

## Alignment with Delaware's 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

## SCIENCE STANDARD ONE

Nature and Application of Science and Technology

By the end of Grade 3 students will know that:

### Science as Inquiry

- Scientists' curiosity about the natural world leads them to ask questions about how things work. In order to answer these questions, scientists observe and explore things carefully.
- Scientists sometimes observe the same object or event and describe it differently. It is important for scientists to describe things as accurately as possible in order to compare their observations.
- Scientists use a variety of instruments, some of them quite simple, in order to obtain additional information for answering questions about the natural world.

### Science, Technology, and Society

- People have always invented new ways to solve problems and get work done. These new inventions affect all aspects of life.

### History and Context of Science

- People from all parts of the world have practiced science and have made many important scientific contributions.
- Many men and women have chosen science as a career and a life-time activity because of their intense interest in better understanding nature and the great joy this pursuit brings them.

By the end of grade 5 students will know that:

### Science as Inquiry

- Curiosity about nature and the world around us leads scientists to ask questions in a way that requires scientific investigation in order to develop an explanation. The breadth and style of this investigation depend on the questions asked.
- In science, answering certain questions requires observation and simple testing to generate additional information and enable a more complete investigation.
- The ability to observe and gather data is enhanced by using a variety of instruments.
- Collaboration, communication, and comparison are important parts of science. Graphs, carts, maps, equations, and oral and written reports can be used to share the results of a scientific investigation and facilitate discussion about it.

### Science, Technology, and Society

- Science consists of many disciplines such as chemistry, biology, geology, and physics, and in the broadest sense, can be viewed as the collective efforts by people in these disciplines to

organize, describe, and understand the natural world.

- Technology applies knowledge to solve problems and to change the world to suit us better. Technological innovation plays an important role in improving the quality of life. Such innovation involves scientific disciplines as well as other disciplines such as engineering, mathematics, medicine, and economics in order to create practical, cost-effective solutions to problems and opportunities.
- Technological development improves the quality of our life immensely and continues to do so in many areas such as medicine, communications, transportation, and agriculture. However, not all development is perfect, uniformly beneficial, or equally available to everyone.

### **History and Context of Science**

- Men and women of all ages and from diverse cultures are involved in a multitude of scientific endeavors in the search to better understand nature. These people practice science in many ways and at various depths and levels of complexity. This search continues to add new knowledge to society's understanding of the world.

By the end of grade 8 students will be able to:

### **Science as Inquiry**

- The design of an investigation, in many cases, is determined by the type of questions asked. Therefore, the thoughtful and informed structuring of such questions is an important part of scientific inquiry. For example, a question such as, "what are the similarities and differences among the plants that grow in this region?" requires a taxonomic investigation in which plants are collected, identified, and classified. On the other hand, answering "What was the reaction of Marie Curie's contemporaries to her work and accomplishment?" may involve consulting, reviewing, and discussing both contemporary and historical publications as part of an investigative design. However, an experimental investigation in which systematic observations are made and in which data are used and analyzed to construct an explanation could result from a question such as, "How do the physical properties of local soil samples lead to differences in drainage or percolation?"
- The ultimate goal of any scientific investigation is to obtain evidence precise and thorough enough to answer a question. Various experimental designs and strategies can be developed to answer the same question. The comprehensiveness and sophistication of the investigation depend on the tools and technologies used.
- Explanations in science result from careful and logical analysis of evidence gained from an investigation. Explanations relate causes to effects and develop relationships based on evidence. Critical analysis skills learned in the classroom can be applied to judge the validity of claims made in everyday life.

### **Science, Technology, and Society**

- Social, cultural, environmental, scientific and technological strengths, and economic facts influence which scientific and technological areas are pursued and invested in. At the same time, the scientific discoveries made and technologies developed directly influence society and its habits, organization, and cultural values.
- The issues surrounding science, technology, and society are complex and involve many risk/benefit considerations. Even though new technology may provide a solution to an important problem, its impact on human health, the environment, and social dynamics needs to be analyzed.

### **History and Context of Science**

- People engaged in doing science are found in many occupations and institutions such as hospitals, universities, classrooms, industry, and farms. The nature of scientific investigation often requires that teams of individuals with different abilities work together to solve a problem or to understand the natural world.

## Materials and Their Properties

By the end of grade 3 students will know that:

### Properties and Structure of Materials

- Materials exist in one of three states - solid, liquid, or gas - and can be changed from one state of matter to another. Each state has distinct physical properties. Physical properties and changes from one state of matter to another state are strongly influenced by heating and cooling.
- Objects and materials may be composed of structures too small to be seen without the use of a tool such as a magnifier.

By the end of grade 5 students will know that:

### Changes in Materials

- The weight of an object remains unchanged when broken into parts, and the parts together weigh the same as the original object.

## SCIENCE STANDARD THREE

### Energy and Its Effects

By the end of grade 3 students will know that:

### Forms/Sources of Energy

- The Sun is the source of heat and light that warms the earth.
- Sound is produced when objects vibrate. Various characteristics of sound such as loudness/softness and high pitch/low pitch can be changed by altering the material producing the sound.
- Force is any push or pull exerted by one body on another. Pushes and/or pulls change the position, motion, and direction.
- Moving objects can exhibit different kinds of motion such as fast, slow, straight, back and forth, circular, and zigzag. The application of pushes or pulls is required to produce any change in the type of motion, including stopping and starting an object in motion.
- Some forces (e.g., magnetism, static electricity) can make things move without touching them.

By the end of grade 5 students will know that:

### Forms/Sources of Energy

- Light is a form of energy which is visible to the eye, spreads from a source, and travels in straight lines. Light is transmitted, reflected, refracted, or absorbed by different materials. Materials which do not transmit light cast shadows.
- When an object is set in motion by a force, its position is defined with reference to the distance it travels and the period of time it takes to travel that distance. Speed is the measure of the distance traveled by a moving object in a given period of time (distance divided by time).
- Force must be applied to change the speed or direction of a moving object. The greater the force, the greater the change in motion.

### Transformation/Conservation of Energy

- Most of the energy reaching the Earth's surface comes from the Sun as light. It is then stored, transferred, or transformed in a variety of ways.
- Some of the Sun's light is transformed into heat when it hits objects.

By the end of grade 8 students will be able to:

### Forms/Sources of Energy

- The electromagnetic spectrum is composed of different wavelength domains. The radiation in this spectrum comes from various sources and spans energy levels from radio waves (longest wavelengths, lowest energy) through microwaves, infrared, visible, ultraviolet, x-rays, to gamma rays (shortest wavelengths, highest energy). White light from the Sun consists of a

mixture of wavelengths and energies in the visible part of the electromagnetic spectrum (red to violet).

### **Forces and Motion**

- Forces must be used to change speed or direction (or both) of a moving object. In the absence of such a force, the object will continue to move with the same speed and in the same direction. Forces have directions and magnitudes that can be measured. Any change in motion depends upon the amount of force causing the change and the mass of the object.

### **Interactions of Energy With Materials**

- Energy can travel as waves which are characterized by wavelength, frequency, amplitude, and speed. Waves have common properties of absorption, reflection, and refraction when they interact with matter. They are either mechanical (e.g., sound, earthquake, tidal) or electromagnetic (e.g., sunlight, radio waves); only electromagnetic waves will travel through a vacuum.
- The motion of an object can be described as its change in position, direction, and speed relative to another object.

### **Transformation and Conservation of Energy**

- Almost all events in the Universe involve the transformation of one form of energy into another form with the release of heat. Regardless of the transformation, the total amount of energy remains constant.

## **SCIENCE STANDARD FOUR**

### **Earth in Space**

By the end of grade 3 students will know that:

#### **Solar System Models**

- There are many objects in the solar system including the Sun, Moon, planets, and comets. Most of the objects are separated by vast space and enormous distances.
- The size of an object appears to change as the observer moves closer to or farther away from the object.

#### **Interactions in the Solar System**

- There are many objects in the sky such as the Sun, Moon, stars, clouds, birds, and airplanes. The patterns of movement of some of these objects such as the Sun, Moon, and stars are cyclic.

#### **Technology and Applications**

- People who live and work in space need special clothing and equipment. Astronauts wear space suits, which are designed and constructed by Delaware scientists, to protect themselves from the extreme conditions of space.

By the end of grade 5 students will know that:

#### **Interactions in the Solar System**

- The Earth is one of several planets that orbit the Sun. As the Earth orbits the Sun, different patterns of stars can be seen in different seasons.

#### **Technology and Applications**

- Technology allows scientists to explore the Solar System and to observe and measure features and structures of the Earth, Moon, and other solar objects.

By the end of grade 8 students will know that:

#### **Solar Systems Models**

- The universe is composed of billions of stars. The Sun is a medium size star which is many millions of miles closer to Earth than the next nearest star.
- The solar system forms part of the Milky Way Galaxy, which is one of many galaxies that comprise the Universe. Some of the galaxies are so far away that their light takes billions of years to reach Earth.

- The nine planets, their respective moon(s), comets and many asteroids, and meteorites orbit the Sun which is the gravitational center of the solar system.

### **Interactions in the Solar System**

- Nuclear processes that take place in the Sun continuously convert matter to energy. A small portion of this energy which is intercepted by Earth drives biological, chemical, and physical process on Earth.
- The gravitational attraction that exists between all forms of matter holds objects on Earth, causes tides, keeps the solar system and galaxy together, and controls the movement of the planets in the solar system.

### **Technology and Applications**

- Close-up pictures and data received from space probes allow scientists to compare the physical properties of planets (e.g., size, surface features, number of rings) and to speculate about conditions on other planets.

## **SCIENCE STANDARD FIVE**

### **Earth's Dynamic Systems**

By the end of grade 3 students will know that:

#### **Components of Earth**

- Earth's materials include rocks, soil, water, and air. Differences exist in all these materials and these differences can be used to sort and classify them.
- The surface of Earth is surrounded by the atmosphere, a thin layer of air that supports life and has physical properties that are measurable and predictable.
- Water exists in different states (solid, liquid, gas) and in different forms such as rain, snow, hail, and vapor. Water is stored in reservoirs, lakes, oceans, ponds, bays, and ice and is a valuable natural resource essential to all living things.

## **SCIENCE STANDARD SIX**

### **Life Processes**

By the end of grade 3 students will know that:

#### **Characteristics of Living Things**

- Plants and animals are alive and have characteristics that make them different from each other and non-living things.

#### **Requirements for Survival**

- Plants and animals need food, water, air, light, and a suitable environment for survival.

By the end of grade 5 students will know that:

#### **Structure/Function Relationship**

- Living things have structures that function to help them reproduce, grow, and survive in different kinds of places.

#### **Health and Technology Application**

- Technological advances in medicine, the development of various safety devices and protective equipment, and improvements in hygiene have helped in the diagnosis and treatment of illness and have reduced the number of damaging and life threatening injuries.

By the end of grade 8 students will know that:

#### **Matter and Energy Transformations •**

- Plants make their food by the process of photosynthesis. Using light energy, green plants convert water and carbon dioxide into energy-rich simple sugars and oxygen. Sugar is the source of food used by most plants and ultimately, by all other consumers. Oxygen produced during photosynthesis is required for the survival of most plants and animals.

- All living things obtain energy from food. Energy is needed for living cells to carry out all the processes of life, such as growing, disposing of wastes, making new cells, and using food

## SCIENCE STANDARD SEVEN

### Diversity and Continuity of Living Things

By the end of grade 3 students will know that:

#### **Heredity and Reproduction**

- The offspring of plants and animals resemble their parents in many ways although they are not exactly like their parents or each other.

#### **Diversity**

- Many different kinds of plants and animals live throughout the world and can be classified or sorted into groups based upon appearance and behavior.

#### **Evolution**

- Plants and animals have features that help them survive and reproduce in different places.

By the end of grade 5 students will know that:

#### **Heredity and Reproduction**

- Physical characteristics are passed on from parent to offspring. Organisms with two parents inherit characteristics of both.

#### **Diversity**

- Organisms have many distinct and unique features which they use for finding food, building shelters, evading predators, and reproducing. Scientists use similarities and differences in these features to classify and group organisms.

#### **Evolution**

- Organisms of the same species have variations which may provide an advantage in reproduction and survival.

By the end of grade 8 students will know that:

#### **Heredity**

- Chromosomes, which are components of cells, occur in pairs and carry hereditary information. The subunits of chromosomes are genes which direct the formation of an organism's traits.

#### **Reproduction and Development**

- In sexual reproduction, gametes (egg and sperm), which are produced in specialized structures of the parents, fuse during fertilization to form an organism. Since each gamete contributes a set of chromosomes, the offspring have traits of both parents.

#### **Evolution**

- Natural selection is the process by which some individuals with certain traits are more likely to survive and produce greater numbers of offspring than other organisms of the same species. Conditions in the environment can affect which individuals survive in order to reproduce and pass their traits on to future generations. Small differences between parents and offspring accumulate over many generations and ultimately new species may arise.

## SCIENCE STANDARD EIGHT

### Ecology

By the end of grade 3 students will know that:

#### **Interactions Within the World Around Us**

- The Earth consists of living and non-living things. All living things interact with each other and the non-living parts of their surroundings – air, water, soil, and Sun.

By the end of grade 5 students will know that:

#### **Interactions Within the World Around Us**

- All living organisms interact with the living and non-living parts of their surroundings to meet their needs for survival.

### **Changes in Environments**

- Organisms adapt in order to live and reproduce in certain environments.
- Those organisms that are best suited for a particular environment have adaptations that allow them to compete for available resources and cope with the physical conditions of their immediate surroundings.
- Changes in an organism's environment can be either beneficial or harmful.

By the end of grade 8 students will know that:

### **Change in Ecosystems**

- Changes in the physical or biological conditions of an ecosystem can alter the diversity of species in the system. As the ecosystem changes, populations of organisms must adapt to these changes, move to another ecosystem, or become extinct.
- The size of populations in an ecosystem may increase or decrease as a result of the interrelationships among organisms, availability of resources, natural disasters, habitat changes, and pollution.

Please note that use of these standards does not imply this state's endorsement of Cogno.