Lesson Plan
Technology Applications
Introduction to Arduino
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Objectives: Students will be able to

- Describe the basic functioning of the Arduino microcontroller
- Describe the basic functioning of the Raspberry PI
- Construct a simple circuit using the Kuman Arduino Starter Kit (LED)
- Write a simple program using the Arduino interface (blink LED)
- Modify their program to display a pattern of their choosing

Standards: 2016 Massachusetts Science and Technology Engineering Standards:

- HS-ETS1-2. Break a complex real-world problem into smaller, more manageable problems that each can be solved using scientific and engineering principles.

- HS-ETS2-2(MA). Explain how computers and robots can be used at different stages of a manufacturing system, typically for jobs that are repetitive, very small, or very dangerous.

- HS-ETS3-2(MA). Use a model to explain how information transmitted via digital and analog signals travels through the following media: electrical wire, optical fiber, air, and space. Analyze a communication problem and determine the best mode of delivery for the communication(s).

Activator:

Students will spend some time examining and getting to know the Kuman Arduino Starter Kit. The teacher will guide the students in their exploration of the kit with the emphasis being learning by discovery.

Mini-Lesson:

Through a combination of lecture, demonstration, and interactive discussion, students will learn the following:

- What is a microcontroller and what is it used for?
- What is an Arduino?
- Different types of Arduinos (Uno, Mega, Nano)
- What is a Raspberry PI?
- How the Raspberry PI be used for programming the Arduino
- What is the Arduino IDE?
- How to setup the Arduino IDE
Student Engagement:

During the course of this lesson, students will do the following:

- **Setup the Raspberry PI**
  - Connect it to the keyboard, mouse, power adapter, and HDMI monitor
  - Install the operating system
  - Download the Arduino IDE

- **Create the simple LED circuit using the Kuman Arduino Starter Kit**
  - Students will need the breadboard, LED, 220k Ohm resistor, and 2 wires
  - Students will plug into the ground and pin 13 ports of the Arduino

- **Write the blink LED program in the Arduino IDE**
  - Students will be guided in writing the program
  - The teacher will point out programming syntax and conventions

- **Upload and run the program**
  - Students will learn about compiling, selecting the correct port, and uploading

Enrichment:

Once students have demonstrated that they are able to run the simple blink LED program, they will be encouraged to modify their programs on their own to make the LED blink a pattern of their choosing. By doing so, students will gain a deeper understanding of using basic loop functions and commands such as digitalWrite and delay.

Subsequent lesson plans will build on the student’s knowledge by including pushbuttons and the digitalRead command to allow students to learn how the Arduino can be used to take information from its environment, thus allowing us to interact with the Arduino.

Assessment:

In general, the main form of summative assessments in this course will be in the form of written bi-weekly quizzes addressing the learning standards of the units covered during that period. In addition, there will be major projects at the end of each term which will challenge the students to use their learning in a creative application of their choosing.