b></p>	<p>Investigate how invasive species out-compete native plants (e.g., phragmites and purple loosestrife). Discuss how some native plants die as a result.</p>	

**Physical Sciences (Chemistry and Physics), Grades 3–5**

<b>LEARNING STANDARD</b>	<b>IDEAS FOR DEVELOPING INVESTIGATIONS AND LEARNING EXPERIENCES</b>	<b>SUGGESTED EXTENSIONS TO LEARNING IN TECHNOLOGY/ENGINEERING</b> (Technology/Engineering standards for grades 3–5 are on page 86.)
<b>States of Matter</b>		
<b>4. Compare and contrast solids, liquids, and gases based on the basic properties of each of these states of matter.</b>	Design several stations, each of which demonstrates a state of matter (e.g., water table, balloon and fan table, sand and block table).	<i>Design one container for each state of matter, taking into account which material properties are important (e.g., size, shape, flexibility). (T/E 1.1, 2.3)</i>
<b>Forms of Energy</b>		
<b>5. Identify the basic forms of energy (light, sound, heat, electrical, and magnetic). Recognize that energy is the ability to cause motion or create change.</b>	Play music through a speaker with and without a grill cover. Discuss the differences in sound.	<i>Design and construct a candle wheel that demonstrates how heat can cause a propeller to spin. (T/E 1.1, 1.2, 2.2, 2.3)</i>
<b>6. Give examples of how energy can be transferred from one form to another.</b>	Rub two pieces of wood together (mechanical energy) and observe the change in temperature of the wood.	<i>Design and build a simple roller coaster for a marble or toy car to demonstrate how energy changes from one form to another. (T/E 2.2, 2.3)</i>

**Physical Sciences (Chemistry and Physics), Grades 3–5**

<b>LEARNING STANDARD</b>	<b>IDEAS FOR DEVELOPING INVESTIGATIONS AND LEARNING EXPERIENCES</b>	<b>SUGGESTED EXTENSIONS TO LEARNING IN TECHNOLOGY/ENGINEERING</b> (Technology/Engineering standards for grades 3–5 are on page 86.)
<b>Magnetic Energy</b>		

LEARNING STANDARD	IDEAS FOR DEVELOPING INVESTIGATIONS AND LEARNING EXPERIENCES	SUGGESTED EXTENSIONS TO LEARNING IN TECHNOLOGY/ENGINEERING (Technology/Engineering standards for grades 3–5 are on page 86.)
<p>7. <b>Recognize that magnets have poles that repel and attract each other.</b></p>	<p>Balance ring magnets on a pencil. Note: The shape of a ring magnet obscures the locations of its poles.</p>	<p><i>Design and build a magnetic device to sort steel from aluminum materials for recycling. (T/E 1.1)</i></p>

**Physical Sciences (Chemistry and Physics), Grades 3–5**

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<b>Sound Energy</b>		
<p><b>8. Recognize that sound is produced by vibrating objects and requires a medium through which to travel. Relate the rate of vibration to the pitch of the sound.</b></p>	<p>Use tuning forks to demonstrate the relationship between vibration and sound.</p>	<p><i>Design and construct a simple telephone (prototype) using a variety of materials (e.g., paper cups, string, tin cans, wire). Determine which prototype works best and why. (T/E 1.1, 1.2, 2.2, 2.3)</i></p>
<b>Light Energy</b>		
<p><b>9. Recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed.</b></p>	<p>Use a flashlight, mirrors, and water to demonstrate reflection and refraction.</p>	<p><i>Design and build a prototype to inhibit solar heating of a car (e.g., windshield reflector, window tinting). (T/E 1.2, 2.1, 2.3)</i></p>

**Physical Sciences (Chemistry and Physics), Grades 6–8**

LEARNING STANDARD	IDEAS FOR DEVELOPING INVESTIGATIONS AND LEARNING EXPERIENCES
<b>Properties of Matter</b>	
1. Differentiate between weight and mass, recognizing that weight is the amount of gravitational pull on an object.	Determine the weight of a dense object in air and in water. Explain how the results are related to the different definitions of mass and weight.
2. Differentiate between volume and mass. Define density.	
3. Explain and give examples of how mass is conserved in a closed system.	Melt, dissolve, and precipitate various substances to observe examples of the conservation of mass.

**Physical Sciences (Chemistry and Physics), Grades 6–8**

LEARNING STANDARD	IDEAS FOR DEVELOPING INVESTIGATIONS AND LEARNING EXPERIENCES
<b>Motion of Objects</b>	
4. Explain and give examples of how the motion of an object can be described by its position, direction of motion, and speed.	
<b>Forms of Energy</b>	
5. Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.	
<b>Heat Energy</b>	
6. Explain the effect of heat on particle motion through a description of what happens to particles during a change in phase.	

Broad Topic	Grades 3–5	Grades 6–8
Energy in the Earth System		<p>4. Energy provided by the sun, global patterns of atmospheric movement, and temperature differences among water, land, and atmosphere are related.</p> <p>11. Earth’s tilt and its revolution around the sun result in uneven heating, causing the seasons.</p>
Structure of the Earth	<p>12. Earth’s surface changes due to slow processes such as erosion and weathering, and rapid processes such as landslides, volcanic eruptions, and earthquakes.</p>	<p>2. Layers of the earth include the lithosphere, mantle, and core.</p> <p>5. Movement of the earth’s crustal plates causes both slow and rapid changes in the earth’s surface.</p> <p>7. Physical evidence supports theories that the earth has evolved over geologic time.</p>
Earth in the Solar System	<p>13. Earth is a part of the “solar system” that includes the sun, planets, and many moons. Earth is the third planet from the sun.</p>	<p>8. Gravity is a force that pulls all things toward the center of the earth. Gravity influences the formation and movement of the planets, stars, and solar system.</p> <p>10. Properties and conditions of objects in the solar system and those on Earth.</p>
Origin and Evolution of Earth		<p>12. The universe contains many billions of galaxies and each galaxy contains many billions of stars.</p>

**STRAND: LIFE SCIENCE (BIOLOGY)**

PK-8	Grades 3–5	Grades 6–8
Evolution and Biodiversity	<p>6. Inherited characteristics may change over time as adaptations to changes in the environment enable organisms to survive.</p> <p>7. Changes in the environment have caused some plants and animals to die or move to new locations.</p>	<p>10. Genetic variation and environmental factors are causes of evolution and the diversity of organisms.</p>

**STRAND: PHYSICAL SCIENCES (CHEMISTRY)**

Broad Topic	Grades 3–5	Grades 6–8
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<b>Properties of Materials and Matter</b>	1. Properties of objects and materials.	2. Volume and mass are distinct components of density. 4. Mass is conserved in a closed system.
<b>States of Matter, Kinetic Molecular Theory, and Thermochemistry</b>	2. Solids, liquids, and gases have distinct properties. 3. Water can be changed from one state to another by adding or taking away heat.	15. The effect of heat on particle motion during a change in phase.
<b>Forms of Energy</b>	4. Basic forms of energy, which cause motion or create change. 5. Energy can be transferred from one form to another.	13. Kinetic energy is transformed into potential energy & vice versa.

**STRAND: PHYSICAL SCIENCES (INTRODUCTORY PHYSICS)**

Broad Topic	PK-8	Grades 3–5	Grades 6–8
<b>Position and Motion of Objects</b>			1. Weight is the amount of gravitational pull on an object and is distinct from mass. 11. An object's motion can be described by its position, direction of motion, and speed.
<b>Forms of Energy</b>		4. Basic forms of energy, which cause motion or create change. 5. Energy can be transferred from one form to another.	13. Kinetic energy can be transformed into potential energy and vice versa.
<b>States of Matter</b>		2. Solids, liquids, and gases have distinct properties. 3. Water can be changed from one state to another by adding or taking away heat.	

<b>Electrical and Magnetic Energy</b>	9. Magnets have poles that repel and attract each other. 10. A magnet will attract some objects and materials but not others.	
<b>Sound and Light Energy</b>	11. Sound is produced by vibrating objects and travels through a medium. The rate of vibration is related to the pitch of the sound. 12. Light travels in a straight line until it strikes an object or travels from one medium to another. Light can be reflected, refracted, and absorbed.	

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