Unit Planner: Unit 1: Engineering Design/Nature of Science
Science 4

Monday, August 1, 2020

*Archdiocesan Essential Curriculum > 2020-2021 > Grade 4 > Science > Science 4 (**BP**) > Week 1 - Week 37

Unit 1: Engineering Design/Nature of Science

Stage 1: Desired Results

General Information

Introduce and build a scientific classroom within the first three weeks by exposing children to the design process and the scientific method through hands-on experiences. Teaching lab safety processes ensures safe practices throughout the year and ensures proper identification and usage of lab equipment.

The Engineering Design and Nature of Science unit should be implemented within each unit throughout the course of the entire year.

Essential Question(s)

- How can you solve a problem using the engineering design process?
- How can you use science to understand the world around you?

Enduring Understandings and Knowledge

Students will know:

Engineering Design Process

- The process of engineering is used to solve problems.
- Possible solutions are limited by constraints.
- Methods to test the quality of designs much show how well the product meets criteria under multiple conditions.
- Methods to test the quality of designs strategically identify failure points in order to improve.
- Background research is vital to the planning process.
- Engineering is a collaborative process that is strengthened when multiple ideas are considered.

Science Processes

- Scientific processes can be used to answer questions and learn about how natural events occur.
- Appropriate methods, tools, and technologies, must be used accurately to answer questions.
- Answers to questions should be supported by evidence.
- Science questions can be answered by recognizing patterns in observations.
- Evidence shows that there are consistent patterns in natural systems.

Skills

Students will be able to:

Applying the Engineering Design Process:

1. **Ask**: define the problem and understand criteria and constraints
2. **Imagine:** brainstorm possible solutions
3. **Plan:** research, collaborate, and design a solution using drawings of physical models
4. **Create:** the plan is followed to create a product. Design a way to test the product to check success.
5. **Improve:** use data to evaluate design choices and compare different designs to make improvements.
6. **Collaborate:** share data on design.

Applying Science Processes:

1. Make observations
2. Ask a testable question
3. Form a possible answer (hypothesis)
4. Follow a model and conduct an investigation, using necessary methods, tools, and techniques.
5. Collect and record data, making accurate measurements.
6. Organize the data using graphs, drawings, sketches, and diagrams
7. Use evidence from data to look for patterns and answer the question related to the hypothesis.
8. Analyze the results in the conclusion to provide justification of the experiment.

- Knowledge of patterns in natural systems can be applied to make predictions.
- Science explanations can change based on new evidence.

Connections to Catholic Identity / Other Subjects

Religion

- How do we use God's gifts/resources in a responsible, yet effective manner?
- The foundation of the Catholic faith helps to relate science innovations to morals and responsibilities faced as stewards of God's world and His people.

Math

- Graphing skills, reading a graph, data analysis

ELA

- Summarizing, writing detailed observations, following directions/procedures
- Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.
- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others ideas and expressing their own clearly.

Vocabulary

Engineering:

- engineer
- criteria
- constraints
- solution
- technology
- tool
- process
- brainstorm
- model
- observation
- test
- data
- evaluate
- improve

Science:

- observation
- inference
- hypothesis
- test
- procedure
- data
- evidence
- analyze
- pattern
- variable
- conclusion

Standards & Frameworks Addressed

NGSS: Science Performance Expectations (2013)
NGSS: Grade 4

3-5.Engineering Design
Performance Expectations

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.

Teaching Ideas/Resources

- *Content Area Expert Resources*