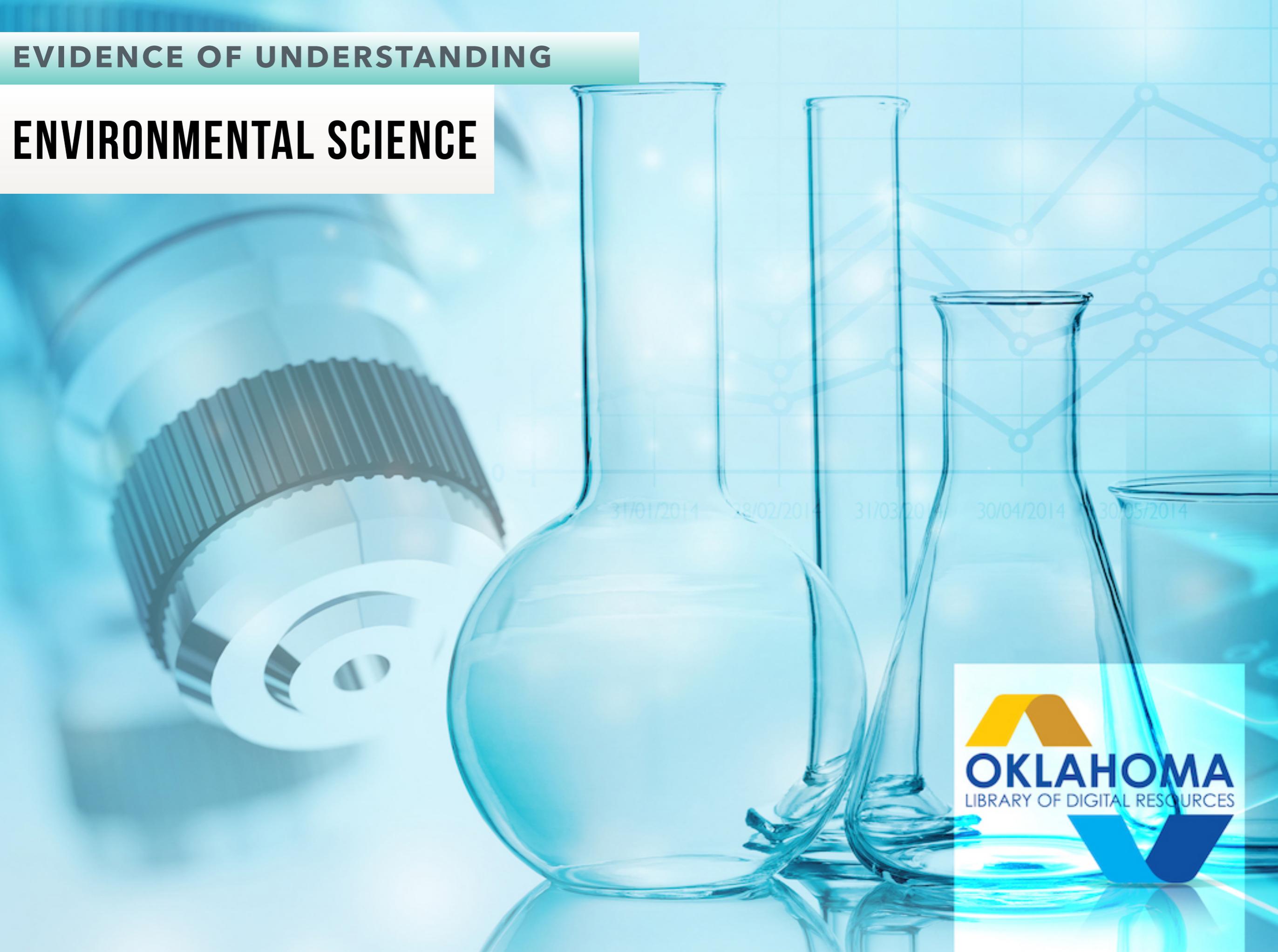


EVIDENCE OF UNDERSTANDING

ENVIRONMENTAL SCIENCE



The Oklahoma Library of Digital Resources is an innovative initiative to provide Oklahoma educators with high-quality, interactive teaching resources.

We appreciate our sponsors:



Thank you to the following educators for their work in curating digital resources:

Eman Beck, Norman Public Schools

Ruth Biggs, Broken Arrow Public Schools

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GETTING TO KNOW OKLDR

WHO IS OSSBA?

The Oklahoma State School Boards Association (OSSBA) works to promote quality public education for the children of Oklahoma through training and information services to school board members. The Association is a leader among leaders in Oklahoma education and a visible presence in the local school districts and throughout the state.

The OSSBA was created in 1944 to provide support for local school board members with a variety of information, assistance, and representation services. OSSBA reaches every school board member through training opportunities. It creates and encouraged effective leaders to promote public education and cultivates productive alliances with governing bodies. OSSBA trains school board members to participate in an effective and supportive manner to provide direction for educational innovation and improves public perception of education in Oklahoma by sharing strategies and tools with our member school districts to focus on the success of Oklahoma public education.

OSSBA works with school boards to demonstrate the impact they have on student achievement. We work to provide meaningful two-way communication of advocacy, services, and training activities to local boards of education and their stakeholders. Other services we provide that have a direct impact on student achievement include strategic planning and superintendent searches. Our legal team provides free legal information to the school districts.

WHY OKLDR?

In the summer of 2016, OSSBA set out on a journey assist teachers in the integration of technology into their classrooms. The Oklahoma Library of Digital Resources (OKLDR) became a collection of digital content resources selected by Oklahoma educators to support the Oklahoma Academic Standards. The resources were curated by teachers from school districts across Oklahoma. Each collection contained a variety of learning resources, such as videos, apps, pdf documents, and websites, and are designed so that teachers can then build their lesson plans. The resources helped bridge the digital equity gap among students while helping schools make the most of limited resources.

After collaborating with educators, school and district leaders for a couple of years, OKLDR has been enhanced in the following ways:

- Resources are now an Open Education Resource (OER) “book” format, making it easier to use and accessible on multiple devices.
- Resources map to ESSA expectations for evidence of student understanding and students’ mastery of the academic standards.
- Tools are now agnostic and can be used on multiple devices.
- Lessons are now focused on student engagement through the use of technology. The first OKLDR version focused on teacher resources. **This is a major change.**
- To prioritize student learning, teacher resources are now located at the back of each book.

HOW TO USE THIS BOOK



The Oklahoma Academic Standards for this lesson are grouped together by key topics. Sometimes you will see only one standard, but other times you will see a grouping of standards.



Evidence of Understanding is the key. This is the concept you want your students to master that reinforces the standards. Mastery means deeper understanding, not just “skim the surface” learning.



Digital Tools are the recommended applications and/or tools for the lesson. Think of this element as the “supplies box.”



In Practice is a suggested activity to engage the students to demonstrate mastery of the standard. You will notice that this is just one suggested lesson, and sometimes there might be a second lesson. The suggested lesson, developed by Oklahoma teachers, is meant to give you a starting point. You might decide to use the lesson or it might give you an idea of something else you could do to teach the concept.

MOVING FORWARD

As you can see the OKLDR book has been designed to inspire educators to have students demonstrate their understanding of the Oklahoma Academic Standards through the use of technology as a productivity tool. While educators have limited time in the day to plan and research high quality content, this book is a jumping off point, with suggested peer-reviewed activities and resources.

While you might encounter extra white space in the book, it is intentional for growth. As you integrate the activities into your lessons, you are encouraged to send us student work samples that might be included in the book, as well as additional activities and resources that could be included in future revisions.

Next Steps:

- We would love to add samples of student work to the activities, so please send the work to: okldr@ossba.org.
- If you would like to be involved in future course creation, or know teachers who would like to be involved, please contact us at: okldr@ossba.org.
- See anything that needs to be changed or enhanced? Contact us at: okldr@ossba.org.

ECOLOGY

ECOSYSTEMS



HS-LS2-2 Students who demonstrate understanding can: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-6 Students who demonstrate understanding can: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.



Evidence of Understanding

Students who demonstrate understanding will use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

Students who demonstrate understanding will evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.



Digital Tools

- *Content Video* - [Africa's Savanna Ecosystems Video](#)
- *Interactive Website* - [Mass Extinctions Interactive Resource](#)
- *Presentation* - [Keynote](#), [Google Slides](#), [Microsoft PowerPoint](#)
- *Design tools* - [Canva](#), [Web Poster Wizard](#)
- *Website Creation* - [Weebly](#), [Google Sites](#)



In Practice

- Students will observe the lecture on the Savanna Ecosystem recording mathematical representations of evidence affecting the biodiversity and populations in the Savanna Ecosystem.
- Students will research another ecosystem to make a presentation or poster to show the mathematical representations of evidence affecting the biodiversity and populations in the ecosystem.
- Students will include factors such as but not limited to climate, natural disasters, geoscience processes, and biotic factors.

ENERGY & MATTER



HS-LS2-4 Students who demonstrate understanding can: Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-ESS2-6 Students who demonstrate understanding can: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS2-7 Students who demonstrate understanding can: Construct an argument based on evidence about the simultaneous co-evolution of Earth's systems and life on Earth.



Evidence of Understanding

Students who demonstrate understanding can use a mathematical representation to support claims for the cycling of carbon and flow of energy as food among organisms in an ecosystem.

Students who demonstrate understanding can evaluate and construct an argument that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

Students who demonstrate understanding can design, evaluate, and refine a solution for reducing the impacts of human activities on the environment biodiversity.



Digital Tools

- *Content Website* - [Carbon Cycle Game](#), [The Flying Cat Story](#), [Population Biology Interactive Lab](#)
- *Word Processor* - [Pages](#), [Google Docs](#), [Microsoft Word](#)
- *Sketch Application*- [Sketches School](#), [Notes, ibis](#), [Absolute Board](#), [Google Draw](#), [Notability](#), [Sketchbook](#),
- *Spreadsheet*- [Numbers](#), [Google Sheets](#), [Microsoft Excel](#)



In Practice

- Students will create an ecosystem using a sketch app or a paperless classroom app. The ecosystem will contain a cycle (carbon cycle, rock cycle, water cycle, etc...), biotic and abiotic factors, and populations for an essential and stable flow of energy and matter.
- Students will construct an argument in a science journal that a change in the cycle, factors, or populations will create an unstable effect on Earth systems.
- Students will use a spreadsheet to demonstrate a mathematical representation of the energy and matter in the system.

POPULATION DYNAMICS



HS-LS2-1 Students who demonstrate understanding can: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2 Students who demonstrate understanding can: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.



Evidence of Understanding

Students who demonstrate understanding will design, evaluate, and refine a solution for reducing the impacts of human activities on the environment biodiversity.



Digital Tools

- *Design Tools* - Web Poster Wizard
- *Website Design* - Weebly
- *Presentation* - Keynote, Google Slides, Microsoft PowerPoint
- *Website* - Population and environment: a global challenge, Population Explosion Activity



In Practice

- Students will utilize information from the World Population article to understand population impact on a global scale.
- Students will construct an argument from evidence in science journal explaining the factors most likely to create future environmental catastrophes and design a solution for the factors.
- Students will create a poster or a presentation to illustrate their solution for reducing human impact on the environment biodiversity.
- Students will manipulate and observe the Population Explosion website to deepen their understanding of factors that influence carrying capacity.
- Students will use mathematical representations to support an explanation on their poster that a particular factor can have an impact on the carrying capacity, biodiversity and populations of an ecosystem.

EARTH SYSTEMS & RESOURCES

EARTH SYSTEMS



HS-ESS2-1 Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth's systems.

HS-ESS2-3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.



Evidence of Understanding

Students will develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

Students will analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth's systems.

Students will develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.



Digital Tools

- *Word Processor* - [Pages](#), [Google Docs](#), [Microsoft Word](#)
- *Presentation* - [Keynote](#), [Google Slides](#), [Microsoft PowerPoint](#)
- *Interactive Website* - [Convection Current Animation](#)
- *Website* - [Glaciers, Erosion and Deposition - Constructive and Destructive Processes](#)
- *Website* - [Taking Earth's Inner Temperature Article](#)
- *Content Video* - [Temporal & Spatial Scales of Climate Change Video](#)



In Practice

- Students will analyze and interpret data from the Constructive and Destructive Processes articles, the Earth's Inner Temperature article, and convection current interactive simulation to create a presentation demonstrating how the change in Earth's surface can create interactions that cause changes to Earth's systems.
- After watching the Spatial and Temporal Scales Video, students will collaborate and interact with each other in small groups on the shareable/collaborative document to produce a display illustrating how Earth's internal and surface processes operate at different spatial and temporal scales to form Earth's features.

LAND & WATER USE



HS-ESS2-5 Students who demonstrate understanding can: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

HS-ESS3-1 Students who demonstrate understanding can: Construct an explanation based on evidence for how the availability of natural resources, the occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ESS3-2 Students who demonstrate understanding can: Evaluate competing design solutions for developing, managing, and utilizing natural resources based on cost-benefit ratios.*

HS-ESS3-3 Students who demonstrate understanding can: Create a computational simulation to illustrate the relationship among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS3-4 Students who demonstrate understanding can: Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems.



Evidence of Understanding

Students will use a natural disaster app that enables the students to create a design solution with criteria and constraints recorded on a data application.

Students will record the evidence the dependence of human populations on technological systems to acquire the natural resources and modify the physical settings.

Students will show evidence of a causal and correlational relationship between environmental factors and human activity.

Students will describe that a decision on a design solution may change over time to increase the benefits of a design solution.

Students will work in groups utilize the “Flood!” classroom activity to analyze the effects of flood waters on the environment. Students will create a presentation using google slides or other slideshow technology.



Digital Tools

- *Website - Flood! Lesson and Activities*
- *Data Collection Application - Science Journal, Easy Measure or Smart Measure, Measure, AngleMeter, Stanley Level, CamToPlan*
- *Online Graphing Tool - Create a graph*
- *Presentation - Keynote, Google Slides, Microsoft PowerPoint*
- *Interactive Website - Stop Disaster Interactive Game*



In Practice

- Students will be able to plan and conduct an investigation of the properties of water and its effects on earth material and surface processes.
- Students will use a data collection application to:
 - A. Record the steps and processes of a design solution using natural resources for solutions to natural disasters.
 - B. Evaluate and communicate finds of competing design solutions for developing, managing, and utilizing natural resources based on cost-benefit ratios.
 - C. Create a computational graph to illustrate the relationship among management of natural resources, the sustainability of human populations and biodiversity in relation to the design solution using the natural resources.
 - D. Evaluate or refine a technological solution to increase the benefits.
- Students will create a computational graph to illustrate the relationship among management of natural resources, the sustainability of human populations and biodiversity in relation to the design solution using the natural resources.

HUMAN IMPACT

POLLUTION



HS-ESS3-1 Students who demonstrate understanding can: Construct an explanation based on evidence for how the availability of natural resources, the occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ESS3-4 Students who demonstrate understanding can: Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems.



Evidence of Understanding

Students will demonstrate understanding by constructing an explanation based on evidence for how the availability of natural resources, the occurrence of natural hazards, and changes in climate have influenced human activity.

Students will demonstrate understanding by evaluating or refining a technological solution that reduces the impacts of human activities on natural systems.



Digital Tools

- *Content Application* - [Air Matters](#)
- *Data Collection Application* - [Science Journal](#), [Easy Measure](#) or [Smart Measure](#), [Measure](#), [AngleMeter](#), [Stanley Level](#), [CamToPlan](#)
- *Spreadsheet*- [Numbers](#), [Google Sheets](#), [Microsoft Excel](#)
- *Website* - [Climate Change Impacts Human Health](#), [Windmill Gallery](#)
- *Online Graphing Tool* - [Create a graph](#)



In Practice

- Students will use the Air Matters app to gather data for analysis from around the globe of air quality and analyze data from the Climate Change Impacts Human Health article to reason and construct an explanation based on evidence for how air quality and climate change influence human activity.
- Students will use a spreadsheet or graphing tool to create graphs to represent their findings and support the explanations.
- Students will use a data collection application to write an argument about wind farms. Even if a wind farm will provide energy for an area, would it be a good idea to put it in the center of a town, near a famous river, or on a resort beach?
- Students will evaluate the windmill designs over time for developing, managing, and utilizing natural resources based on cost constraints using the Windmill Gallery.

ENERGY RESOURCES AND CONSUMPTION



HS-ESS2-4 Students who demonstrate understanding can: Analyze and interpret data to explore how variations in the flow of energy into and out of Earth's systems result in changes in atmosphere and climate.



Evidence of Understanding

Students who demonstrate understanding will analyze and interpret data to explore how variations in the flow of energy into and out of Earth's systems result in changes in atmosphere and climate.



Digital Tools

- *Website* - Changes in the flow of energy through the Earth's climate system article, Carbon Cycle Diagram, What Does the Sun have to do with the Carbon Cycle Article, Causes of Ice Age Article
- *Word Processor* - Pages, Google Docs, Microsoft Word
- *Presentation* - Keynote, Google Slides, Microsoft PowerPoint



In Practice

- Students will analyze and interpret data from the articles and diagram to create a valid claim on a word processing app. that variations in amount of carbon and the sun's energy result in changes in the atmosphere and climate.
- Students will analyze and interpret data from the Causes of Ice Ages Article to create a presentation to show the factors in changes to global and regional climate.

GLOBAL CHANGE



HS-ESS2-2 Students who demonstrate understanding can: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth's systems.

HS-LS2-7 Students who demonstrate understanding can: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment biodiversity.



Evidence of Understanding

Students who demonstrate understanding will analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth's systems.

Students will design, evaluate, and refine a solution for reducing the impacts of human activities in relation to CO₂ on the environment and the biodiversity.



Digital Tools

- *Note Taking Apps* - Notes, Paper by 53, Evernote
- *Sketch Application* - Sketches School, ibis, Absolute Board, Google Draw, Notability, Sketchbook
- *Website* - Carbon Footprint Article, Climate Change and CO2 Diagram, CO2 Emissions Simulation



In Practice

- Students will read an article as well as analyze and collect data from the CO2 Emissions Simulation and Climate Change and CO2 Diagram and then engage in a discussion on Carbon Footprints cause of changes to other Earth Systems.
- Students will use document apps to construct an argument on the effects of CO2 emissions.
- Students will then create Doodle Notes in a digital note-taking or Sketch application to design, evaluate, and refine a solution for the reduction in CO2 emissions based on human activities.

RESOURCES

TEACHER

- [Periodic Table App](#)
- [Flinn Science Lab Safety](#)
- [Safety Contracts](#)
- [Chemical Safety Data Sheets App](#)
- [Significant Figures- YouTube Videos](#)
- [Eyedropper Hydrometer](#)
- [Rutherford & The Atom - App](#)
- [Periodic Trends Organizer](#)
- [YouTube: Properties of Matter](#)
- [YouTube: Chemical Formulas Explained: Nomenclature](#)
- [Phet: Balancing Chemical Equations](#)
- [YouTube: Force Note Guide](#)
- [Law of Motion Magic](#)
- [Wave Reflection Interference](#)
- [Making Waves with the Electromagnetic Spectrum](#)