Unit 1: Engineering and Technology (Engineering Design)

Content Area: **Science**
Course(s): **Science Gr 1**
Time Period: **SeptOct**
Length: **30 Days**
Status: **Published**

Title Section

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Science: Grade 1

Unit 1: Engineering and Technology

Belleville Board of Education

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Board Approved: September 23, 2019

Unit Overview

In this unit, children will...

- define and identify problems
- define and identify examples of technology
- describe how people understand problems and use technology to solve problems
- explore and apply a design process

Enduring Understanding

- Students will build two solutions and analyze data to determine which materials will keep a model house from blowing down.
- students will be able to use what they have learned to define a problem, gather information about it, and build something to solve the problem.
- students will be able to develop and test simple models to solve problems through a design process, and comunicate those solutions.

Essential Questions

Essential Questions for Unit 1 Project:

Students can be prepared for their Unit 1 Project by asking the following questions:

- What are some ways to keep an object in place?
- How can examining the way one object is made help to solve a different problem?
- What evidence can be collected to show a problem has been solved?

Essential Questions:

- How do engineers use technology?
- What is an engineer?
- What is technology?
- How can we solve a problem?
- What is Mia's problem? How can you understand the problem to solve it?
- How would you design a leash to solve the problem of a dog pulling during a walk?

Exit Skills

By the end of Grade 1, Science Unit 1, the students should be able to:

- effectively communicate what the problem is
- explain what steps need to be taken to determine how to solve the problem
- name the steps in a design process
- write how they use the steps to develop a solution to the problem

New Jersey Student Learning Standards (NJSLS-S) & NGSS

SEP - Asking Questions and Defining Problems

SEP - Analyzing and Interpreting Data

SEP - Developing and Using Models

DCI - Defining and Delimiting Engineering Problems

DCI - Developing Possible Solutions

DCI - Optimizing the Design Solution

CCC - Structure and Function

NextGen Science Standards

SCI.K-2.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.
SCI.K-2.K-2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
SCI.K-2.K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Interdisciplinary Connections

Do the Math! pp. 10, 26

Lesson 1:

Connections to Math

1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Connections to English Language Arts

W.1.8 With guidance and support from adults, recall information from experiences or gather information

from provided sources to answer a question.

Lesson 2:

Connections to Math

1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each...

Connections to English Language Arts

W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.

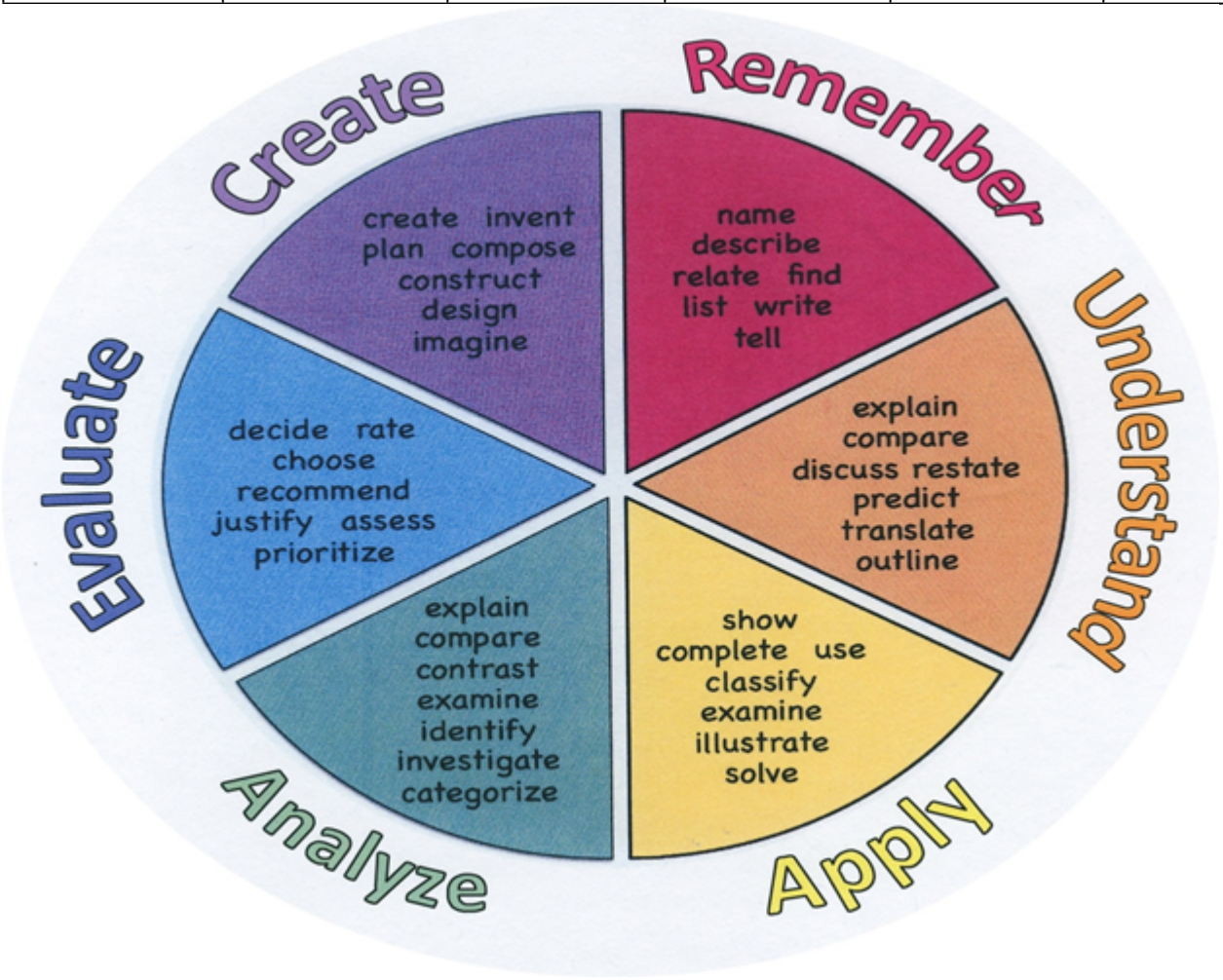
Learning Objectives

- SWDAT explore how engineers make and use technology to solve problems
- SWDAT to develop and test simple models to solve problems through a design process
- SWDAT effectively communicate those possible solutions

- SWDAT work collaboratively to define a problem, gather information about it, and build something to solve the problem
- SWDAT make observations, ask questions, and follow a design process to develop solutions in order to prevent a cat from scratching the furniture

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate

Recall Recognize Repeat Reproduce	Select Show Summarize Tell Translate Associate Compute Convert Discuss Estimate Extrapolate Generalize Predict	Complete Compute Discover Divide Examine Graph Interpolate Manipulate Modify Operate Subtract	Outline Point out Separate		Prescribe Propose Reconstruct Revise Rewrite Transform



Suggested Activities & Best Practices

Vocabulary Game- Guess the Word

Hands-On Activities: Solve the Headphones Problem & Protect the Legs!

Interactive Activity: Marshmallow Launcher

Unit Project

Take It Further

- Transportation Timeline
- Solve a Paw-blem

Assessment Evidence - Checking for Understanding (CFU)

- Admit Tickets
- Anticipation Guide
- Create a Multimedia Poster
- DBQ's
- Describe
- Design
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- HMH End-of-Year Test (Benchmark)
- HMH Mid-Year Test (Benchmark)
- HMH Performance-based Assessment (Alternative)
- Journals
- KWL Chart

- Learning Center Activities
- Multimedia Reports
- Outline
- Question Stems
- Quizzes (Formative)
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests (Summative)
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

HMH Science Dimensions: Teacher Edition, Student workbooks, online resources

HMH Equipment & Safety Kits

HMH Science Dimensions S&E Leveled Readers

- On Level: How Do You Investigate? How Do Engineers Solve Problems?
- Extra Support: How Do You Investigate? How Do Engineers Solve Problems?
- Enrichment: Making a Car Go Faster; Design a Home for a Pet

Ancillary Resources

https://ngss-assessment.portal.concord.org/

Technology Infusion

HMH Science Dimensions "Explore online" sections embedded throughout online teacher/student edition to extend student learning

HMH Science Dimensions "Can you explain/solve it?" videos embedded throughout online teacher/student edition

Computer-based assessments

Alignment to 21st Century Skills & Technology

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to

apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Media Literacy

21st Century Skills

- Civic Literacy
- Environmental Literacy
- Global Awareness

Differentiation

Leveled Readers (On Level, Extra Support, Enrichment)

Reinforce Vocabulary- To help students remember the vocabulary word, have them take turns mimicking a partner's behavior and use the word in a sentence. Remind students to look for the highlighted word as they proceed through the lesson.

RTI/ Extra Support- Supply students with materials for hands-on discovery.

Extension- Students who want to find out more can do research on a topic from the text

ELL- Point out labels, pictures, captions, and headings throughout the lesson. Discuss real-life connections to content, and provide hands-on examples of materials when possible.

(ELL support resources include a glossary in English and Leveled Readers in Spanish and English)

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Auditory presentations

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments

- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Varied journal prompts
- Varied supplemental materials

Special Education Learning (IEP's & 504's)

- Provide modifications dictated by the IEP/504 Plan
- Modify assessment format
- Check work frequently for understanding

- check work frequently for understanding
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- multi-sensory presentation
- Provide modifications as dictated in the student's IEP/504 plan
- secure attention before giving instruction/directions

English Language Learning (ELL)

- Provide study guides
- Allow students to correct errors (looking for understanding)

- Allowing productions (projects, models, timelines, demonstrations, charts, etc.) to demonstrate student's learning

- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- decreasing the amount of workpresented or required

At Risk

- Tutoring by peers
- Using videos, illustrations, pictures, and drawings to explain or clarify
- Decreasing the amount of work represented or required

- teaching key aspects of a topic. Eliminate nonessential information
- decreasing the amount of workpresented or required
- tutoring by peers

Talented and Gifted Learning (T&G)

- Advanced problem-solving
- Higher order, critical and creative thinking skills, and discovery
- Utilize project based learning for a greater depth of knowledge

- Allow students to work at a faster pace
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Unit Name: Unit 1: Engineering and Technology

NJSLS: ETS-1, ETS-2, ETS-3

Interdisciplinary Connection: Math, ELA

Statement of Objective: SWDAT describe how people understand problems and make technology

Anticipatory Set/Do Now: Define/Review vocabulary

Learning Activity: 1. Read lesson 1: How Do Engineers Use Technology? or play the lesson on the hmhco.com/one website and answer questions throughout the text

2. Complete Lesson 1 Lesson Check together or in groups

3. Complete Lesson 1 Self Check independently

Student Assessment/CFU's: Lesson 1 Check, Lesson 1 Self Check, teacher observation, evidence notebook

Materials: Lesson video, SMART TV and/or SMART Board, chromebooks, evidence notebooks (online or hard copy notebook)

21st Century Themes and Skills: Communication and Collaboration; Information Literacy

Differentiation/Modifications: repeat directions, small group instruction, extra time, eliminate questions

Integration of Technology: hmhco.com unit 1, lesson 1 resources