SCHOOL DISTRICT OF THE CHATHAMS

Design & Technology
Grade 2
Full Year

Course Overview

The essential intent of the School District of the Chathams' Design & Technology program is to empower students to think critically and creatively to develop innovative solutions to problems present in our modern world. Our Design & Technology program is a nationally award winning and comprehensive program that enables our students to engage in authentic problem solving, collaboration, innovation, and critical thinking, while developing creativity and perseverance. Students gain proficiency in the application of relevant grade 2 mathematics, science, technology, and engineering concepts while engaging in the development of solutions to problems through hands-on, collaborative, project-based learning utilizing the Engineering Design and Design Thinking Processes.

New Jersey Student Learning Standards
The New Jersey Student Learning Standards (NJSLS) can be located at www.nj.gov/education/cccs/2020/.

Engineering Design
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.

Interaction of Technology & Humans
8.2.2.ITH.1: Identify products that are designed to meet human wants or needs.
8.2.2.ITH.2: Explain the purpose of a product and its value.
8.2.2.ITH.3: Identify how technology impacts or improves life.
8.2.2.ITH.4: Identify how various tools reduce work and improve daily tasks.
8.2.2.ITH.5: Design a solution to a problem affecting the community in a collaborative team and explain the intended impact of the solution.

Nature of Technology
8.2.2.NT.2: Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem.

Effects of Technology on the Natural World
8.2.2.ETW.1: Classify products as resulting from nature or produced as a result of technology.
8.2.2.ETW.2: Identify the natural resources needed to create a product.
8.2.2.EC.1: Identify and compare technology used in different schools, communities, regions, and parts of the world.

Technology Standards

9.4.2.TL.1: Identify the basic features of a digital tool and explain the purpose of the tool.
9.4.2.TL.2: Create a document using a word processing application.
9.4.2.TL.3: Enter information into a spreadsheet and sort the information.
9.4.2.TL.4: Navigate a virtual space to build context and describe the visual content.
9.4.2.TL.5: Describe the difference between real and virtual experiences.
9.4.2.TL.6: Illustrate and communicate ideas and stories using multiple digital tools
9.2.2.TL.7: Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts.

21st Century Integration | NJSLS 9

Creativity and Innovation
9.4.2.CI.1: Demonstrate openness to new ideas and perspectives.
9.4.2.CI.2: Demonstrates originality and inventiveness in work.

Critical Thinking and Problem-Solving
9.4.2.CT.1: Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem.
9.4.2.CT.2: Identify possible approaches and resources to execute a plan.
9.4.2.CT.3: Uses a variety of types of thinking to solve problems (e.g., inductive, deductive)

Career Ready Practices
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

Comprehensive Health & Physical Education
- 2.1.2.EH.2: Identify what it means to be responsible and list personal responsibilities.
- 2.1.2.EH.3: Demonstrate self-control in a variety of settings (e.g., in the classroom, on the playground and in an assembly).
- 2.1.2.EH.4: Demonstrate strategies for managing one's own emotions, thoughts and behaviors.
- 2.1.2.EH.5: Explain healthy ways of coping with stressful situations.
- 2.1.2.SSH.7: Explain healthy ways for friends to express feelings for and to one another.
- 2.1.2.SSH.8: Demonstrate healthy ways to respond to disagreements or conflicts with others (e.g., leave, talk to trusted adults, tell a sibling or peer).
- 2.1.2.CHSS.5: Identify situations that might result in individuals feeling sad, angry, frustrated, or scared.
- 2.1.2.CHSS.6: Identify individuals who can assist with expressing one's feelings (e.g., family members, teachers, counselors, medical professionals).
- 2.2.2.MSC.4: Adjust and correct movements and skill in response to feedback.
- 2.2.2.MSC.6: Execute appropriate behaviors and etiquette while participating in and viewing activities, games, sports, and other events contributes to a safe environment.
- 2.2.2.MSC.7: Demonstrate kindness towards self and others during physical activity to create a caring environment.

Revision Date: October 2021

- 2.2.2.PF.4: Demonstrate strategies and skills that enable team and group members to achieve goals.
- 2.3.2.PS.1: Demonstrate personal habits and behaviors that contribute to keeping oneself and others healthy and the environment clean and safe.
- 2.3.2.PS.3: Recognize and demonstrate safety strategies to prevent injuries at home, school, in the community.

<u>Science</u>
- 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.
- 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.
- 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.
- 2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties
- 2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

<u>English Language Arts</u>
- NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- 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.
- RI.2.8 Describe how reasons support specific points the author makes in a text.
- W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

Units of Study

Unit 1: Properties of Matter *(~10 days)*
- How and why do engineers design?
- What is the process like that engineers engage in design and problem solving?
- Why is it important to do problem solving tasks?
- How can I use each step of the engineering design process to help me to solve a problem?
- What factors should we consider when developing solutions to problems?
- Why is it important to work collaboratively with others in the design of solutions to problems?
- How do materials affect design?
- How do I share solutions and ideas with others?

Unit 2: Density & Buoyancy *(~15 days)*
- How can I use each step of the engineering design process to help me to solve a problem?
- What factors should we consider when developing solutions to problems?
- Why is it important to work collaboratively with others in the design of solutions to problems?
- How do materials affect design?

Revision Date: *October 2021*

- How do I share solutions and ideas with others?

Unit 3: Seed Dispersal *(~15 days)*
- How do seeds travel?
- How does structure affect function?
- How do living things depend on each other in their habitats?
- Why is it important for seeds to travel?
- How do engineers use their observations of natural design to help them create new technologies?

Learning Objectives/Discipline Standards of Practice

<u>Learning Objectives:</u>
- Define matter and identify the three types of matter.
- Apply the engineering design process to solve a problem.
- Analyze a text and identify main points and relevant details of the problem that will guide their possible solution.
- Define specifications and constraints.
- Conduct an experiment to investigate the properties of different solids.
- Collaborate with peers to develop a plan for one design.
- Communicate ideas to peers.
- Create a solution to solve a problem.
- Improve their designs based on observations during testing.
- Evaluate the effectiveness of a design.
- Analyze results to figure out how materials affect design.
- Utilize text boxes, graphics, and word art in a word processing setting.
- Design an ad on Google Slides.
- Choose their materials based on their investigation results.
- Compare and contrast materials based on their properties.
- Conduct an experiment to investigate the properties of different solids.
- Explain why some objects float and some do not.
- Identify conditions under which an object can float.
- Explain how and why seeds travel.
- Define structure and function, as well as how structure affects function.
- Explain codependency in nature.
- Use their observations of natural design to help them create new technologies.
- Design a way for a seed to be dispersed.

<u>Discipline Standards of Practice</u>:
- Computing Systems
  - People interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form.
- Networks and the Internet
  - Computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world.
- Impacts of Computing

Revision Date: October 2021

- ○ Computing affects many aspects of the world in both positive and negative ways at local, national, and global levels. Individuals and communities influence computing through their behaviors and cultural and social interactions, and, in turn, computing influences new cultural practices.
- Data & Analysis
  - ○ Computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions.
- Algorithms & Programming
  - ○ An algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are translated into programs, or code, to provide instructions for computing devices. Algorithms and programming control all computing systems, empowering people to communicate with the world in new ways and solve compelling problems.
- Engineering Design
  - ○ People design for enjoyment and to solve problems, extend human capabilities, satisfy needs and wants, and improve the human condition. Engineering Design, a systematic approach to creating solutions to technological problems and finding ways to meet people's needs and desires, allows for the effective and efficient development of products and systems.
- Interaction of Technology and Humans
  - ○ Societies influence technological development. Societies are characterized by common elements such as shared values, differentiated roles, and cultural norms, as well as by entities such as community institutions, organizations, and businesses. Interaction of Technology and Humans concerns the ways society drives the improvement and creation of new technologies, and how technologies both serve and change society.
- Nature of Technology
  - ○ Human population, patterns and movement focus on the size, composition, distribution, and movement of human populations and how they are fundamental and active features on Earth's surface. This includes understanding that the expansion and redistribution of the human population affects patterns of settlement, environmental changes, and resource use. Patterns and movements of population also relate to physical phenomena including climate variability, landforms, and locations of various natural hazards and their effects on population size, composition, and distribution.
- Effects of Technology on the Natural World
  - ○ Many of engineering and technology's impacts on society and the environment are widely regarded as desirable. However, other impacts are regarded as less desirable. Effects of Technology on the Natural World concerns the positive and negative ways that technologies affect the natural world.
- Ethics & Culture
  - ○ Ethics and Culture concerns the profound effects that technologies have on people, how those effects can widen or narrow disparities, and the responsibility that people have for the societal consequences of their technological decisions.

Instructional Resources and Materials

Revision Date: October 2021

Resources
- ITEEA's Engineering byDesign™ Program
- Engineering is Elementary (Museum of Science, Boston)
- Google Apps for Littles by Christine Pinto & Alice Keeler
- Headphones *
- STEM folders and notebooks *
- The Three Little Pigs (book)
- Lesson Resources: *
  - 4th Piggy Material Investigation
  - 4th Piggy Advertisement Planning Sheet
  - Sink or Float Boats Challenge Introduction
  - Sink or Float Material Investigation
  - Sink or Float Boats Material List
  - Sally the Seed Biomimicry Design Challenge
  - Sally the Seed Material List
  - Seed Dispersal Research Worksheet

Materials
- Hair dryer
- Small, portable fans
- Tub of water for research
- Coins *(preferably pennies)* for testing designs
- Tennis ball
- Building/Modeling Materials: *
  - Masking Tape
  - Scissors
  - Construction Paper
  - Craft Sticks
  - Pipe Cleaners
  - Aluminum Foil
  - Plastic bags (big and small)
  - Straws
  - Spoons
  - Paper Clips
  - Brass Fasteners
  - Index Cards
  - Ruler
  - Math Manipulatives (Hundreds Blocks, Ten Rods, Ones pieces)

Assessment Strategies

Revision Date: October 2021

> *Assessment is designed to measure a student's mastery of a course standard and learning objective. Assessment can be used for both instructional purposes (formative assessment) and for evaluative purposes (summative assessment).*

The following is a general list of the many forms assessment may take in learning.
- Projects
- Unit Assessments

Course Specific Assessments Include:
- <u>Formative:</u>
    - Peer Feedback: TAG (Tell, Ask, Give) Sticky Notes
    - Peer Feedback Form
    - Self-Reflection: 2 Stars & 1 Wish
    - Design Challenge Self-Assessment
    - Critique Guide
    - Reflective Exit Tickets/Slips
    - Engineering Notebook Review/Student Work Samples
    - Class Discussions
    - Teacher Observations

- <u>Summative Assessment:</u>
    - Students are challenged to create an invention that mimics an adaptation of one of the types of wind dispersal seeds and travels at least 6" during the "Sally the Seed Design Challenge".
    - Students will apply the five steps of the engineering design process when solving the given problem and also utilizing research and technological skills.