

Elementary Intro to Computer Science ASE (12wk)

Lesson Abstract

Elementary Intro to Coding explores with students the history of computers and computer science, the terms and concepts necessary to better understand computers, how they function, and how we program them.* During this 12-week session, we inspect further into each subject from the CS 6-week course.

Performance Objectives

Students will -

- have understanding of general history of computers.
- have understanding of the basic layers of the computer
- be able to understand switching devices; binary and digital.
- have understanding of how a computer program functions.
- be able to create a design on LED pendant using binary code.

Day 1

Materials:

Class roll
iPads - Lightbot
Projector
[CS1 Slides](#)

Objectives of the day:

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Icebreaker: Introduce yourself; ask students to share with the class their name, grade, and what they use computers/devices for.

Explain what Computer Science actually is. Computer Science is the study of computational thinking, or how to use logical thinking and abstraction to develop generalized solutions to complex problems.

Explain the goals of the day.

Use provided power-point ([see CS1 Slides link above](#)):

Discuss History to Babbage/Ada

Discuss what efficiency is. Ask the class, what is efficiency?

Discuss what a computer program is.

Start students on Lightbot App (students should get to Procedures).

While students work on Lightbot, explain that the robot acts like a computer and we are programmers giving the robot a set of instructions (writing a program) that it completes; in that order, to perform a particular function (lighting up the blue squares).

After several minutes of lightbot, define efficiency with the class in general, then relate to Lightbot.

Use class roll sheet to record the individual iPad numbers of students.

Have students code on lightbot until they get to a few levels in procedures.

[Link for After-Class instructions for instructor](#)

[Record the level they reach on Lightbot, so they know where they left off for next class.](#)

Day 2

Materials:

Class roll

iPads - Lightbot

Projector*

[CS1 Slides](#)

Computer Components Jar

5min

Review Hardware and Software.

15-20min

Discuss Computer vs. Computer System; [Layers of a computer](#). Relate the different layers back to software/hardware, Ada, and Lightbot.

15min

Lecture from Babbage/Ada through modern microprocessor (show vacuum tubes, transistors, and microchips); begin discussions on switching devices (i.e. digital and binary)

15-20min

Explain what a transistor is - [Transistor exercise](#)

10min

Review Lightbot (Efficiency and procedures).

Have students continue with Lightbot.

[Link for After-Class instructions for instructor](#)

Day 3

Materials:

Class Roll

iPads - Lightbot, Circuit Coder

Projector*

[CS1 slides](#)

Computer Components Jar

15min

Review vacuum tube, transistor, and microchip.

Have students recall that, Since a transistor can be in two distinct states (off or on), it can store two different numbers (zero or one).

Transistors create logic gates (Slide 25*). Transistors are combined to form logic gates and circuits.

15-20min

Go over types of [logic gates](#)

Show students the Arduino gate with LED. Have them try it out themselves to discover what type of gate it exhibits.

15min

Have students create AND, OR, NOT gates in Circuit Coder app.

[Link for After-Class instructions for instructor](#)

Day 4

Materials:

Class roll

Mini Logic gate quiz

Example LED pendant with Space Invaders code

30min

Review what 0 and 1 can mean. (They are used to store data; 0=off=false, 1=on=true).

[Start binary number lesson](#)

Count to 10 in binary.

Add two binary numbers together.

15min

Mini logic gate quiz ([Link](#))

15min

Show students LED pendant

Explain what the lit and unlit LEDs mean in terms of binary and explain that they will use their understanding of 0's and 1's to code their pendants towards the end of class.

Day 5

Materials:

Class Roll

iPads - Circuit Coder

20min

Review Binary number system (Count to 10) and adding binary numbers.

Recap that transistor combine to form logic gates.

15min

Present half adder ([link](#))

-Explain that logic gates are combined to form circuits.

15min

Have students create a half adder on Circuit Coder app

For students that finish this quickly, have them continue with Lightbot. If students get to Overloading on lightbot, explain the definition of overloading.

Day 6

Materials:

Class Roll

iPads - Lightbot

20min

What have we learned? (Slide 32)

Recap on Hardware/Software

Software - human readable instructions for computer.

Re explain the important notion that **computers do what they are told, and only what they are told, in the order they are told. (Robot in lightbot is the computer, and the student/user is the computer programmer).**

Make sure students understand what procedures are in Lightbot.

20min

Have students continue with Lightbot to Overloading and Loops.

Day 7

Materials:

Class Roll

iPads - Hopscotch

15min

Have students start on Hopscotch ([link to hopscotch curriculum](#)).

15min

After the menu items are reviewed and students have explored what they do, have them create a new project (title with their name and 'square'), challenge them to have their desired character make a square.

20min

Once students are finished making a square, have them create a new project (title with their name and 'star')

10min

For students that finish, they can explore what they can code their character to do on their own project or trying to mimic already-made projects within the app.

Day 8

Materials:

Class Roll

iPads - Hopscotch

25min

Discuss what variables/values are in terms of computing and math.

Have students create a new project (title it their name and 'Variables'), conduct variable/value

Hopscotch exercise -

<https://docs.google.com/document/d/1w-NCP5zvcdL14CfuT0Ue62YcQhcWWjVf7gfiKs-i1kU/edit>

20min

Have students create a new project (title it their name and 'Race!'), challenge them to make two characters race each other using what they learned from the previous exercise.

Day 9

Materials:

Class Roll

Slides

Projector*

Remember that we are always searching to improve computer software and hardware devices.

15min

Continue Computer Science history with Computer Pioneers from slides.

20min

Binary Search Tree exercise. ([Link](#))

5-10min

Continue with computer history - mechanical aids using slides

Day 10

Materials:

Class Roll

Sample LED pendant

8x8 frame sheets

20min

Quick Review of Binary number system (Count to 10) and switching devices.

Show students LED pendant again, explain how it works.

Explain to students that they will use binary code to code their LED pendant.

Have students work on their 8x8 frame sheet.

Make sure students write their name on their 8x8 frame sheet and hand back to instructor before class.

[Link for After-Class instructions for instructor](#)

Day 11

Materials:

Class Roll

iPads - Koder

Mini history/binary/gates quiz

8x8 frame sheets

20min

Lighthearted quiz on some history, binary, logic gates!

Hand back students' 8X8 designs.

Have students continue their designs.

Once students finish their designs, walk them through Koder App ([Link](#)).

Have students either continue design on Koder (using a keyboard) or 8X8 sheet.

Conditions

[Link for After-Class instructions for instructor](#)

-put rest of students' code on koder app, make sure LED pendants are prepped and loaded with the binary code.

Day 12

Materials:

Class Roll

iPads

8x8 frame sheets

Have students finish their design on Koder App.

Show students how to transfer their code to the LED pendant ([Link](#))

Hand out loaded LED pendants to corresponding students.

Have the students tweak their code if they want to.

Once students are finished or waiting, have them work on either of the following: Lightbot,

Circuit Coder or Hopscotch.

Lighthearted quiz on some history, binary, logic gates!