DT Challenge Year 7/8 Arduino – Sound

Module 1: Hello, Arduino!
https://groklearning.com/learn/aca-dt-78-ar-sound/1/0/

Previous: None
Next: Using Sensors

Key Concepts

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<th>Coverage</th>
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<td>Abstraction</td>
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<td>Data: collection, representation, interpretation</td>
<td>Representing data as integer and string</td>
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<td>Specification, algorithms, implementation</td>
<td>Simple Algorithms, user input</td>
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Digital Systems

Interactions | Interaction (input/output)

Impact |

Objectives (Content Descriptions)

| ACTDIP027 | Define and decompose real-world problems taking into account functional requirements and economic, environmental, social, technical and usability constraints. |
| ACTDIP030 | Implement and modify programs in a general-purpose programming language. |

What are we learning? (Abstract)

Embedded computing, involving microcontrollers (really small, cheap computers that perform a single function), are what run most pieces of technology today. Including your mouse, drill, remote control and car. This module introduces embedded programming through the Arduino Esplora. We learn how programs run, control flow, syntax or the Arduino language, and how we control different sensors and LEDs.

After the overview, this lesson goes through the control-flow of an Arduino, how the program gets converted to text on the screen to something actually running on the board.

We also learn how to write to the outputs on the board, in particular the RGB LED.
Module outline

Students are introduced to the concept of an embedded system, and how almost every interaction students have with technology is through embedded systems.

In the first activity, students learn how to write a simple program for the Arduino, through setting the LED. They learn how we set multiple colours, how the primary colours add together to form other colours, and how our eyes perceive colour.

The middle section focuses on syntax and how the Arduino system runs. We learn what a block of code is, and how to import code from a library. Students learn how to write notes in code through comments, and how the syntax of a programming language is important, just like natural languages.

In the final section, students are introduced to controlling the timing of embedded systems, and further explore how colours are made. They are led to think about how eyes see colour (additive), contrasted with how printers create colour (subtractive).

Guiding Question

How do we make a computer do exactly what we want?
How can we input and output information with a computer?
How are colours created?
How do we control the timing of devices?

Elements

Representations
Sequencing
User / Environmental Input
Output
Timing
Colour
Purpose/Hook - Embedded devices are everywhere!

Video:
Make: Introduction to Arduino: [https://www.youtube.com/watch?v=CqrQmQqpHXc](https://www.youtube.com/watch?v=CqrQmQqpHXc)

This video is quite well-produced about the Arduino environment and gives people an idea of what kind of projects are possible with the Arduino. Since electronic devices are permeating a large portion of our lives, there are infinite possibilities of things that we can make to interact with specific devices, or create something to improve our daily lives.

Students should be guided through a class discussion on where embedded devices are used every day, as well as what kinds of needs they have that could be solved using an embedded device.

Discussion:
Where are these microcontrollers used in our everyday lives? What objects in the classroom would use one? What kind of things would students like to make with the Arduino?
Examples include:
- Detect when an object is close to you: [http://www.instructables.com/id/Arduino-Distance-Detector-with-a-Buzzer-and-LEDs/](http://www.instructables.com/id/Arduino-Distance-Detector-with-a-Buzzer-and-LEDs/)
- Robot ESKY: [https://www.hackster.io/hackerhouse/make-an-autonomous-follow-me-cooler-7ca8bc](https://www.hackster.io/hackerhouse/make-an-autonomous-follow-me-cooler-7ca8bc)

Structure of the lesson:

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Lesson Components:

Why do we need to learn programming?

Discussion: As described above

Step 1: Getting Started

Plugged Activity
In the first activity, students write set the colour of the LED, and are introduced to how the Arduino system runs

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Step 2: Arduino Syntax

Plugged Activity
In this activity, students learn how syntax is important and how common errors occur

Start at Module 1, slide 4
https://groklearning.com/learn/aca-dt-78-ar-sound/1/7/

Step 3: Arduino Functions

Plugged Activity
In this activity, students are introduced to controlling the timing of the Arduino system, and performing multiple operations in the one program

Start at module 1, slide 8
https://groklearning.com/learn/aca-dt-78-ar-sound/1/11/

Review:

Variables are encountered everywhere

Group Activity
What kind of things can we control with the Arduino? Is it just blinking lights?

Discuss how the Arduino Esplora is different to a regular Arduino. The Esplora is purpose-built with lots of the sensors wired in already, but has limited scope to attach external inputs and output (the 4 IO tabs on the top can achieve this).

Why we're using the Arduino Esplora instead of a regular Arduino? The Esplora doesn't require any additional components, so we can access sensors and get a genuine idea of what it's like to interface with additional components without the need to do any electronics. We're learning the programming of electronics, without the need for wiring.
Resources and Links

Printables

Digital Resources
Make: Introduction to Arduino: https://www.youtube.com/watch?v=CqrQmQqpHXc

Feedback Link: ★★★★★