

Lesson 3 - Algorithms: Watch Me Dance

Learning Goals

- Students will understand that an **algorithm** is a set of instructions to accomplish a task.
- Students will practice following instructions to perform an algorithm.

Equity Spotlight

This lesson invites students to draw on their own experiences with something that they do well. Connecting learning to students' experiences is important for authentic engagement and building STEM identity.

Preparation

- Preview the videos that the class will watch in the Warm Up and make sure you can play them in your classroom. ([clip 1](#); [clip 2](#))
- [Think, Pair, Share](#): Ensure that you are familiar with this routine. Students will engage in this routine during the Warm Up.
- This lesson is adapted from Code.org [Course E Lesson 1: Follow the Algorithm](#).
- Watch [PD Videos #9 and #12](#) to learn more about how certain UDL and CRP teacher practices are integrated into this lesson in alignment with Project-Based Learning elements.

Links

For teachers:

- [Think, Pair, Share](#)
- [400m Hurdles Race \(start\)](#)
- [400m Hurdles Race \(finish\)](#)
- [Video #5: PBL Step 1](#) - PD resource
- [Video #12: PBL Step 8](#) - PD resource

Vocabulary

- **Behavior** - An action that a character or object performs
- **Algorithm** - A list of steps to finish a task
- **Program** - An algorithm for a computer to follow

Teaching Guide

Warm Up (10 minutes)

Equitable Teacher Practices	
	8.UDL.a Give students choice during the product design process.
	1.CRP.a Connect content to students' experiences, cultures, and interests.

- Remind students that they will have opportunities over the next several weeks to investigate and answer many of their questions about invasive species, and to share what they learn by creating a final project on Code.org. To work on that final project they will need to learn how to give instructions to computers, which they will work on in today's lesson.
- Show a short video clip of an athlete, musician, or artist at work. Ask students to pay attention to all of the different actions that the person does. After students watch the video clip(s), briefly discuss the different actions that students observed a person in the video doing. Examples:
 - 400m hurdles <https://www.youtube.com/embed/ftNUT0E1Wrg?start=5&end=56> [51 sec. clip of 2:57 video]
 - 400m hurdles <https://www.youtube.com/embed/GOuvbf11mZY?start=0&end=46> [46 sec. clip of 4:37 video]
- Engage students in a [Think, Pair, Share](#) about the following: Think of a hobby, sport, or activity that you know how to do well. What do you have to do? Are there times when you need to coordinate or perform different

actions at the same time? What specific (smaller) actions do you have to do in sequence or at the same time to do this hobby/sport/activity? We could call these specific actions **behaviors**.

- Ask: *What if you had to describe to a person that was unfamiliar with this hobby how to do this activity or tell a computer how to do this activity?*
- These instructions need to be detailed and in a language that the person understands well. We call this kind of detailed instructions an *algorithm*.
 - Ask: *Have you heard this word before? When?*
- Tell students that when we code a project, an algorithm is a detailed set of instructions that the computer will follow.

Main Activity (25 minutes)

- Tell students that today they will play a game, running an algorithm to do a silly dance.

Teacher Note: Consider students' mobility and preferences when reviewing the instructions for this game. You may wish to substitute behaviors that are more appropriate for your classroom. For example, waving, humming, tapping, 'dabbing.'

- Explain: *In this game, I will be giving all of you commands to follow, and your job is to follow my instructions. The commands will always start with "begin" or "stop". If I tell you to begin doing a behavior, you need to start that behavior and keep it going until I tell you to stop. I might also tell you to "stop everything," which means you can end all of the behaviors I've given you so far. Some of the behaviors you might have to do are marching and clapping.*
 - Ask: *What other behaviors might we add?* Sample answers: nodding, growing, swimming, dabbing, flossing, blinking, etc.
- Play Round 1 (Basic). Give each command to students, allowing a few seconds before the next.
 - *Begin marching in place.*
 - *Stop marching in place.*
 - *Begin clapping.*
 - *Stop clapping.*
 - *Begin marching in place.*
 - *Begin clapping.*
 - *Stop everything.*
- Display the Round 1 algorithm so that all students can see it.
- Ask: *What do you notice about these instructions or this algorithm? How is the language different from how we usually talk to each other?*
 - Sample answer: Every command starts with the word *begin* or *stop* and is followed by an action. To make explicit connections between the game and the concept of algorithms, explain that the commands of an algorithm need to be very specific and that there are certain kinds of commands that you can use in an algorithm.
 - Sample answer: At the end it says "Stop everything." This is the only one that refers to multiple actions, the others are single actions.
 - Sample answer: We started at the top, not the middle, and then went in order til the end.
- Play Round 2 (Intermediate). As before, give each command to students in order. You may wish to edit this algorithm to replace some behaviors with student suggestions.
 - *Begin waving your arms in the air.*
 - *Begin bobbing your head.*
 - *Stop waving your arms in the air.*
 - *Stop bobbing your head.*
 - *Begin shaking your knees.*
 - *Begin flapping your arms like a bird.*
 - *Stop shaking your knees.*
 - *Begin bobbing your head.*
 - *Begin marching in place.*
 - *Stop flapping your arms like a bird.*
 - *Stop everything.*

- Display the Round 2 algorithm so that all students can see it.
- Ask: *What happened when you were told to clap but you were already marching in place?*
 - Sample answer: It was difficult to follow the instructions.
Explain that Round 2 was a more complex algorithm because the command *Begin* was used more than once before using *Stop*.
- Ask: *What strategies do you think are helpful for making sure you follow instructions correctly?*
 - Sample answer:
- Ask: Why is it important to keep track of each behavior separately?
 - Sample answer:

Wrap Up (15 minutes)

- Have students, working in pairs, make their own algorithms for a game or dance using *begin* and *stop* as commands followed by different behaviors.
- Pairs should test their algorithm by having a partner or another group “run” the algorithm.
- Ask: *What did we learn today?*
- Let students know that in the next lesson, they will look at **programs**, which are algorithms for the computer to follow. The programs will be projects in Code.org.

Possible Extension

- Create an algorithm in another language, such as Spanish or French.
 - Display the algorithm to the class and ask them to “run” it. What happens?
 - What does this tell us about how we need to communicate for an algorithm to run successfully?

[Give anonymous feedback on this lesson.](#) (optional)