G&T Grade 3 Unit 1: Electronic Circuits

Content Area: **Gifted & Talented**
Course(s):
Time Period: **MP1**
Length: **35 days**
Status: **Published**

NJSLS

8.1.5.CS.1	Model how computing devices connect to other components to form a system.
8.1.5.CS.2	Model how computer software and hardware work together as a system to accomplish tasks.
8.1.5.CS.3	Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.
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.
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.
4-PS3-2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
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.
8.1.5.DA.3	Organize and present collected data visually to communicate insights gained from different views of the data.
8.1.5.DA.5	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
8.2.5.ED.1	Explain the functions of a system and its subsystems.
8.2.5.ED.3	Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
8.2.5.NT.1	Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem.

Rationale and Transfer Goals

In collaborative groups, students will use electronic circuit boards and computer applications to conduct experiments on various items, like fruits, vegetables, tinfoil, pencil graphite and molding clay. The experimentation is to determine the conductive properties (or lack thereof) of these items. Students will determine why a material is conductive or not conductive and predict whether a material will or will not be conductive.

Simultaneous with experimentation and all associated work, students will use a multimedia template to document all processes on multiple projects with text and images.

Enduring Understandings

Electric current follows a path, (circuit) and students will learn how to create paths, interrupt paths, and what materials may constitute a good “path” (conductive) or not (insulator).

Using multimedia to record experiments leads to an understanding that learning via experimentation is a process that can be documented in order to reassess and improve methods and outcomes.

Computing devices may be connected to other devices to form a system as a way to extend their capabilities.

Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information).

Individuals can select, organize, and transform data into different visual representations and communicate insights gained from the data.

Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge.

Often, several design solutions exist, each better in some way than the others.

Technology innovation and improvement may be influenced by a variety of factors.

At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.

Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.

Essential Questions

How does electrical current travel? How can I create a path or interrupt a path?

What does conductive mean? How can I tell if an object or material is conductive?

Why is a material conductive?

What does insulator mean? How can I tell if an object or material is a good insulator?

Why is a material an insulator?

How can I change or improve processes to change or improve outcomes?

How can I document my experimentation and processes?

How can I arrange my images and texts to convey my ideas and outcomes?

Why is it important to collaborate and how can I make sure another's ideas are heard as well as my own?

What are good collaborative practices when working with others?

Content - What will students know?

- Electrical current follows a path
- Definition of Conductivity
- Definition of Constraint
- Definition of Insulator
- Definition of Invention
- Definition of Polarity
- Definition of Prototype
- Electrical current can be interrupted or redirected
- Multimedia can be used to document a long term process

Skills - What will students be able to do?

- Predict and then determine the conductivity of a material based on certain properties (for example) if it contains liquid or metal
- Work collaboratively in a group to plan and discuss implementing experiments
- Using research to determine properties of materials and experimentation ideas
- Document results using images and text in a multimedia application

Activities - How will we teach the content and skills?

- Introduction to "Makey" circuit boards
- Introduction to vocab words
- Introduction to and review of "apps" to use with Makey: Keyboard app, Bongo app
  Site: Blob Opera
- Students testing Makeys with items for conductivity: Bananas, Potatoes, Play Doh,
  Various items as requested by students
- Students construct "guitars" to test with apps using Makeys, cardboard, tinfoil
- Use of Makeys with directed graphite drawings, independent graphite drawings
- Concurrent with all Makey activities:
    - Slide template introduction for documentation of all Makey activities
    - Review of blank slide creation, use of camera to take pictures, general aesthetics of a slide show, proper grammar, spelling and punctuation

Evidence/Assessments - How will we know what students have learned?

- Daily observation of students' work
- Monitoring of slide templates
- Tests/Quizzes
- Participation in collaborative conversations in groups
- Checking on project progress

- Evaluation of final project

Key Resources

Electronic circuit board kit

Electronic circuit board websites and associated “apps”: keyboard, bongos, guitar

Chromebooks or other computing device

Google apps: Drive, Slides, Docs, Camera

Assorted items such as fruits, vegetables, tin foil, cardboard, molding clay

21st Century Life and Careers

9.2.5.CAP.4	Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

Career Readiness, Life Literacies, & Key Skills

9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).
9.4.5.CT.3	Describe how digital tools and technology may be used to solve problems.
9.4.5.IML.2	Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3).

Interdisciplinary Connections/Companion Standards

LA.RI.3.4	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.
LA.RI.3.7	Use information gained from text features (e.g., illustrations, maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
LA.W.3.4	With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing

	types are defined in standards 1–3 above.)
LA.W.3.6	With guidance and support from adults, use technology to produce and publish writing as well as to interact and collaborate with others.
LA.W.3.8	Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
LA.W.3.10	Write routinely over extended time frames (time for research, reflection, metacognition/self-correction and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
LA.SL.3.4	Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
LA.SL.3.5	Use multimedia to demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.
LA.SL.3.6	Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.