MP4b-Engineering Design

Content Area: **Science**
Course(s): **Science 5**
Time Period: **Marking Period 4**
Length: **MP 4**
Status: **Published**

Essential Questions

- What is science? How does technology affect our lives?
- What do you already know about the engineering design process?
- What do you already know about human impacts on Earth Systems?

Big Ideas

- Even though students have grown up surrounded by high-tech gadgets, they may not be aware of the connection between technology and science.
- Science is the study of the natural world to understand how it functions.
- Technology changes or modifies the natural world to meet human needs or solve problems. Advances in technology contribute to advances in science.

Science and Society

Charles Babbage

Originated the idea of programmable computer

Karl Benz

Internal combustible engine for automobiles

CSDT Technology Integration

8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.

Activity:

Students will work in teams to examine the design and function of a whirlygig. They will then create a new whirlygig product using the design process to change the speed and or spin of the tool. After students are able

to modify the whirlygig they will work together to solve the problem of impact force on a “spaceship” trying to land safely on Earth. Students will need to use the knowledge and problem solving skills they acquired on the whirlygig project to design, build, and evaluate their landing systems. Groups will measure their designs success by dropping the landers from different heights. Results will be gathered and entered into a spreadsheet. Students will use the data collected to create graphs and analyze initial results and then redesign landers based on analysis results.

Enduring Understandings

Engineering Design

3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Student Learning Standards

ELA/Literacy

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS-2)

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3-5-ETS-2)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS-2)

W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1),(3-5-ETS1-3)

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1),(3-5-ETS1-3)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1),(3-5-ETS1-3)

Mathematics

MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

MP.4 Model with mathematics. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

MP.5 Use appropriate tools strategically. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1),(3-5-ETS1-2)

Focus Areas

Knowledge

- Students define a problem using criteria for success and constraints or limits of solutions.
- Students research and consider multiple possible solutions to a given problem.
- Generating and testing solutions also becomes more rigorous as the students learn to optimize solutions by revising them several times to obtain the best possible design.

Skills

- Plan and create an investigation
- Design a model
- Test model
- Develop a presentation
- Communicate findings

Understanding

- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.

Climate Change

3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

- Activity: Students will generate multiple solutions to a given problem, evaluate each solution based on specified criteria and constraints, and compare them to determine the most effective solution.

3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

- Activity: Students will work in small groups and be assigned a model or prototype to work with. Students will inspect their assigned model/prototype and discuss potential areas for improvement based

on initial observations. Students will identify the variables that need to be controlled during testing and discuss how changing one variable at a time helps in isolating the effects. Students will carry out their planned tests. Students will note any instances where the model/prototype did not perform as expected or failed during testing. Students will analyze their data and present their findings.

Resources

Primary Resource

- Designs and Function p. 361-386

Scientific Inquiry

Core

- How can you make a paper helicopter drop slowly? p. 54
- How much weight can a model arm support? p.398-403