

OKLAHOMA ACADEMIC STANDARDS

SCIENCE FRAMEWORK

GRADE 1: OVERVIEW



OKLAHOMA STATE DEPARTMENT OF
EDUCATION
— CHAMPION EXCELLENCE —

The Oklahoma State Department of Education is excited to announce the release of the first resources being offered through the Oklahoma Academic Standards Science Frameworks. The Science Frameworks represent curricular resources developed by Oklahoma teachers to help teachers translate standards into classroom practice. The *Framework Overviews* represent how a group of Oklahoma teachers, at a given grade level, might bundle performance expectations/standards found in the Oklahoma Academic Standards for Science.¹ **Bundling** is how teachers would **group performance expectations/standards** for the purpose of developing **instructional units of study**.

Once bundled, the *Science Framework* writers were then charged with completing **four categories of information** that coincided with the bundle of performance expectations/standards. The categories provide insight into how the Science Framework writers collaborated to begin to translate standards into classroom instruction. The guidance provided in the categories does **not** represent a **directive** to teachers, schools or districts for classroom instruction and should not be viewed as such.

The Oklahoma State Department of Education would like to say a special thank you to the Oklahoma educators who participated in developing the Oklahoma Science Framework Overviews, Doug Paulson of the Minnesota State Department of Education who served as a consultant, Lawton Public Schools and to Quentin Bidy, the project director.

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“The vision of the Overviews is to provide a resource for teachers that encourages them to embrace the new standards and implement them effectively in their classrooms. The suggestions provided by the frameworks project **do not** have to be implemented exactly as they are written and are **not required** to be a successful teacher, but **serve as a guide** to setting up effective lessons that will help students meet the necessary levels of success in a science classroom.” - Oklahoma Science Framework Project Writer

¹ Download the Oklahoma Academic Standards for Science at <http://sde.ok.gov/sde/science>.

How To Read This Document

Below you will find short descriptions about each of the sections of information provided in this document. If you have questions regarding the Framework Overviews, please contact Tiffany Neill at 405-522-3524 or Tiffany.Neill@sde.ok.gov

Science Framework Overview: Sections

In Lay Terms

This section aims at providing a brief introduction to the goals outlined in the Performance Expectation Bundles/grouping of standards.

Three Dimensional Storyline

This section aims at providing a comprehensive instructional storyline of how the three dimensions represented in the Performance Expectation Bundles intertwine to support students engaging in science and engineering practices, crosscutting concepts and disciplinary core ideas. Keep in mind each performance expectation includes one **science and engineering practice**, one **crosscutting concept** and one **disciplinary core idea**. The **color-coding** in this section allows teachers to see where components of these three dimensions appear in the instructional storyline. To find out more about the three dimensions and how they are incorporated into the Oklahoma Academic Standards for Science, review pages 7-8 in the Oklahoma Academic Standards for Science² or check out the OKSci PD on Your Plan Module series, Transitioning to the Oklahoma Academic Standards for Science³.

Lesson Level Performance Expectations

This section aims at providing **scaffolding three-dimensional learning targets** that teachers can design instruction around to meet the end goal of the Performance Expectation(s) represented in the bundles or units of study. Keep in mind the performance expectations represent the things students should know, understand and be able to do to show proficiency at the end of instruction they participate in. As teacher can **utilize the Lesson Level Performance Expectations** in each bundle **as a way to develop a series of instruction** to meet the end goals of the performance expectations. For example, a teacher can develop or use a lesson, which may allow students to participate in instruction that covers some of the Lesson Level Performance Expectations, but not all. In this case the teacher would then develop or conduct another lesson that covers other Lesson Level Performance Expectations in the bundle.

Misconceptions

This section aims at providing research-based misconceptions that students frequently have related to the science concepts (disciplinary core ideas) embedded in the Performance Expectation Bundles along with matching correct conceptions.

² Download the Oklahoma Academic Standards for Science at <http://sde.ok.gov/sde/science>.

³ Access the OKSci PD on Your Plan Modules: Transitioning to the Oklahoma Academic Standards for Science at

Bundle: Waves

1-PS4-1

Students who demonstrate understanding can:

Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

1-PS4-4

Students who demonstrate understanding can:

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

In Lay Terms

When materials vibrate, they can make a sound. Sounds can also make materials vibrate. People can use a variety of devices to communicate over long distances. These devices can use both light and/or sound to send and receive information.

Three Dimensional Storyline

In this performance expectation bundle, students can **design a device** using light or sound to communicate over a distance. In order to begin designing a device, students should be given opportunities to **investigate how sound works**. Investigations should include first-hand experiences and observations with any object that makes sound when it vibrates (guitars, rulers, etc.). Students can work in small groups to **plan and conduct multiple investigations to collect data** that will allow them to determine that: (1) vibrating materials produce sound, (2) sound can make materials vibrate and (3) that when the vibrations stop so does the sound. This will allow students to **make claims, supported by observational evidence**, that vibration and sound are directly related. Students can **use the data they collect as evidence to explain** what causes sound. The students can **use the evidence to identify** that causing an item to vibrate has an effect of producing a sound, and conversely, sound causes materials to vibrate.

Once students are familiar with how sound and light works, they can then use **tools and materials to design and build a device to communicate over a distance**. **See Grade 1 Framework Overview on light to help students understand how light works prior to students being expected to build communication devices with light**. Students can begin by **raising questions** about how people communicate with others who are far away. Students can then work in small groups to **construct a device using sound or light** based on their prior experiences and **observations (both first-hand and from media)**. Example devices could include: using a light source to send signals, paper cup string telephones, and using a drum to create beat patterns. Once they have **completed the design and construction process**, they will engage in **constructing an explanation** for why they think their device does or doesn't work to communicate using light or sound.

Lesson level Performance Expectations

- Students can **gather observational evidence** that shows that sound **can make** matter vibrate.
- Students can **gather observational evidence** that shows that vibrating matter **can make** sound.
- Students can **raise questions using my observations** to get more information about how people communicate with others who are far away.
- Students can **communicate using evidence why and how** people use a variety of devices to send and receive information over long distances.
- Students can **communicate** that we use technology every day and life would be hard without it.
- Students can **design and build** a device to communicate with other people using sound or light.

Misconceptions

1. As waves move, matter moves along with them.
2. In a telephone, actual sounds are carried through the wire rather than electrical pulses.
3. Sound can only travel through air.

Accurate Concept

1. Waves, like sound waves, move through a medium.
2. In a telephone, sounds are converted to electrical signals transferred over the line and then converted back into sound in the telephone on the other end of a call.
Sound can travel through different media, but does so at different speeds.

References

- <http://newyorkscienceteacher.com/sci/pages/miscon/phy.php>

Bundle: Light

1-PS4-2

Students who demonstrate understanding can:

Make observations to construct an evidence-based account that objects can be seen only when illuminated.

1-PS4-3

Students who demonstrate understanding can:

Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

In Lay Terms

Light is necessary for objects to be seen. Light can come from external or internal sources. Different materials respond to light in different ways. Some allow light to pass through, others only allow some light through, and others block light completely, creating shadows where light cannot reach. Mirrors can be used to redirect light.

Three Dimensional Storyline

In this performance expectation bundle, students can **work in small groups to conduct investigations** about light. At this age, **investigations** are conducted in collaboration with peers and serve to **produce data to use as evidence**. Students can use information from their first-hand **observations** with light to discover that **objects can only be seen if light is available to illuminate them, or if they give off their own light**. Students should be given an opportunity to see that this occurs in a variety of situations so they can **identify it as a pattern**. Students can also **observe** the **behavior of light** when it is reflected in a mirror. However, students are **not expected to explain why** this happens simply observe it as a behavior of light.

Through **investigations** students can also see that **some materials allow light to pass through them, others allow only some light to pass through, and others block light completely**. This too is a **pattern students can identify** through first-hand experiences, if they are given an opportunity to **investigate** lights **impact** on different materials (clear plastic, waxed paper, cardboard, etc.). At this age, students should be encouraged to **develop explanations** for **why these patterns exist**. They should also be given an opportunity to **evaluate their own explanations as well as other students' explanations** for this.

Lesson Level Performance Expectations

- Students can **observe** that objects can be seen if light is available to illuminate them or if they give off their own light.
- Students can **communicate using evidence** how light is necessary for objects to be seen.
- Students can **carry out investigations** that show that some materials (**patterns**) allow light to pass through them, others allow only some light through, and other block all the light and create a shadow.
- Students can **carry out and investigations** that show that mirrors can be used to redirect a light beam.
- Students can **communicate using evidence** that light is **affected** when an object is placed in the path of its beam.

Misconceptions

1. Objects can be seen in complete darkness, after our eyes adjust.
2. Light can only be reflected from shiny surfaces (such as a mirror).
3. A shadow is something that exists on its own.

Accurate Concept

1. Light must be present, even in a very small amount, for our eyes to “see” objects.
2. Light can be reflected from many different types of surfaces to varying degrees.
Light must be present to produce a shadow.

References

- <http://beyondpenguins.ehe.osu.edu/issue/energy-and-the-polar-environment/common-misconceptions-about-light-heat-and-the-sun>
- <http://www.amasci.com/miscon/opphys.html>

Bundle: Earth & Solar System

1-ESS1-1

Students who demonstrate understanding can:

Use observations of the sun, moon, and stars to describe patterns that can be predicted.

1-ESS1-2

Students who demonstrate understanding can:

Make observations at different times of year to relate the amount of daylight and relative temperature to the time of year.

In Lay Terms

We can observe patterns where the sun, moons, and stars in the sky can be described and even predicted. Over time, seasons take place and these present patterns as well. These seasonal changes can be described by observing patterns in the sunrise and sunset.

Three Dimensional Storyline

In this bundle, the crosscutting concept of patterns is a focus for both PEs. Students can observe patterns or repeating events related to the sun, moon, and stars in the sky. For example students can see that the sun appears to rise in one part of the sky and set in another. Students can see that stars, other than the sun, are visible at night.

Students can also observe seasonal patterns of sunrise and sunset as well as temperatures. Observations are essential in students identifying these patterns. In this bundle of PEs, students are expected to make observations and determine if patterns exist. Once students determine patterns exist, they can use these patterns as evidence to make predictions about future events (the sun will rise in the same part of the sky tomorrow, the amount of daylight in the winter next year will probably be close to what it is this year).

Lesson Level Performance Expectations

- Students can make observations about the patterns of the sun and moon rising and setting and the path they travel in the sky.
- Students can analyze and interpret data about the sun's patterns to make predictions about the apparent motion of the sun.
- Students can analyze and interpret data about the moon's patterns to make predictions about the moon's motion.
- Students can make observations to determine that stars other than our sun appear in the sky.
- Students can plan and carry out a simple investigation that shows at different times of the year there are different amounts of daylight.
- Students can make comparisons about seasonal temperature in relation to the amount of daylight the earth receives at different times of the year.

Misconceptions

1. Earth is closer to the Sun during summer and farther away during winter.
2. Seasons happen at the same time everywhere on Earth.
3. Seasonal characteristics and change are the same everywhere on Earth.
4. The Sun goes behind hills.
5. Clouds cover the Sun.
6. The Moon covers the Sun.
7. The Sun goes behind the Earth once a day.
8. The Earth goes around the Sun once a day.

Accurate Concept

1. Earth is closer to the Sun during winter and farther away during summer, the change of seasons is due to the tilt of the Earth and the angle at which the Sun strikes the Earth at each time of the year.
2. Seasons vary from the Northern and Southern Hemispheres.
3. Seasons vary from the Northern and Southern Hemispheres.
4. The Earth is a sphere and rotates, as a result the sun only shines on one half of the Earth at any given time.
5-8. See 4.

References

- <http://beyondpenguins.ehe.osu.edu/issue/polar-patterns-day-night-and-seasons/common-misconceptions-about-day-and-night-seasons>

Bundle: Heredity

1-LS1-2

Students who demonstrate understanding can:

Read text and use media to determine patterns in behavior of parents and offspring that help offspring survive.

1-LS3-1

Students who demonstrate understanding can:

Make observations to construct an evidence-based account that young plants and animals are like, but not exactly alike, their parents.

In Lay Terms

Animals and plant have young; the adult plants and animals can have certain behaviors that help their offspring to survive. Plants' and animals' young are like their parents, but not exactly the same. Each offspring can have specific things that are like their parents, but can still have major differences from their parents.

Three Dimensional Storyline

. Plants and animals produce offspring. These offspring can have similar traits as their parents, but also have characteristics that can vary giving them their unique aspects. Students should be able to **make observations** that all plants and animals of the same type are recognizable because they have **similar characteristics**. As offspring grow, parents and their young exhibit certain behaviors to ensure that the young survive. Students should have opportunities to **research using age appropriate text and media to help them identify some of the patterns** of characteristics and behaviors parents and offspring engage in to help them survive. Students should be able to **use their observations to construct explanations** about how these **patterns** of behavior help organisms survive.

At this age, students need concrete examples of why things are happening around them. **Researching behaviors and traits** will allow **students to be able to make the observations** of the **patterns that exist in plant and animal offspring**. When teaching these standards, if students are not **making noticeable observations** of the **patterns**, guide them to see the **patterns** to get a deeper understanding of the concept.

Lesson Level Performance Expectations

- Students can **gather evidence to determine** that adult plants and animals have young.
- Students can **make observations** that in many kinds of animals, the parents and babies have certain **patterns of behavior** to help the baby survive.
- Students can **analyze data to determine** that young animals are **like** their parents, but not exactly the same.

- Students can **analyze data to determine** that plants are like their parent plant, but not exactly the same.
- Students can **communicate** that young from plants and animals have **similarities** from their parents that can be seen, but can also have **differences**.

Misconceptions

1. Traits are inherited from only one of the parents.
2. Only mammals are animals.
3. Students often do not recognize that trees, vegetables, and grass are all plants.

Accurate Concept

1. Offspring inherit traits from both parents.
2. One of a large group of living things that can move around by themselves to find food.
3. One of a large group of living things that use sunlight to make their own food.

References

- <http://wiki.nb27.org/science/1stOrganisms/first/organisms/docs/1stPlantsAnimalsMiscon.pdf>

Bundle: Human Impact

1-ESS3-1

Students who demonstrate understanding can:

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*

In Lay Terms

Things that humans do every day to live can affect the world around them. However, they can make choices that can reduce their impact on the land, water, air, and other living things.

Three Dimensional Storyline

In this performance expectation, students can explore ways that humans can reduce their impacts on the Earth's environments. In order to **communicate a solution to human's impact on the environment**, students must have opportunities to identify impacts and consider what may be **causing** them. In the earliest grade levels, students can **observe the world around them to look for patterns**. Students can **ask questions to consider the causes of those patterns** and **begin to communicate how human choices can impact their environment**.

Here, students can **collect information/observational data** about the **things people do to live comfortably** (e.g. cutting trees to produce paper, using resources to make the things humans use, and throwing away unwanted trash). Students can then consider what **impact those actions can have on the world around them** if those **patterns** continue.

Once students have had a chance to **consider this impact**, they can be prompted to think about the **choices and actions people can make to reduce these impacts** and begin to **design solutions to reduce these impacts**. **Solutions can be communicated through oral and/or written forms, including models and/or drawings**.

Lesson Level Performance Expectations

- Students can **raise questions** about how human choices **impact** the land, water, air, and other living things.
- Students can **gather evidence to determine** how human choices **impact** the land, water, air, and other living things.
- Students can **evaluate and communicate solutions** that will reduce human **impact** on the world around us through sketches, drawings, or physical models.

Misconceptions

1. Plants are dependent on humans.
2. Ecosystems change little over time.
3. Species coexist in ecosystems because of their compatible needs and behaviors; they need to get along.

Accurate Concept

1. While people often care for plants (especially those indoors), plants as a whole are not dependent on people for their needs.
2. Ecosystems change as a result of natural hazards, environmental changes, and human activity.
3. Within an ecosystem, species compete for resources and feed on one another. Species live in the same ecosystem because of similar adaptations and environmental needs.

References

- <http://beyondpenguins.ehe.osu.edu/issue/tundra-life-in-the-polar-extremes/common-misconceptions-about-biomes-and-ecosystems>

Bundle: Structure and Function

1-LS1-1

Students who demonstrate understanding can:

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*

In Lay Terms

Plants and animals have external parts that help them survive. Their different parts help them to grow, move, and protect themselves in nature. Humans can mimic these external parts to solve a problem or meet a specific human need.

Three Dimensional Storyline

In this performance expectation, students are expected to **design a solution to a human problem** by **mimicking the structures** of plants and animals. In order to do this, students should be given the opportunity to **observe** a variety of plants and animals and be prompted to identify their external parts. As students **observe** these external parts, they will notice that **some plants and animals have similar external parts and some have different**. This can lead to students **questioning why** they have **similar** or **different** parts and **how those external parts might help the plant or animal survive**. Students should be encouraged to explain how the **different external structures help protect plants and animals, help them to grow, and help them respond to things around them**. Although the explanation may be simple, it provides a basis for students to then think about **how those structures might also solve a human problem** (e.g. fastening structures (hook and loop) that mimic burrs, clothing or equipment mimicking turtle shells, acorn shells, and animal scales). Students can also be prompted to consider how **external parts** serve to **help plants or animals take in information so they can respond to situations** (cat eyes helping cats see at night to hunt). Students can then work in small groups to **design a solution** to a **human problem by mimicking a plant or animal's structure**.

Lesson Level Performance Expectations

- Students can **observe and describe** a variety of external **structures** of plants and animals.
- Students can **observe** that plants have **similar** and **different external parts**.
- Students can **observe** that animals have **similar and different external parts**.
- Students can **make a claim** about how animals use their **body parts** in ways that help them grow and survive.
- Students can **make a claim** about how plants use **their parts** in ways that **help them grow and survive**.

- Students can **develop and use models** to explain that plants and animals capture and respond to stimuli in the environment in which they live.

- Students can **raise questions** about how animals and plants **use their external parts for growth and survival**.
- Students can **communicate from observation** how animals and plants **use their parts to respond to things around them**.
- Students can **solve a human problem** by mimicking an animal or plant's **external parts**.

Misconceptions

1. Plants cannot defend themselves against herbivores.
2. Traits are developed by individuals in response to the needs of the individual.
3. Acquired characteristics can be inherited.
4. Bigger organisms are more able to protect themselves and small organisms are helpless.

Accurate Concept

1. Plants have a range of defenses including external structures (sap, hairs, thorns, wax) and chemicals that either reduce digestibility or are toxic.
2. Traits are developed across generations in response to environmental demands.
3. Traits acquired during an organism's life are not passed to offspring.
4. Nearly all organisms have some characteristic or behavior that helps them survive.

References

- <http://beyondpenguins.ehe.osu.edu/issue/tundra-life-in-the-polar-extremes/common-misconceptions-about-biomes-and-ecosystems>
- Original list shared by UNL Prof, Ron Bonnstetter, 11/29/06, with additions from the *New York Science Teacher Website*, <http://www.newyorkscienceteacher.com/sci/miscon/index.php> Revised by S-Person-Pandil, ESU#3, Sept. 2008;

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