

# Dash on Planet X

## Summary

Dash is trapped on Planet X with an unknown alien.

Over the course of **6 challenges**, your students will **add to a program** that will enable Dash to sense the location of the alien using distance sensors. The **Wait for** block allows students to set a condition for a subsequent action or sound, e.g., **object behind, clap or picked up**. These cues will trigger **pre-programmed sounds**. In the **Drive** control, your students will learn how to program movement **forward, backward, left and right**. Students will dramatize Dash's reaction to various scenarios, **turning in a 360° circle, head shaking** and programming **Eye Pattern** lights to make Dash smile. Students will be happy to learn that in the final challenge, Dash is rescued by the student as a friendly alien!

## Concepts Covered

- **Distance Sensors** - students will learn that Dash can recognize objects when programmed in **front** and in **back** with infrared lights.
- **Add to program** - students will learn how to drag and drop blocks as commands in a program.
- **Start** - students will learn that the **Start** button in the left hand corner of the screen is used to initiate a program.
- **Sound** - students will learn that the **Say** block can be used to add pre-programmed sounds and words, e.g., **"Uh-oh!"** or **sigh of relief**.
- **Look** - students will learn to program a **head shake** by editing the Look block, left, right and forward.
- **Drive** -
  - students will learn how to program Dash turn left or right.
  - students will learn to program Dash to turn in a 360° circle
  - students will learn how to program Dash to move forward.
- **Wait for** - students will recognize that a **Wait for** block puts a hold on the program until a new cue or command is introduced, e.g., object behind, clap, picked up.
- **Eye Pattern** - students will learn to turn lights on or off to resemble a facial expression for Dash e.g., smile.

## In App

### Vocabulary:

**Control:** to use power to manage or command

**Drive:** to control the movement or direct the course of Dash

**Light:** a form of energy that makes it possible for the eye to see

**Eye Pattern:** an arrangement of lights

**Look:** to face a certain direction

**Sensors:** a device that detects and responds to changes within the environment

**Sounds:** anything that can be heard by your ears

**Start:** the beginning of or to begin the program that was created

**Wait for:** putting a hold on the program until a new cue or command is introduced

## Reflection Questions:

1. In which direction does a program proceed sequentially? *Left to right? Right to left? Top to bottom? Bottom to top?* What other objects or materials in your world can be connected in one direction. (Example: Legos, a plug into a wall)
2. In Challenge 3, Dash **turns** right to face the alien! How many degrees does Dash need to turn?
3. In Challenge 4, Dash turns right in a 360° circle. Can add to the program to make Dash turn left in a 360° circle?
4. What would happen if you programmed Dash to turn right 90° 4 times?
5. What would happen if you deleted all of the Wait for blocks? How does that affect the program?

## Extension Activities

### 1. Dash the Actor

Tell students that Dash is all ready for his big moment in Hollywood. It's time for Dash's screen test. Challenge students to program Dash's Eye Pattern lights to resemble various expressions. How can you make Dash Frown? Look surprised? Shocked? Angry?

### 2. Dashing Data

Research creatures in nature that make use of sensors and sounds as protection from predators. Compare them to Dash's sensors and sounds. Evaluate and determine the ways in which the creature's sensors are more or less effective. Dash's head turns just in time to see the alien's tentacle. Research a creatures in nature that can turn their heads 180 or 360 degrees. How does this capability impact the creature's survival? Based on these two features, select one creature with the best chance of survival on Planet X. Create a Google

slideshow to share your data and explanation as a multimedia presentation. Include images and sounds. Digital Presentation Resource: <http://www.wix.com/>

### **3. Acting Out**

In this activity, students will act out individual blocks commands, enacting the Planet X program. First Assign a block command to each student. Have students create a label for their block and tape to shirt. Example: Backward 30 cm. fast. Students will experiment with rearranging the sequence of commands, and the speed and distance of the forward and backward commands using a ruler and timer. Discuss how these changes affect the program and Dash's escape from the alien's tentacles. Which one change might best improve Dash's escape and survival?

### **4. Alien Movie**

Use your iPad and iMovie App to record Dash's performance of the Planet X puzzle as an exciting Sci-Fi movie trailer. Write a dramatic narrative script explaining what is happening and have one member record it in iMovie. Give it a title. Select an appropriate theme and background music to build excitement and tension. Director's Cut: Include a final chapter in which you, as the director, explain the following math concepts and how they played a part in "directing" Dash's daring performance in the Planet X puzzle: symmetry, rotation, angle, variables, measurement.

# Solutions

## Challenge 1

When Dash detects an alien's giant tentacle coming too close for comfort, Dash says, "Uh-oh!" Try out the program by tapping **Start** and putting your hand or foot in front of Dash!

The screenshot displays the Dash robot programming interface. On the left is a vertical menu with categories: Start, Drive, Look, Light, Sound, Animations, Control, Variables, and Accessory. The main workspace contains a script with three blocks: a 'When Start' block, a 'Wait For Dash Obstacle In Front' block, and a 'Say Uh oh!' block. A 'Reset' button is in the bottom right of the workspace. Below the workspace is a 'Need a hint?' button. At the bottom of the screen, there is a 'START' button on the left, a progress bar with five segments (the first is blue, the others are green), and a right arrow button on the right. A hint box at the bottom contains the text: 'When Dash detects an alien's giant tentacle coming too close for comfort, Dash says "Uh-oh!" Try out the program by tapping **Start** and putting your hand or foot in front of Dash!'.

## Challenge 2

**Add to the program** to make Dash back away fast saying, "Uh oh!" Then Dash should do a head shake and look forward.

When Start

Wait For Dash Obstacle In Front

Say Uh oh!

Backward 30 fast

Look left 90

Look right 90

Look forward 0

Reset

Need a hint?

START ▶

◀

▶

Add to the program to make Dash back away fast after saying, "Uh oh!" Then Dash should do a head shake and look forward.

## Challenge 3

The danger isn't over! **Add more to the program.** Make Dash **wait for** an alien tentacle sneaking up from **behind**. Make Dash say, "Uh-oh!" then move **forward** and **turn** around to face the alien!

When Start

Wait For Dash Obstacle In Front

Say Uh oh!

Backward 30 fast

Look left 90

Look right 90

Look forward 0

Wait For Dash Object Behind

Say Uh oh!

Forward 30 fast

Turn Right 180

Reset

Need a hint?

START ▶

◀

▶

The danger isn't over! **Add more to the program.** Make Dash **wait for** an alien tentacle sneaking up from **behind**. Make Dash say, "Uh-oh!" then move **forward** and **turn** around to face the alien!

## Challenge 4

There's a thunderstorm brewing on Planet X. **Add blocks** to make Dash **wait for** a **clap**, say "Huh" and **turn** around in a **360 degree circle**.

The code blocks in the workspace are as follows:

- Wait For Dash Obstacle In Front
- Say Uh oh!
- Backward 30 fast
- Look left 90
- Look right 90
- Look forward 0
- Wait For Dash Object Behind
- Say Uh oh!
- Forward 30 fast
- Turn Right 180
- Wait For Dash Hear Clap
- Say Huh?
- Turn Right 360

At the bottom, a hint box contains the following text:

The danger isn't over! **Add more to the program.** Make Dash **wait for** an alien tentacle sneaking up from **behind**. Make Dash say, "Uh-oh!" then move **forward** and **turn** around to face the alien!

## Challenge 5

It's finally time to rescue Dash. You are now a friendly giant alien. **Add to the program** so that Dash **waits for** rescue. When you **pick up** Dash, the robot should **sigh** in relief.



The image shows a Scratch-style programming environment. On the left is a vertical menu with categories: Start, Drive, Look, Light, Sound, Animations, Control, Variables, and Accessory. The main workspace contains a script with the following blocks:

- Backward 30 fast
- Look left 90
- Look right 90
- Look forward 0
- Wait For Dash Object Behind
- Say Uh oh!
- Forward 30 fast
- Turn Right 180
- Wait For Dash Hear Clap
- Say Huh?
- Turn Right 360
- Wait For Dash Picked Up
- Say Sigh..

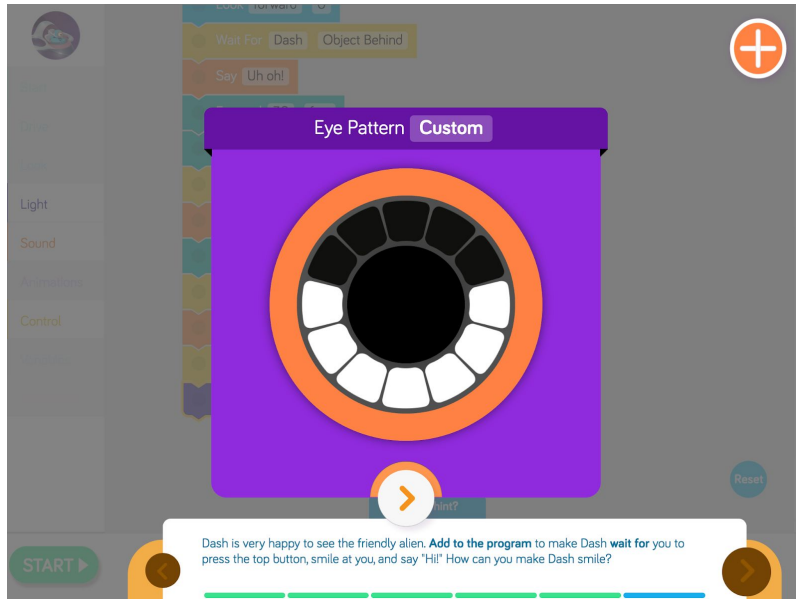
At the bottom of the workspace, there is a "Need a hint?" button and a "Reset" button. Below the workspace is a "START" button with a right arrow, a left arrow button, a progress bar with five segments (the first three are green, the last two are blue), and a right arrow button.

It's finally time to rescue Dash. You are now a friendly giant alien. **Add to the program** so that Dash **waits for** rescue. When you **pick up** Dash, the robot should **sigh** in relief.



## Challenge 6

Dash is very happy to see the friendly alien. **Add to the program** to make Dash **wait for** you to press the top button, smile at you, and say, "Hi!" How can you make Dash smile?



*\*Customized Eye Pattern: Turn off top half of lights to create a smile effect.*

A screenshot of the Dash robot's programming interface. The interface shows a sequence of blocks in the program editor. The blocks are: "Look right 90", "Look forward 0", "Wait For Dash Object Behind", "Say Uh oh!", "Forward 30 fast", "Turn Right 180", "Wait For Dash Hear Clap", "Say Huh?", "Turn Right 360", "Wait For Dash Picked Up", "Say Sigh..", "Wait For Dash Top Button", "Eye Pattern Custom", and "Say Hi". The "Eye Pattern Custom" block is highlighted. Below the editor, there is a "START" button and a "Need a hint?" button. A hint box at the bottom reads: "Dash is very happy to see the friendly alien. Add to the program to make Dash wait for you to press the top button, smile at you, and say 'Hi!' How can you make Dash smile?"

# Educational Standards

## **CC Mathematical Practices:**

1, 2, 4, 5, 6, 7, 8

## **CC Math Standards:**

1.MD.A.2, 2.MD.A.2, 3.MD.B.4, 4.MD.A.1, 5.MD.A.1  
4.MD.C.5, 4.MD.C.5.A, 4.MD.C.5.B, 4.MD.C.6  
5.OA.B.3

## **CC Language Arts Standards**

RI.2.5; R1.2.10; RI.3.4; RI.3.10; RI.4.4; RI.4.10; RI.5.4; R1.5.10

## **CSTA K-12 Computer Science Standards**

- 1A-DA-05 Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data.
- 1A-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.
- 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.
- 1B-AP-08 Compare and refine multiple algorithms for the same task and determine which is the most appropriate.
- 1B-AP-10 Create programs that include sequences, events, loops, and conditionals.
- 1B-AP-11 Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.
- 1B-AP-12 Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.

## **NGSS Science and Engineering Practices**

- K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-PS3-2 - Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.
- K-ESS2-2 - Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. \*This standard applies to Dashing Data Activity Extension.
- K-ESS3-1 - Represent the relationship between the needs of different plants and animals (including humans) and the places they live. \*This standard applies to Dashing Data Activity Extension.
- 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. \*Applicable to Dashing Data Activity Extension.

