

OKLAHOMA ACADEMIC STANDARDS

SCIENCE FRAMEWORK

GRADE 2: 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.

Science Framework Writers

Solomon Bayouth	Megan Cannon	Wendy Howard	Jenny Thompson
Elizabeth Beck	Mandi Cloud	Traci Richardson	Sarah Vann
Colleen Bennett	Benjamin Cottingham	Georgia Smith	Megan Veldhuizen
Rachel Brown	Jennifer Crabb	Stacey Stapelton	Tammy Will
Randi Butcher	Maria Harris	Amy Tankersley	Susan Wray

“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. A 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 at: <https://www.evernote.com/l/AUXXIQC11VZDeLmUkOMPpjhKeJjqS-R8gww>

Bundle: Physical Maps

2-ESS2-2

Students who demonstrate understanding can:

Develop a model to represent the shapes and kind of land and bodies of water in an area.

In Lay Terms

Maps give us information about the land around us. Maps can tell us where certain types of landforms are and can also provide us with information about bodies of water.

Three Dimensional Storyline

There are several different types of maps. Map reading is a visual literacy skill that teaches students how to interpret large scale areas on a much smaller diagram. Maps give us a multitude of information depending upon the type of map we are looking at. Students can analyze and interpret information from maps to determine locations of types of landforms and bodies of water in a certain area, such as rivers, lakes, mountains, and valleys. These are very important skills that students must understand to grasp the full understanding of maps and their various purposes as time goes on.

Patterns on maps help make a connection between landforms and bodies of water. Students can use these patterns to gain a better understanding of the world and the systems working around them. When students are given opportunities to determine patterns between a specific type of landform and recurring shapes in those areas, it makes the map concept easier to learn and retain the information.

Lesson level Performance Expectations

- Students can raise questions about what types of information can be shown on a map.
- Students can obtain information that shows shapes and kind of land and water can be shown on a map.
- Students can interpret and analyze information from maps to determine patterns in Earth's surface features.
- Students can develop and use visual models like maps to communicate information about location and types Earth's surface features.

Misconceptions

1. Students may confuse symbols with real-world referents, based on things like color or shape.
2. If objects on a map are close together they are

Accurate Concept

1. Symbols and colors on maps are used to represent the real world and are not exactly like what they represent.
2. Scale needs to be taken into account when looking at a map.

not very far from each other.

References

- <http://education.nationalgeographic.com/news/map-it-young-children/>

Bundle: Matter

2-PS1-1

Students who demonstrate understanding can:

Plan and conduct an investigation to describe and classify different kind of materials by their observable properties.

2-PS1-2

Students who demonstrate understanding can:

Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1-3

Students who demonstrate understanding can:

Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

2-PS1-4

Students who demonstrate understanding can:

Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

In Lay Terms

Matter is all around us and can exist in different states, including solids and liquids, depending on its temperature. Sometimes these changes from solid to liquid or liquid to solid can be reversed by heating or cooling. We can observe these changes to make observations about matter and why it sometimes changes states. In addition, materials can have different properties (ex: flexibility, hardness, texture) that can be used to determine how that material could be used. Sometimes materials are used to make parts that can be put together to create a variety of objects.

Three Dimensional Storyline

Most matter is either a solid or liquid depending on the temperature. **(Other states of matter do exist, such as gases which are introduced at the 5th grade level.)** Students should be able to **plan and conduct an investigation to make observations** of different types of material being heated or cooled in order to **determine** that the state of matter of a material **can be changed** and sometimes reversed by heating or cooling. For example students can observe water changing into ice, or ice melting into water; or wax or butter melting and cooling. Students can **use evidence from these investigations to construct an argument** that heating and cooling can **cause a change** in the state of matter and some

changes can be reversed and some cannot.

All materials are made up of matter. Each material has different properties, such as flexibility, texture, and hardness. The properties of materials help us to determine the purpose for which the material might be best suited. Students should be given opportunities to **gather data from observations** about the properties of different materials. Students can **use these observations to discover patterns** about the properties of different types of materials in order to **classify** them into student-generated categories. For example, metals can be bent and is shiny. Students can **ask questions and propose ideas** about how each type of material could be used based on its properties. Using these ideas, students can **test to determine** which materials are best suited for different purposes.

When **investigating different materials**, students should be given opportunities to **observe that many objects are made of smaller pieces**. These **objects consist of smaller pieces working together in a system**. Students should be able to see this in many real life man-made objects, such as cars, clocks, etc. as well as in nature leaves, petals, stem etc. **(The focus in this PE bundle is that objects are made of smaller pieces, not in memorizing parts of objects or organisms)**. Students can **use models, such as building blocks or other manipulatives, to determine** that objects can be taken apart into smaller components and sometimes can be put together in different ways to make objects different from the original object.

Lesson Level Performance Expectations

- Students can **gather evidence** that shows **different** kinds of matter exist.
- Students can **observe** that matter exists in liquid and solid forms.
- Students can **plan and conduct investigations to determine** that matter can **change** from liquid to solid or solid to liquid by heating or cooling it.
- Students can **explain** that some matter **changes** by heating or cooling it.
- Students can **construct an argument using evidence** that some **changes** in matter can be reversed and some cannot.
- Students can **make observations** about properties of matter (e.g. color, texture, hardness, and flexibility).
- Students can **use evidence to explain** that matter can be observed, described, and **classified**.
- Students can **use observations** about properties of matter **to describe and classify** materials.
- Students can **ask questions** about **different** materials and **how they could be used**.
- Students can **plan and conduct investigations** to test **different** materials for **different purposes**.
- Students can **analyze data** that shows **different properties** are suited to **different purposes**.
- Students can **communicate** that every human-made product is designed by applying knowledge of the natural world using materials from the natural world.
- Students can **make observations** to determine that several objects can be built up from a small set of pieces.

Misconceptions

1. Materials can only exhibit properties of one state of matter.
2. Melting and dissolving are the same thing.
3. Solids are matter, but liquids and gases are not.
4. When matter changes states it is a new substance.

Accurate Concept

1. Matter can change states depending on the temperature.
2. Melting (just changes state) and dissolving are different processes.
3. Solids, liquids, and gases are all different states of matter.
4. When matter changes state it is still the same substance.

References

- <http://beyondpenguins.ehe.osu.edu/issue/water-ice-and-snow/common-misconceptions-about-states-and-changes-of-matter-and-the-water-cycle>
- <https://curriculum.wiki.dublinschools.net/3rd+Grade+Science+Common+Misconceptions>

Bundle: Earth Events

2-ESS1-1

Students who demonstrate understanding can:

Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

In Lay Terms

Change occurs all around us. Some things change rapidly, like an eruption of a volcano; while others change very slowly, like the erosion of rock over a long period of time. We observe changes in the Earth every day; some changes start small and grow into big changes over time. Other changes occur much faster and allow us to watch the change take place right in front of us.

Three Dimensional Storyline

Changes happen to the Earth every day. Some events happen very quickly while others are slow moving and evolve over time. Students will be able to gather information from different sources in order to construct explanations about why earth events can take place both quickly and slowly. Students can make observations about Earth changes, like erosion, but students have a difficult time understanding the long timeframes needed for things like erosion to take place since this is hard to visualize. We see these changes around us and sometimes don't even realize they are happening; the Earth is always changing. New lakes, rivers, and mountains are being made, while others are disappearing. After teaching this concept, students will be able to use the information and provide evidence about these changing Earth systems. Students will focus on the crosscutting concept stability and change allowing students to gain a deeper understanding of Earth's various changing systems.

Lesson Level Performance Expectations

- Students can ask questions about changes that occur on Earth.
- Students can gather evidence that describes Earth changes happening quickly and Earth changes happening slowly.
- Students can explain using evidence that some Earth events occur rapidly and some occur slowly.

Misconceptions

1. Erosion happens quickly.
2. Rocks do not change.
3. All volcanoes erupt violently.

Accurate Concept

1. Erosion occurs over long periods of time.
2. Rocks change over time.
Some volcanic eruptions are nonviolent.

References

- <http://beyondpenguins.ehe.osu.edu/issue/earths-changing-surface/common-misconceptions-about-weathering-erosion-volcanoes-and-earthquakes>

Bundle: Wind and Water

2-ESS2-1

Students who demonstrate understanding can:

Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*

2-ESS2-3

Students who demonstrate understanding can:

Obtain information to identify where water is found on Earth and that it can be solid or liquid.

In Lay Terms

On Earth, water is found in oceans, rivers, lakes, and ponds. This water can be solid or liquid in form. Wind and water can cause changes in the land. There are things that can be done to control and limit the effects of water and wind on the Earth.

Three Dimensional Storyline

Water is found in various forms and places throughout Earth. Through appropriate grade level text and other media, students can **research and identify where water is found on the Earth**, and that water can be **solid or a liquid**. Students can **use evidence to explain** that water can be found **in oceans, rivers, lakes and ponds** and that **water can exist in nature as both a solid as ice and in liquid form**. As students **make observations** about water and **construct explanations**, they can begin to **see patterns in the distribution of water and the forms in which water exists**.

There are many different forces in nature that can **cause changes** in the shape of the land. Students can **ask questions and collect evidence** that both **wind and water are capable of changing** and **shaping Earth's surface features**. Movement of wind and water is a **main cause** for these **changes to the Earth's surface**. Students can **make observations** about the different ways that **wind and water shape Earth's surface**. These **changes** can occur both **rapidly or slowly**. Students can **define problems** related to **wind and water erosion** and **collaboratively develop possible solutions**. Students can **use models to test and compare multiple solutions** including both student proposed solutions and real life solutions. Students will **observe first-hand or through media** a variety of solutions to **slow down or prevent these changes from happening**. They will then be able to **construct explanations** as to why the solutions were effective.

Lesson Level Performance Expectations

- Students can **observe** that wind and water can **change** the shape of the land.
- Students can **gather information and compare** more than one possible solution to prevent wind and/or water from **changing the shape** of the land.

- Students can **communicate** the ways in which technology **impacts** the natural world.
- Students can **explain using evidence** that water is found in the ocean, rivers, lakes and ponds.
- Students can **construct an argument using evidence to communicate** that water exists as solid ice in a liquid form.

Misconceptions

1. Rocks do not change.
2. Erosion (changes in the land) happens quickly.
3. Erosion (changes in the land) is always bad.
4. Wind cannot break or change rock.

Accurate Concept

1. Rocks change over time.
2. Erosion can happen at various timescales.
3. Erosion can have both positive and negative effects.
4. Wind can erode rock surfaces.

References

- <http://beyondpenguins.ehe.osu.edu/issue/earths-changing-surface/common-misconceptions-about-weathering-erosion-volcanoes-and-earthquakes>
- <http://assessment.aaas.org/topics/WE#/,tabs-222/2>
- <http://www.nsta.org/elementaryschool/connections/201209AppropriateTopics-ElementaryStudentScienceMisconceptions.pdf>

Bundle: Diversity in Habitats

2-LS4-1

Students who demonstrate understanding can:

Make observations of plants and animals to compare the diversity of life in different habitats.

In Lay Terms

Around the world, plants and animals live in a variety of places. They can exist on land, water, or a combination of the two. They make their homes in habitats fitting to their nature (ex: penguins live in a polar habitat, not the in desert).

Three Dimensional Storyline

In this performance expectation, students can **make observations to compare the diversity of life in different habitats**. There are **many kinds of plants and animals that exist in a variety of places on land and in water**. In order to **compare** the habitats, students can be given opportunities to **observe a variety of plants and animals in their habitats**. This can be done through first-hand **observations** (ex: an aquarium, outside on the playground, a zoo) **or from various media**, as **all plant and animal habitats are not present everywhere**. Once students have **made observations**, they should be prompted to **make comparisons** of the **different kinds of living things and the surroundings or habitats they live in**.

Students can **discuss their observations** and may begin to **ask questions** about **why** some **plants and animals live in some habitats and not in others**. These questions are good, but there is no expectation for this performance expectation that students know why.

Lesson Level Performance Expectations

- Students can **raise questions** about habitats and the plants and animals that are found in them.
- Students can **observe** habitats and the plants and animals that are found in them.
- Students can **communicate** the **similarities** and **differences** that exist between plants they observe.
- Students can **communicate** the **similarities** and **differences** that exist between animals they observe.
- Students can **use observations of habitats to explain why** they think some plants and animals live there.
- Students can **use observations of habitats to explain why** they think some plants and animals don't live there.
- Students can **communicate** that there are many **different** kinds of living things in any area, and they exist in **different** places on land and in water.

Misconceptions

Accurate Concept

1. Plants depend on humans.
2. Plants do not live in water.
3. Ecosystems do not function as a whole.

1. Plants obtain what they need to survive from their surrounding ecosystem.
2. Some plants live in water.
3. Plants and animals work together with the other parts of the ecosystem in which they live.

References

- <http://ecomisconceptions.binghamton.edu/ecosystem.htm>

Bundle: Ecosystems

2-LS2-1

Students who demonstrate understanding can:

Plan and conduct an investigation to determine if plants need sunlight and water to grow.

2-LS2-2

Students who demonstrate understanding can:

Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

In Lay Terms

Plants are living things that need sunlight and water to grow. Without sunlight or water, a plant will not survive. In order for more plants to grow, they must be pollinated or have their seeds scatter. Plants depend on insects and animals to help with pollination and seed dispersal.

Three Dimensional Storyline

In this performance expectation bundle, students can explore **if plants need sunlight and water to grow**. Plants are living things, just like humans, and just like humans, plants **have specific needs that must be met to survive**. In order to establish an understanding about if plants need sunlight and water to survive, students can work in small groups to both **plan and conduct investigations** to determine **the specific things plants must have to survive**. Students can use **data from their investigation as evidence in claims** that **plants need sunlight and water to grow**. **Claims** can include students **using evidence** of what happens to plants if they do not receive sunlight or water.

In addition to needing sunlight and water for survival, **plants are also dependent on animals to help them scatter their seeds around, as well as for pollination**. Students can be given opportunities to explore different seed **structures** to consider how those seeds might relate to how **(function)** the seeds are dispersed by animals. Students can also be given opportunities to observe animals dispersing seeds through video or through nature walks to determine any possible **patterns in seed dispersal and seed structure**. Once students have had a chance to make observations such, students can **develop or use physical models** that mimic how **animals assist plants in pollination and in the dispersion of seeds** (using an eyedropper to move liquids from one container to another emulating hummingbirds or bees pollinating plants or using a duster to move dust to emulate birds or insects carrying pollen).

Lesson Level Performance Expectations

- Students can **raise questions** about **the effects** of sunlight and water on plants.
- Students can work with a small group to **plan and conduct investigations** on **the effects** of sunlight and water on plants.

- Students can **communicate** that plants depend on water and light to grow.
- Students can **develop and use models to explain** how animals can help plants survive and reproduce.
- Students can **communicate** that plants **depend** on animals for pollination or to disperse their seeds around.
- Students can **create a design through sketches, drawings, or physical model** to show how plants **depend** on animals to pollinate or move their seed around.
- Students can **communicate to others how the design** shows how plants **depend** on animals to pollinate or move their seeds around.

Misconceptions

Accurate Concept

1. Plants are not alive.
2. Sunlight is helpful for plants, but not critical for survival.
3. The sun helps plants by keeping them warm.

1. Plants are living organisms.
2. Plants require sunlight in order to make food.
3. Plants require sunlight in order to make food.

References

- <http://beyondpenguins.ehe.osu.edu/issue/polar-plants/common-misconceptions-about-plants>

For questions or feedback contact:

Tiffany Neill

Tiffany.Neill@sde.ok.gov

405-522-2524



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