

# Algorithms vs. Programs

## CS Unplugged Lesson Plan

Grade	K-2
Setup Time	5 minutes
Duration	40 to 50 minutes
Group size	Pairs

## Learning Objectives

Students will:

- Deepen their understanding of algorithms.
- List the steps needed to move their character to a desired goal in a map.
- Use these steps to write a program.
- Identify the difference between an algorithm & a program.

## Learning Summary

- **ENGAGE: Getting Started (10 minutes)**  
Review and introduce Vocabulary
- **EXPLORE: Activity (15 minutes)**
  - **PLAN:** Words to Symbols
  - **PLAY:** Learn to Code 'C' [Help Baloo get ready for school]
  - **PLAY:** Learn to Code 'D' [Help Baloo Bear make a sandwich]
- **ELABORATE (5 minutes)**  
Flash cards
- **EXPLAIN:** Reflection and Discussion
- **EVALUATE:** Assessment

## **Guide for educators** | Preparation & Materials

### **Student Materials**

- Taco Playbits C-STEM Kit
  - Playbits Wand
  - Learn to Code ABC coding chip
  - Directional coding chips | Forward, Backward, Left & Right
- Printed Worksheets

### **Educator Materials**

- Teacher Lesson Guide
- Coding chip tray

### **Teacher Preparation**

- Teacher Lesson Guide
- Print Learn to Code 'B' coding sheet
- Print Learn to Code 'C' coding sheet
- Create slides or write prompts/definitions on the board
- Put students in pairs to complete the activities

## Getting Started (10 minutes)

### ENGAGE (Review Concepts)

- a. Recall: Ask your students to think back to the the previous lesson and how they provided you with steps from Point A to Point B in the classroom.
  - You can review the instructions verbally or have them written out
- b. Show the students the Coding Sheet for “Time for Dinner, Baloo Bear” on the projector screen
- c. Ask them to review the steps as to how they completed the task the last time. As they are listing out the steps, write them down on the board.

### ENGAGE (Introduce Vocabulary)

- a. Ask the children if they remember what this list of steps is called [An algorithm]
- b. Next to each of the steps you have written down, have students tell you which symbol represents the appropriate direction.
- c. Instruct the children that when we write the steps in with symbols, the algorithm becomes a PROGRAM.
- d. Now tell them that a machine like a Computer or Robot will work only if the correct program is given to it.

## EXPLORE (20 minutes)

### PLAN

- a. Hand out the Learn to Code C worksheet to the students.
- b. Tell them to study the worksheet and plan how Baloo bear will clean up his room.

### PLAY

[Learn to Code C: Help Baloo Bear get ready for school]

- a. Put students in pairs and encourage them to collaborate.
  - For example: One student can use the worksheet to call out the steps for the code, while the other student can tap the sequence of commands on the coding chips with the PlayBits wand.
- b. Have students write down the directions in the box next to the map on their worksheet.
- c. Students activate the game by tapping on the "Learn to Code ABC" coding chip - 3 times. The wand should say "Learn to Code C".
- d. Have students use the directions they have written down to tap on the direction chips in the correct sequence. Have them troubleshoot collaboratively if some is incorrect to fix it.
- e. Make sure students correct their worksheets as they tap the chips.

## EXPLORE (20 minutes)

### PLAN

- a. Hand out the Learn to Code D worksheet to the students.
- b. Tell them to study the worksheet and plan how Baloo bear will make a sandwich.

### PLAY

[Learn to Code D: Help Baby Bear make a sandwich]

- a. Instruct the students to have the wand, Learn to code chip, and the 4 directional coding chips ready.
- b. Have students collaborate in pairs to solve the problem.
- c. Have students activate the game by tapping on the "Learn to Code DEF" coding chip - once. The wand will say "Learn to Code D".
- d. Students activate the game by tapping on the "Learn to Code ABC" coding chip - 3 times. The wand should say "Learn to Code C".
- e. Have students use the directions they have written down to tap on the direction chips in the correct sequence. Have them troubleshoot collaboratively if some is incorrect to fix it.
- f. Make sure students correct their worksheets as they tap the chips.

## Explain and Elaborate (5 minutes)

- Were you able to help Baloo Bear get ready for school?
- Were you able to help Baloo Bear make his lunch?
- What type of sandwich is your favorite? Write the algorithm you would use to make it.
- Were you more or less accurate in coding challenges A & B from last lesson or C & D from this lesson? Describe.
- What is the difference between an algorithm and a program?
- When you want Baloo Bear to do something, you create steps. What is the difference between writing these steps in an algorithm and writing them as a program?

## Note to the Teacher

- This lesson serves provides the child with another exposure to algorithm design & thinking which they had done in the previous session.
- In this session, the two activities that they completed helped them develop another element in Computational thinking i.s.
- **One of the elements encountered in this activity is Algorithm design and thinking.**
- **Algorithm design helps learners to tackle problem solving via:**
  - Thinking ahead, making a plan & execute the steps in the plan
  - Developing the step by step instructions for completing a task or solving a problem
  - This is also known as working through Sequential coding : the order that a program has to follow

## Note to the Teacher

### Computational Thinking skills:

#### Algorithmic Thinking:

- a) Thinking; making a plan & executing the steps (directions)
- b) Sequential coding: order that a program has to follow
- c) Developing the step by step instructions for completing a task or solving a problem

#### Decomposition:

- a) Sorting & Grouping together facts that are similar
- b) Drawing an insight from having seen the similarity
- c) Forming a new grouping of related insights
- d) Breaking down data, processes, or problems into smaller, manageable parts

## Standards Alignment K-2

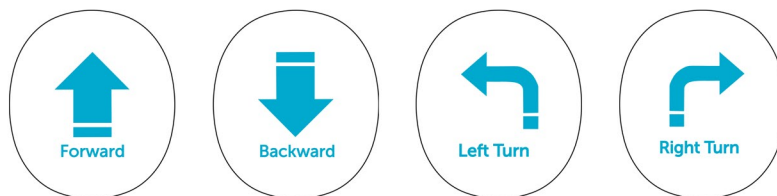
### Computer Science Teachers Association,

### K-12 Computer Science Standards Alignment

- **1A-DA-07** Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions
- **1A-AP-08** Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.
- **1A-AP-09** Model the way programs store and manipulate data by using numbers or other symbols to represent information.
- **1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem.
- **1A-AP-11** Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.
- **1A-AP-12** Develop plans that describe a program's sequence of events, goals, and expected outcomes.
- **1A-AP-14** Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.
- **1A-AP-15** Using correct terminology, describe steps taken and choices made during the iterative process of program development.

Learn to Code - C: Time for School, Baloo Bear


Write the Correct Code to help Baloo bear put his clothes on and get ready for school. Write the arrows in the boxes below






Learn to Code - D: Help Baloo Bear make a sandwich


Write the Correct Code to help Baloo bear make a sandwich for lunch. Follow the order of the ingredients.

Forward	Backward	Left Turn	Right Turn
