Elementary Computer Science

6 wk lesson plan

1/12/2017 Day 1

- ❑ **Objectives:**
  - ❑ **Intro/goals**
  - ❑ **iPad etiquette**
  - ❑ **Early Computers**
  - ❑ **Hardware vs. Software**
  - ❑ **I/O devices**
  - ❑ **Computer Program**
  - ❑ **Lightbot**

- 2:15 - 2:20: Introductions & Objectives
  - Share names and grades
  - Goals for the class
  - Discuss guidelines for iPads

- 2:20 - 2:25 What is a computer?
  - Ask the class what they think a computer is
  - In order to be a computer, does it need to have a battery?
  - Is your parent's car a computer?

- 2:25 - 2:35 Early Computers
  - Early computers were tools (mechanical devices) to help people do math
  - To help gain an appreciation for where computers are today, walk through slides from Tally Sticks to Babbage machine and Ada.
    - Get input from class and discuss how some of these early computers might work

- 2:35 - 2:45 Draw a Computer
  - Have class draw what they think is a computer, try to label parts of their drawing
  - Ask what is software? What is hardware?
  - Hardware: the physical stuff; the 'hard' things
  - Software: programs; instructions to tell a computer what to do
  - Ask if they see hardware in their drawings (should be all of it)
  - Discuss Input/Output devices

- 2:45 - 2:55 Simon Says/Efficient
  - Do a simple demonstration of efficiency using the Simon Says game
    - Quickly explain the Simon Says game (they should all know it already? Too old now?)
    - Pick two students
    - Give them instructions to go to the same place:
      - "Simon Says, walk five steps; simon says turn right…"
      - but, have one complete it using a lot more unnecessary steps than the other one
  - Ask class which set of instructions was more efficient?

- Explain what it means to be efficient
- Explain that we'll be using the app, Lightbot to learn basics of programming instructions for a computer to carry out

- 2:55 - 3:15 Lightbot
  - Iterate again that to program is to give a computer step-by-step instructions to do something
  - Quickly explain Lightbot; giving a robot instructions to light up the blue squares
  - It cannot do this on its own, you have to 'program' it

Were Objectives met?

1/19/2017 Day 2

- ❑ **Objectives:**
  - ❑ **Efficiency in terms of hardware advancements**
  - ❑ **Transistors/Logic Gates**
  - ❑ **Build logic gates on Circuit Coder**

- 2:15 - 2:20: Review
  - Hardware vs. Software
  - Computer program
  - Early computers were mechanical aids/tools to help people perform math

- 2:20 - 2:30 Continue Early Computers
  - Use computer components jar for visuals
  - Focus on, engineers are always searching for building faster, better devices and developing tools to help people use these devices more productively
  - Discuss the hardware advancements that were categorized into generations
  - From vacuum being main component of hardware, to transistor, to circuits (micro chips)

- 2:30 - 2:45 Transistors and Logic Gates
  - "Building blocks" of computers
  - The internal "switching" logic that allows hardware to execute instructions provided by the software
  - Transistors combine to form logic gates
  - The more logic gates in a computer, the more capabilities
  - Computer hardware is a series of on/off switches
  - Touch on Binary
  - Explain a few logic gate symbols and their truth tables on a white board with student input
    - AND, OR, NOT

- 2:45 - 3:00 Circuit Coder app
  - Have students build the switching devices that were explained in the Circuit Coder app
  - Maybe do a demonstration first/walk-through of app
  - Have students create a new "sandbox" file

- 3:00 - 3:15 Lightbot
    - For students that finish, have them continue where they left off with Lightbot
    - Iterate instructions given to a computer/programming
    - If they get to procedures, explain functions

Were Objectives met?

1/26/2017 Day 3

- ❑ **Objectives:**
    - ❑ **Logic gate review**
    - ❑ **binary**

- 2:15 - 2:25: Review
    - Go over logic gates, see if students can remember how to make AND, OR, NOT with their truth tables (whiteboard or paper)
    - If class seems up to it: provide and example of combining logic gates with student's input
    - Option to do transistor exercise with tennis balls
    - Rough transistor diagram
    - If arduino board logic gate is available, use that to have the class test a simple AND gate to turn on an LED

- 2:25 - 2:40 Binary Numbers
    - Computer's only understand in binary language
    - Binary number system exercise w/ the binary cards
    - Have the class try and count up to ten in binary on a whiteboard

- 2:40 - 2:55 Hopscotch
    - Another app for learning some fundamentals of programming
    - Explain an Event, a trigger that the computer recognizes and causes it to do something.
    - In Hopscotch, you have to specify a certain event, so the computer knows when to run your program.
    - To quick run-through of the app
        - Create a new project
        - Drag and drop a character
        - Tap the character to 'see code': This is where you give that object a sequence of instructions
        - Have them choose an event to let the computer know to start the program, give their character an instruction (move forward), and test it.

- 2:55 - 3:15 Programming Challenge
    - Have students try and make a program to have a character controlled by buttons to move in at least four directions
    - If students finish early, challenge them to have other object interact with the character when it bumps it -have an event occur when two objects collide

Were Objectives met?

2/2/2017 Day 4

- ❑ **Objectives:**
  - ❑ **Review binary**
  - ❑ **Algorithm activity**
  - ❑ **LED pendant project intro/designs**

- 2:15 - 2:20: Review
  - Review binary numbers
  - Have class count to 10 in binary

- 2:20 - 2:40 Algorithm Activity
  - Discuss with the class on steps for pouring a bowl of cereal
    - What if the steps were slightly out of order? For instance, the milk is poured before the bowl is even put out
  - Discuss with class that this is an example of an algorithm; step-by-step instructions to complete a task or solve a problem.
  - Remember, computers (or lightbot) do what they are told, only in the order they were told. This is known as a sequence, an order of events.
  - Just like with pouring a bowl of cereal, with computers, it is important to give instructions in the right order, or else the program won't run as you expected.
  - A Sequence is important in a computer algorithm because the correct order of steps is needed in order to make the algorithm work.
  - computers do what they are told, in the order they were told
  - Have the class conduct the algorithm activity; put together the steps in the correct order to plant a seed

- 2:40 - 2:50 LED pendant project
  - Explain the project
  - Iterating binary numbers; we will program them using binary numbers

- 2:50 - 3:15 Drawing LED designs
  - Pass out the LED pendant drawing
  - Explain how it works (shaded in squares are 1, blank squares are 0)

Were Objectives met?

2/9/2017 Day 5

- ❑ **Objectives:**
  - ❑ **Layers of a computer activity**
  - ❑ **Abstraction**

- ❑ **Transfer LED designs**

- 2:15 - 2:30 Layers of a computer activity
  - Discuss the slides on the layers of a computer
  - While talking about each layer, have the students make their model to follow along

- 2:30 - 2:40 Abstraction
  - Explain that they just made an model to show abstraction
  - When we are dealing with a computer on one layer (for example, programming), we don't need to be concerned with the other layers
  - We remove unnecessary details so we can focus on what we need to accomplish at the time

- 2:40 - 3:15 Transferring LED designs
  - Have students transfer their LED designs from paper to the Koder app
  - Quick walk-through of app
  - If students finish early, have them continue on Lightbot or make a 'crossy road' game on Hopscotch

- **Make sure to prep all LED pendants with student's code**

Were Objectives met?

2/9/2017 Day 6

- ❑ **Objectives:**
  - ❑ **Mini quiz**
  - ❑ **Have finished LED pendants**
  - ❑ **Challenges**

- 2:15 - 2:25 Review
  - Mini logic gate/binary quiz!
  - After 5min over the quiz as a class

- 2:25 - 2:35 LED Pendants
  - Explain the parts of the LED pendant; how they can recharge the battery
  - Have students test out their LED pendant displays
  - Make changes to the code if they need to on the laptops

- 2:35 - 3:15 Challenges
  - For students that are completely finished with pendants have them complete one or two challenges
  - Lightbot: Work up to Conditions and complete the levels
  - Hopscotch: finish/start "crossy road" game create another fun game

Were Objectives met?