

# SCHOOL DISTRICT OF THE CHATHAMS

## Design & Technology

Grade 1

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 1 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/](http://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.

#### 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.

#### 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.
- 2.2.2.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.
- 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.

#### **Science**

- 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.
- 1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
- 1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
- 1-LS1-3. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like their parents.

### Social Studies

- 6.1.2.CivicsPI.5: Describe how communities work to accomplish common tasks, establish responsibilities, and fulfill roles of authority
- 6.1.2.CivicsPD.1: Engage in discussions effectively by asking questions, considering facts, listening to the ideas of others, and sharing opinions.
- 6.1.2.CivicsPD.2: Establish a process for how individuals can effectively work together to make decisions.
- 6.1.2.CivicsPR.1: Determine what makes a good rule or law
- 6.1.2.CivicsPR.3: Analyze classroom rules and routines and describe how they are designed to benefit the common good.
- 6.1.2.CivicsPR.4: Explain how individuals can work together to make decisions in the classroom.
- 6.1.2.CivicsCM.2: Use examples from a variety of sources to describe how certain characteristics can help individuals collaborate and solve problems (e.g., open-mindedness, compassion, civility, persistence).

### Visual Arts

- 2.2.2.CR1a: Discover, share and express ideas for media artworks through experimentation, sketching and modeling.
- 2.2.2.CR1b: Brainstorm and improvise multiple ideas using a variety of tools, methods and materials.
- 2.2.2.P1c: Discover, experiment with, and demonstrate creative skills for media artworks.
- 2.2.2.CR1e: Choose ideas to create plans for media art production.
- 2.2.2.P1b: Identify, describe, and demonstrate basic creative skills, such as trial-and-error and playful practice, within media arts production.
- 2.5.2.CR1a: Engage in individual and collaborative exploration of materials and ideas through multiple approaches, from imaginative play to brainstorming, to solve art and design problems.
- 2.5.2.CR1b: Engage in individual and collaborative art making through observation and investigation of the world, and in response to personal interests and curiosity
- 2.5.2.CR3a: Through experimentation, build skills and knowledge of materials and tools through various approaches to art making.
- 2.5.2.CR3b: Demonstrate safe procedures for using and cleaning art tools, equipment and studio spaces.

<h2>Units of Study</h2>
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### Unit 1: The Design Process (~8 days)

- Why is it important to design, visualize objects, transform ideas into sketches, and use the design process to solve problems?

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- How does an engineer conduct research and generate new ideas?
- Why is failure inevitable and important for successful designs?
- What are the advantages and disadvantages of various computer applications?
- How are things made and how can they be improved?

#### Unit 2: The Nature of Design & Technology (~15 days)

- How do people develop ways to improve comfort, ease workloads, and increase leisure time?
- How can knowledge gained in one setting be applied in another?
- What are the basic features of a computer and digital devices and how can they be used for educational purposes?
- How can the Internet be used appropriately for educational purposes?
- What are the advantages and disadvantages of various computer applications?
- How do shapes and structure influence the design and function of bridges?

#### Unit 3: Animal Adaptations & Biomimicry (~16 days)

- How do people use creative or inventive thinking to adapt to the natural world to help meet human wants and needs?
- How do animals' adaptations help them survive in their respective environments?
- How have animal adaptations inspired technological invention?
- How do people use creative or inventive thinking to adapt to the natural world to help meet human wants and needs?
- How do animals' adaptations help them survive in their respective environments?
- How does structure (shape, size, etc.) impact the function of a tool?

<h3>Learning Objectives/Discipline Standards of Practice</h3>
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#### Learning Objectives:

- Identify the steps of the Engineering Design Process
- Tower Design Challenge:
  - Identify the problem that needs to be solved in words and pictures.
  - Sketch and label possible tower solutions
  - Choose a final solution to build
  - Work with a partner to build a tower
  - Test the tower
- Identify the basic features of a computer and explain how to use them effectively.
- Demonstrate the ability to navigate developmentally appropriate web tools.
- Describe how technology products are useful at school, home, and work.
- Identify the resources needed to create technological products or systems.
- Bridge Building Design Challenge:
  - identify types of bridges
  - choose a type of bridge to build
  - sketch possible solutions of the design
  - create a design plan for the bridge that includes a sketch, list of materials, and list of steps
  - collaborate with a partner to design and build the bridge model
- Explain how animals have different adaptations that help them survive in their environments.
- Identify ways that humans have created technologies modeled after animal adaptations.
- Biomimicry Design Challenge:
  - Make connections between animal adaptations and human made technology
  - Identify animal adaptations and explain their impact on society

- Bird Beak Design Challenge:
  - Apply the steps of the Engineering Design Process to solve a real-world problem.
  - Conduct research about bird beaks using a video.
  - Sketch possible solutions a bird beak design
  - Create a design plan for the bridge that includes a sketch, list of materials, and list of steps
  - Collaborate with a partner to design and build a beak

Discipline Standards of Practice:

- 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
  - 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**

*Whole class resources have been identified with an asterisk.*

#### **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 \*
- Lesson Resources: \*
  - Animal Adaptations Video
  - 21 Elephants and Still Standing by April Jones Prince
  - Yertle the Turtle by Dr. Seuss
  - Super Inventions
  - What makes bridges so strong? Video
  - Bridge Facts
  - Forces on bridges
  - Dyson Bridge Video

#### **Materials**

- Building/Modeling Materials: \*
  - Scissors
  - Masking Tape
  - Glue
  - Cotton balls
  - String
  - Pipe Cleaners
  - Cardboard
  - Construction Paper
  - Popsicle Sticks
  - Cups
  - Brass Fasteners
  - Packing Peanuts
  - Paper Clips
  - Plastic Forks
  - Plastic Spoons

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- Straws
- Binder Clips
- Clothespins
- Paper Towel Rolls
- Cubes and Blocks

### **Assessment Strategies**

*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:

- Formative/Feedback/Check-Ins:
  - 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
  - Check lists within packets at the Imagine and Plan Step
  - Students use the specifications for each project to assess their readiness to test
  - Engineering Notebook Review/Student Work Samples
  - Class Discussions
  - Teacher Observations
- Summative Design Challenges
  - Tower Design Challenge:
    - In this challenge, students learn about a problem that Sniffer the Puppy has, in which he wants to be king of all of the puppies. To help him solve this problem students need to help Sniffer build a tower to lift him at least 12 inches off the ground and stay elevated for at least 1 minute. Students use blocks and base ten blocks to build their towers.
  - Bridge Design Challenge:
    - In this challenge, students learn how the Brooklyn Bridge was tested with 21 elephants from the circus walking across it. They are then challenged to build a bridge that can sustain the weight of 21 blocks (to represent elephants). The bridge must hold that weight for at least 1 minute. They are able to use a variety of materials including popsicle sticks, straws, paper towel rolls, and tape.
  - Bird Beak Design Challenge:
    - Students do research about different types of bird beaks and how each type helps that bird eat a certain kind of food. They are then challenged to design a bird beak that can collect the most amount of food in 1 minute. The food is a mix of classroom materials that are made to represent differences between fish, seeds, nuts, bugs, etc.