Kindergarten Science, Unit 4

The Human Factor

Overview

Unit abstract

In this unit of study, students are expected to develop an understanding of what humans need to survive and the relationship between their needs and where they live. The crosscutting concept of cause and effect is called out as the organizing concept for the disciplinary core ideas. In the kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems and in obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

Essential question

Please note—*There are no essential questions in the kindergarten storyline that match the content for this unit of study. The following question is the driving question associated with K-ESS3-3.*

- How can humans reduce their impact on the land, water, air, and other living things in the local environment?

Bristol–Warren, Central Falls, Cranston, Tiverton, and Woonsocket, with process support from The Charles A. Dana Center at the University of Texas at Austin

Written Curriculum

Next Generation Science Standards

<table>
<tr><th colspan="3">K. Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment</th></tr>
<tr><td colspan="3">Students who demonstrate understanding can:
K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]</td></tr>
<tr><td colspan="3">The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:</td></tr>
<tr><th>Science and Engineering Practices</th><th>Disciplinary Core Ideas</th><th>Crosscutting Concepts</th></tr>
<tr>
<td>Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
▪ Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)</td>
<td>ESS3.C: Human Impacts on Earth Systems
▪ Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3)
ETS1.B: Developing Possible Solutions
▪ Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to K-ESS3-3)</td>
<td>Cause and Effect
▪ Events have causes that generate observable patterns. (K-ESS3-3)</td>
</tr>
<tr><td colspan="3">Connections to other DCIs in kindergarten: K.ETS1.A (K-ESS3-3)</td></tr>
<tr><td colspan="3">Articulation of DCIs across grade-levels: 2.ETS1.B (K-ESS3-3); 4.ESS3.A (K-ESS3-3); 5.ESS3.C (K-ESS3-3)</td></tr>
<tr><td colspan="3">Common Core State Standards Connections:
ELA/Literacy –
W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS3-3)</td></tr>
</table>

K-2. Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions. ▪ Ask questions based on observations to find more information about the natural and/or designed world. (K-2-ETS1-1) ▪ Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)	**ETS1.A: Defining and Delimiting Engineering Problems** ▪ A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) ▪ Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) ▪ Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)	N/A

Connections to K-2-ETS1.A: Defining and Delimiting Engineering Problems include:
Kindergarten: K-PS2-2, K-ESS3-2
Connections to K-2-ETS1.B: Developing Possible Solutions to Problems include:
Kindergarten: K-ESS3-3, **First Grade:** 1-PS4-4, **Second Grade:** 2-LS2-2
Connections to K-2-ETS1.C: Optimizing the Design Solution include:
Second Grade: 2-ESS2-1

Articulation of DCIs across grade-bands: **3-5.ETS1.A** (K-2-ETS1-1); **3-5.ETS1.C** (K-2-ETS1-1)

Common Core State Standards Connections:
ELA/Literacy –
RI.2.1 Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text. (K-2-ETS1-1)
W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. *(K-2-ETS1-1)*
W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1)
Mathematics –
MP.2 Reason abstractly and quantitatively. *(K-2-ETS1-1)*
MP.4 Model with mathematics. *(K-2-ETS1-1)*
MP.5 Use appropriate tools strategically. *(K-2-ETS1-1)*
2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. *(K-2-ETS1-1)*

Clarifying the standards

Prior learning

There are no disciplinary core ideas that are considered prior learning for the concepts in this unit of study.

Progression of current learning

Driving question 1
How can humans reduce their impact on the land, water, air, and other living things in the local environment?

Concepts	Practices
• Events have causes that generate observable patterns. • Things that people do to live comfortably can affect the world around them. • People can make choices that reduce their impacts on the land, water, air, and other living things. • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. • A situation that people want to change or create can be approached as a problem to be solved through engineering. • Asking questions, making observations, and gathering information are helpful in thinking about problems. • Before beginning to design a solution, it is important to clearly understand the problem.	• Observe patterns in events generated due to cause-and-effect relationships. • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. • Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. • Ask questions based on observations to find more information about the natural and/or designed world. • Define a simple problem that can be solved through the development of a new or improved object or tool. • Ask questions, make observations, and gather information about a situation that people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool.

Integration of content, practices, and crosscutting concepts

In this unit of study, students will develop an understanding of the impact that humans have on the land, water, air, and other living things in the local environment and engage in a portion of the **engineering design process** in order to communicate solutions that can reduce these impacts.

To help students recognize the impact that humans have on the living and nonliving components of the local environment, they need opportunities to observe and think about the things that people do to live comfortably. Over a period of a few days, students can observe their families in their day-to-day lives, paying attention to what they eat, what they throw away, when and how they use water, how they warm or cool their home, what types of appliances and gadgets they use, how they maintain their home and yard, what resources are used to make the clothes they wear, how they travel from place to place, and how they communicate with others. During whole-group discussions, students can share their observations and then discuss the concept of

resources. As a class, they can create a list of resources that are used to provide their families with a comfortable lifestyle. This list could include:

- Plants and animals for food
- Trees, rocks, sand, and other materials for building homes and schools
- Local reserves of water for drinking, washing clothes, showering, washing dishes, watering lawns, and cooking
- Gas and oil for cars and buses
- Electricity to power the appliances in their homes
- Land for homes, schools, parks, parking lots, and landfills

Then the class can discuss how obtaining and using these types of resources affects the local environment. To help with these discussions, teachers can use books, multimedia resources, field trips, or even invite guest speakers to the classroom. As students participate in discussions, they should be encouraged to ask questions, share observations, and describe cause-and-effect relationships between human use of resources and human impact on the environment.

As students come to understand that things people do to live comfortably can affect the world around them, they are ready to engage in the ***engineering design process***. The process should include the following steps:

- As a class or in groups, students participate in shared research to find examples of ways that people solve some of the problems created by humans' use of resources from the environment. For example, people in the community might choose to:
  - Recycle plastic, glass, paper, and other materials in order to reduce the amount of trash in landfills;
  - Plant trees in areas where trees have been cut down for lumber to renew regional habitats for local wildlife; or
  - Set up rainwater collection systems so that rainwater can be used to maintain landscaping instead of using water from local reserves.
- Groups of students then develop a simple sketch, drawing, diagram, or physical model to illustrate how the solution reduces the impact of humans on land, water, air and/or other living things in the local environment.
- Groups need the opportunity to communicate their solutions with the class in oral and/or written form, using their sketches, drawings, diagrams, or models to help explain how the solution reduces the human impact on the environment.

While engaging in this process, students should learn that even though humans affect the environment in many ways, people can make choices that reduce their impacts on the land, water, air, and other living things in the environment.

Integration of engineering

In this unit, students ask questions, make observations, and gather information about a situation people want to change. Students define a simple problem, determine ways that the problem can be solved, and use sketches, drawings, or physical models to convey solutions that reduce the impact of humans on the land, water, air, and/or other living things in the local environment. This process is outlined in greater detail in the previous section.

Integration of DCI from other units within this grade level

In Unit 2, Plants, and Unit 3, Animals, students developed an understanding of what plants and animals need to survive and the relationship between their needs and where they live. Students collected and analyzed data, looked for patterns, developed and used system models, and engaged in argument from evidence.

The following connections to disciplinary core ideas occur in Unit 2, Plants, and Unit 3, Animals.

In these units of study, kindergarten students learn that:

- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.
- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.
- Plants and animals can change their environment.

In addition, the following connections to engineering disciplinary core ideas occur in Unit 1, Weather; Unit 5, Pushes and Pulls; and Unit 6, Effects of the Sun.

In these units of study, kindergarten students learn that:

- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problem.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

Integration of English language arts and mathematics

English language arts

In order to integrate the CCSS-ELA standards into this unit, students need the opportunity to participate in shared research in order to find examples of ways that humans reduce their impact on the land, water, air, and other living things in the local environment. With prompting and support, students will ask and answer questions about key details in a text. Students, with adult support and/or peer collaboration, can also use simple books and media resources to gather information and then use drawings, simple informative writing (or dictation), and visual displays to represent some of the ways that people lessen their impact on the environment. With support from adults, students will recall information from experiences or gather information provided from sources to answer a question. Students can clarify their ideas, thoughts, and feelings using simple informative writing.

Mathematics

During this unit of study, students will make connections to the CCSS for Mathematics as they classify data by one attribute, sort data into categories, and graph the data. For example, students can keep track of the amount of materials recycled over a period of time. They can classify recycled trash as paper, plastic, or glass, then count and graph these data, using bar graphs or picture graphs. Student should have opportunities to analyze and compare the data and then use the data to solve word problems. As students work with their data, they are

learning to reason abstractly and quantitatively, model by diagramming the situation mathematically, and use appropriate tools strategically.

Future learning

The following disciplinary core ideas are future learning related to the concepts in this unit of study.

In Grade 2, students will know that:

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

In Grade 4, students will know that:

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

In Grade 5, students will know that:

- Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, oceans, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

In Grades 3–5, students will know that:

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and constraints.

Number of Instructional Days

Recommended number of instructional days: 20 (1 day = 20–30 minutes)

Note—The recommended number of days is an estimate based on the information available at this time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.