Sept. Grade 2 Unit 1: Engineering Design Process

Content Area: **Science**
Course(s):
Time Period: **September**
Length: **6-8 Weeks**
Status: **Published**

Unit Overview

In this unit, students will:

- ask questions, make observations, and gather information to define a problem;
- use a design process to solve a problem;
- compare the strengths and weaknesses of multiple design solutions.

Enduring Understandings

Engineers use a specific design process to solve real world problems.

We can work like engineers to solve problems as well.

Essential Questions

What is the Design Process and how can we use it to solve problems?

Instructional Strategies & Learning Activities

- Unit 1: Engineering Design Process

  Teacher Edition

  Engineering Design Process: Unit At a Glance

  Unit at a Glance for "Engineering Design Process" includes the unit table of contents, unit vocabulary words, and the vocabulary game, Guess the Word. In this unit, children will:
  - ask questions, make observations, and gather information to define a problem;
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- Unit 1: Engineering Design Process

  Teacher Edition

  Engineering Design Process: 3D Unit Planning

  Planning resources are available for each lesson and hands-on activity in the unit "Engineering Design Process."

- Unit 1: Engineering Design Process

  Student Edition

  Engineering Design Process: Unit Opener

  The Unit Opener for "Engineering Design Process" introduces the unit project, Runaway Wagon. During this unit project, children will:
  - Use a design process to define and solve a problem.
  - Construct an argument using evidence to support a claim.

- Unit 1: Engineering Design Process

  Teacher Edition

  Engineering Design Process: Connecting with NGSS

  These opportunities for informal science learning provide local context and extend and enhance concepts from the unit "Engineering Design Process."

- Unit 1: Engineering Design Process

  Home Letter

  Engineering Design Process: Home Letter

  This is the home letter for the unit "Engineering Design Process."

- Unit 1: Engineering Design Process

  Assessment Guide

  Engineering Design Process: Unit Pretest

  The Unit Pretest for "Engineering Design Process" focuses on prerequisite knowledge. The test is

composed primarily of DOK 1 items that evaluate student preparedness for the upcoming content.

- Unit 1: Engineering Design Process

  Assessment Guide

  Engineering Design Process: Unit Test

  The Unit Test for "Engineering Design Process" assesses students' ability to apply knowledge to solve problems and explain phenomena in relation to the Performance Expectations associated with the unit. In this unit, children:
  - ask questions, make observations, and gather information to define a problem;
  - use a design process to solve a problem;
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- Unit 1: Engineering Design Process

  Student eBook

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- Unit 1: Engineering Design Process

  Online Assessment

  Engineering Design Process: Unit Pretest

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- Unit 1: Engineering Design Process

  Teacher eBook

  Engineering Design Process: Unit Opener

  The Unit Opener introduces the unit "Engineering Design Process" and the unit project, Runaway Wagon.

- Unit 1: Engineering Design Process

  Teacher Edition

  Engineering Design Process: Unit Opener

  The Unit Opener introduces the unit "Engineering Design Process" and the unit project, Runaway Wagon.

- Unit 1: Engineering Design Process

  Teacher Edition

  Engineering Design Process: Integrating the NGSS* Three Dimensions of Learning

  This section details the Performance Expectations covered in the unit "Engineering Design Process."

- Unit 1: Engineering Design Process

  Teacher Edition

  Engineering Design Process: Differentiate Instruction

  This page provides differentiated support for this unit's Science & Engineering Leveled Readers, "How Do Engineers Solve Problems?" and "Ben's Engineering Project."

- Unit 1: Engineering Design Process

  Student Edition

  Engineering Design Process: Unit At a Glance

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- Unit 1: Engineering Design Process

  Teacher Edition

  Engineering Design Process: Unit Project: Runaway Wagon

During the unit project "Runaway Wagon," children will:

- Use a design process to define and solve a problem.
- Construct an argument using evidence to support a claim.

- Unit 1: Engineering Design Process

  Assessment Guide

  Engineering Design Process: Unit Pretest (Editable)

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  Unit 1: Engineering Design Process

  Assessment Guide

  Engineering Design Process: Unit Test (Editable)

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  Unit 1: Engineering Design Process

  Teacher eBook

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  Unit 1: Engineering Design Process

  Online Assessment

  Engineering Design Process: Unit Test

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Unit 1: Engineering Design Process

Unit Performance Task Worksheet

Engineering Design Process: Unit Performance Task: Engineer It - Build a Water Bottle Holder

This is the Unit Performance Task worksheet for "Engineer It - Build a Water Bottle Holder." During this task, children will define a problem to solve and develop possible solutions that take into account the structure and function of their water bottle holder.

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Unit 1: Engineering Design Process

Student eBook

Engineering Design Process: Unit Review

The Unit Review assesses student understanding of key ideas and concepts from the unit "Engineering Design Process."

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Unit 1: Engineering Design Process

You Solve It

Sort It Out (Teacher)

Teacher support materials are available for "Sort It Out." During this activity, students will design a strainer that can separate objects based on characteristics such as size and shape. They evaluate their designs, compare them with other designs, and redesign as necessary.

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Unit 1: Engineering Design Process

Teacher eBook

Engineering Design Process: Unit Performance Task: Engineer It - Build a Water Bottle Holder

During the Performance Task "Engineer It - Build a Water Bottle Holder," children will define a problem to solve and develop possible solutions that take into account the structure and function of their water bottle holder.

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Unit 1: Engineering Design Process

You Solve It

Sort It Out

In Sort It Out, students design a strainer that can separate objects based on characteristics such as size and shape. They evaluate their designs, compare them with other designs, and redesign as necessary.

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- Unit 1: Engineering Design Process

  Leveled Readers - Green

  Enrichment: Ben's Engineering Project

  The leveled reader "Ben's Engineering Project" is designed for above-level readers and can be used to extend key concepts from the unit "Engineering Design Process."

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- Unit 1: Engineering Design Process

  Teacher eBook

  Engineering Design Process: Unit Review

  The Unit Review assesses student understanding of key ideas and concepts from the unit "Engineering Design Process."

- Unit 1: Engineering Design Process

  Unit Project Worksheet

  Engineering Design Process: Unit Project: Runaway Wagon (Editable)

  This is the editable Unit Project worksheet for "Runaway Wagon." During this project, children will:
  - Use a design process to define and solve a problem.
  - Construct an argument using evidence to support a claim.

- Unit 1: Engineering Design Process

  Leveled Readers Teacher's Guide

  Topic 2: Technology and Our World

  The Leveled Readers Teachers Guide provides teaching strategies and support (as well as reproducible English and Spanish worksheets) for the Unit 1 readers "How Do Engineers Solve Problems?" and "Ben's Engineering Project." On-Level and Extra-Support worksheets focus on vocabulary development, while Enrichment worksheets reinforce and enrich content.

- Unit 1: Engineering Design Process

  Unit Project Worksheet

  Engineering Design Process: Unit Project: Runaway Wagon

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- Unit 1: Engineering Design Process

  Leveled Readers - Blue

  On-Level: How Do Engineers Solve Problems?

  The leveled reader "How Do Engineers Solve Problems?" is designed for on-level readers and can be used to enrich key concepts from the unit "Engineering Design Process."

- Unit 1: Engineering Design Process

  Student Edition

  Engineering Design Process: Unit Review

  The Unit Review assesses student understanding of key ideas and concepts from the unit "Engineering Design Process."

- Unit 1: Engineering Design Process

  Unit Performance Task Worksheet

  Engineering Design Process: Unit Performance Task: Engineer It - Build a Water Bottle Holder (Editable)

  This is the editable Unit Performance Task worksheet for "Engineer It - Build a Water Bottle Holder." During this task, children will define a problem to solve and develop possible solutions that take into account the structure and function of their water bottle holder.

- Unit 1: Engineering Design Process

  Leveled Readers - Red

  Extra-Support: How Do Engineers Solve Problems?

  The leveled reader "How Do Engineers Solve Problems?" is designed for below-level readers and can be used to reinforce key concepts from the unit "Engineering Design Process."

- Unit 1: Engineering Design Process

Teacher Edition

Engineering Design Process: Unit Review

The Unit Review assesses student understanding of key ideas and concepts from the unit "Engineering Design Process."

Integration Career Exploration, Life Literacies and Key Skills

Students will explore Engineering by learning how engineers solve problems.

	Different types of jobs require different knowledge and skills.
9.1.2.CAP.1	Make a list of different types of jobs and describe the skills associated with each job.
9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
CAEP.9.2.4.A.1	Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
CAEP.9.2.4.A.3	Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
CAEP.9.2.4.A.4	Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

Technology and Design Integration

Students will interact with the SmartBoard, Ipads, chromebooks, and document camera.

TECH.8.1.2	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.2.A.CS1	Understand and use technology systems.
TECH.8.1.2.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.2.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.2.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.2.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
TECH.8.2.2.D.1	Collaborate and apply a design process to solve a simple problem from everyday experiences.
TECH.8.2.2.D.CS1	Apply the design process.

Interdisciplinary Connections

LA.RI.2	Reading Informational Text
LA.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.
LA.RI.2.2	Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.
LA.RI.2.3	Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
LA.RI.2.4	Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.
LA.RI.2.5	Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.
LA.RI.2.6	Identify the main purpose of a text, including what the author wants to answer, explain, or describe.
LA.RI.2.7	Explain how specific illustrations and images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
LA.RI.2.8	Describe and identify the logical connections of how reasons support specific points the author makes in a text.
LA.RI.2.9	Compare and contrast the most important points presented by two texts on the same topic.
LA.RI.2.10	Read and comprehend informational texts, including history/social studies, science, and technical texts, at grade level text complexity proficiently with scaffolding as needed.

Differentiation

- Understand that gifted students, just like all students, come to school to learn and be challenged.
- Pre-assess your students. Find out their areas of strength as well as those areas you may need to

address before students move on.
- Consider grouping gifted students together for at least part of the school day.
- Plan for differentiation. Consider pre-assessments, extension activities, and compacting the curriculum.
- Use phrases like "You've shown you don't need more practice" or "You need more practice" instead of words like "qualify" or "eligible" when referring to extension work.
- Encourage high-ability students to take on challenges. Because they're often used to getting good grades, gifted students may be risk averse.

- **Definitions of Differentiation Components**:

    - Content – the specific information that is to be taught in the lesson/unit/course of instruction.
    - Process – how the student will acquire the content information.
    - Product – how the student will demonstrate understanding of the content.
    - Learning Environment – the environment where learning is taking place including physical location and/or student grouping

Differentiation occurring in this unit:

See differentiation strategies suggested in the teacher's manual for struggling or advianced students.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

IEP and 504 plans will be utilized.

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

DRA

Additional Benchmarks used in this unit:

DRA

AIMSweb

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

Formative Assessments used in this unit:

- Teacher observation
- Questioning
- Whiteboard Response
- Think-Pair Share
- Classroom discussion
- Workbook pages
- Writing/Performance rubrics included in lesson

Pretest

Summative Assessments

summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

Unit Test

Performance Task

Instructional Materials

HMH Science Dimensions teaching materials

Various hands on materials for labs

Leveled Readers

Student workbook

Standards

ED	Engineering Design
	Engineering design is a creative process for meeting human needs or wants that can result in multiple solutions.
8.2.2.ED.1	Communicate the function of a product or device.
8.2.2.ED.2	Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.
8.2.2.ED.3	Select and use appropriate tools and materials to build a product using the design process.
8.2.2.ED.4	Identify constraints and their role in the engineering design process.