Light Show #1551

Summary	
Overview: Have you ever wondered how to make a light show by using directions (also known as code)? In this experiment students build a 3-LED circuit and then use an Arduino sketch to program a light show.	**Grade Level:** 5th - 12th grade **Group Size:** 2-3 Students **Pacing:** 45 minutes - 1 hour **Content Area:** Science → Computational Thinking → Coding and Engineering **Vocabulary:** ● LED ● Resistor ● Jumper Wires ● Arduino ● Sketch ● Code ● Cathode ● Anode
Materials: ● Computer, 1 per student group ● Sensor Kit, 1 per student group	
Pre-work: ● Make sure that all of the computers that the students will be using have the Chrome browser and the Ardusat Chrome Extension installed and the FTDI driver (see Step 3 of the Quickstart guide) ● Gather the supplies and have them ready for the students. You may wish for the students to retrieve the supplies from a special area of the room, or you may want to have the parts all divided up so that the students just have to grab a cup or container of supplies.	

Educator to Home Connection: *Copy and paste this text to email to parents about the experiment.*

Today we did an experiment that involved getting LED lights to blink. The students took a pre-written Arduino (ask your student what an Arduino is) Sketch (code block) and altered the code to program one LED to turn on and off. Once the students mastered changing the code, they made multiple LED lights blink on and off. Ask your student about the light show they created and how it was different from others in the classroom.

Instructional Tools	
Essential Question: Can you use an Arduino sketch to make your own LED light show?	**Learning Objective:** ● Students will wire a 3-LED circuit. ● Students will alter an Arduino sketch to create their own LED light show sequence.

Inquiry Guidelines:

1. *The instructor's role is to facilitate learning and to excite interest in students and the scientific method. Because of this, be mindful of wait time after you ask a question--your questions should be intended to spark deeper thought. Your questions are not intended to promote regurgitation of facts, rather they should be questions that get the students thinking and tying in past experiences to help formulate answers. All student's*

opinions should be respected and valued--show the students that taking a risk and making a prediction is okay. Show the students that your classroom is a safe place to make predictions and to prove them right or wrong.

2. *It is your responsibility to model scientific thinking and inquiry for the students--random, outloud self-questioning and hypothesizing like: "I wonder what would happen if I ______? I think _______will happen. What do you think? I'm going to try it!"*

3. *When the students ask questions that you don't have answers to, don't be afraid. Encourage them to test their questions and hypotheses, become collaborative learners with your students--your expertise should be used to help the students maximize their experience with the scientific method. You primary role is to show the students how to go from the "I wonder what would happen if _______" to actually formulating a scientific question, hypothesis and experiment that would test the "what if." When your students ask questions that you don't have the answers for, you should celebrate and collaborate!*

NGSS:
Elementary School

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.

Middle School

MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool or process such that an optimal design can be achieved.

High School

HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more

	manageable problems that can be solved through engineering.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.