Northern York County School District

Curriculum Overview

Course: 3rd Grade Discovery	
Grade Level: 3	
Development/Revision Date:	**Length of Time:** 30 Days

Course Description:

This course provides an in-depth exploration of the engineering design process, focusing on developing and evaluating solutions to real-world problems. Students will engage in hands-on research and testing of potential solutions, identifying challenges in the design process and existing designs to discover opportunities for improvement. The course emphasizes critical thinking, communication, collaboration and problem-solving skills to determine the most effective design approach.

Key concepts include understanding the fundamental properties of matter and how these effect material selection for usage in designs. Students will learn that engineering design is both a systematic and creative process, essential for addressing and overcoming various challenges both technological and societal. This course is aligned to the Pennsylvania STEELS State Standards and the fifth grade STEELS PSSA (Pennsylvania System of School Assessment).

Course Objectives:

- Determine which tested solution best solves a problem
- Research and test possible solutions
- Identify failure points or challenges in designs, leading to opportunities for improvement
- Identify, evaluate, and compare multiple solutions to resolve problems
- Understand the fundamental concepts of matter and how it relates to the materials used during the design process
- Understand that engineering design is a systematic and creative process used to solve challenges

Related Standards:

Pennsylvania STEELS State Standards

- **3.5.3-5.DD** Demonstrate how simple technologies are often combined to form more complex systems.
- **3.5.3-5.CC** Describe how a subsystem is a system that operates as a part of another larger system.
- **3.5.3-5.BB** Illustrate how, when parts of a system are missing, it may not work as planned.
- **3.5.3-5.Y** Identify the resources needed to get a technical job done, such as people, materials, capital, tools, machines, knowledge, energy, and time.
- **3.5.3-5.S** Illustrate that there are multiple approaches to design.
- **3.5.3-5.W** Describe the properties of different materials.
- **3.5.3-5.V** Interpret how good design improves the human condition.

- **3.5.3-5.K** Judge technologies to determine the best one to use to complete a given task or meet a need.
- **3.5.3-5.L** Demonstrate how tools and machines extend human capabilities, such as holding, lifting, carrying, fastening, separating, and computing.
- **3.5.3-5.D** Predict how certain aspects of their daily lives would be different without given technologies.
- **3.5.3-5.M** Demonstrate essential skills of the engineering design process.
- **3.5.3-5.I** Design solutions by safely using tools, materials, and skills.
- **3.5.3-5.R** Apply tools, techniques, and materials in a safe manner as part of the design process.
- **3.5.3-5.P** Evaluate the strengths and weaknesses of existing design solutions, including their own solutions.
- **3.5.3-5.C** Can follow directions to complete a technological task.
- **3.5.3-5.A** Can use appropriate symbols, numbers and words to communicate key ideas about technological products and systems.
- **3.5.3-5.U** Can evaluate designs based on criteria, constraints, and standards.

Units:

- Computer Science Essentials
- Engineering Design Process
- Engineering Practices

Concepts:

- INTEGRATION OF KNOWLEDGE, TECHNOLOGIES, AND PRACTICES - Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.
- CORE CONCEPTS OF TECHNOLOGY AND ENGINEERING - Effective problem-solving in engineering and technology involves researching before designing, testing solutions under various conditions, considering material constraints, and refining designs through collaboration and failure analysis to best meet specified criteria.
- IMPACTS OF TECHNOLOGY - Historical examples of daily life before modern technologies such as airplanes, computers, modern agriculture, sanitation, and so on will provide opportunities to consider how their lives have been impacted by technology.
- NATURE AND CHARACTERISTICS OF TECHNOLOGY AND ENGINEERING - People use appropriate tools and skills to help them do their work as well as use resources to make things they use every day.

Competencies:

- Demonstrates connections between human-designed products and their real-world applications.
- Identifies and utilizes appropriate resources to address technological inquiries.
- Adopts emerging technologies and formulates strategies to enhance current concepts.
- Analyzes and articulates ethical considerations and trade-offs in technology-related decisions.
- Refines written and verbal communication skills for clear and effective conveyance of ideas.
- Engages in iterative experimentation to enhance and optimize designs.
- Practices safe and effective use of tools, materials, and processes suited to developmental stages for project construction.
- Proactively explores new technologies and devises strategies for the improvement of existing solutions.

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- APPLICATION, MAINTENANCE, AND ASSESSMENT TECHNOLOGICAL PRODUCTS AND SYSTEMS - Effective design requires researching the problem, testing solutions under various conditions, and collaborating with peers to improve ideas.

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Learning Activities:

- Asking questions and defining problems
- Plan and carry out investigations
- Engage in argument from evidence
- Developing and using models
- Analyze and interpret data
- Construct explanations and design solutions
- Obtain, evaluate, and communicate information
- Use math and computational thinking

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Performance Tasks:

- Formative assessments such as student discussion, questioning, peer collaborative activities, reflections, and projects.

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Other Assessment Measures:

- SeeSaw portfolio

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Textbook/Primary Resource:
Engineering is Elementary. (2024). *Engineering is elementary (2nd ed.)*. Youth Engineering Solutions

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Supplemental Resource Materials:

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