i wonder,
therefore i am.

Welcome to the Wonder League!

This packet includes everything you need to know about Dash, Dot, and how to get started!

Setting up your robots

Setting up your robots is easy, and a getting started guide is included in every box! Here are some tips for classrooms. We recommend **3 students per robot**. For the latest information, go to makewonder.com/start.

1 **Name your robots.** To connect your tablet to the right robot when using multiple robots with multiple tablets, we recommend naming each with a unique identifier. This can be done simply by labeling each robot with a permanent marker, sticker, tag, or ear color. To make it a collaborative effort, students can nominate and vote on names!
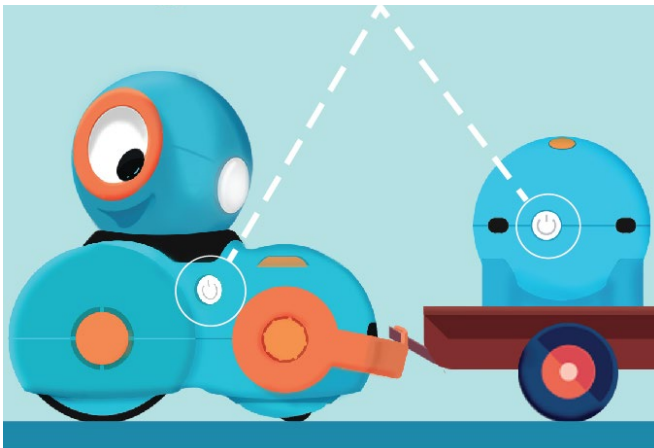
2 **Download Wonder for Dash & Dot Robots** from the App Store, Google Play, or Kindle Store to update and set up their names so that your tablets can identify them. To connect, make sure Bluetooth is enabled on your tablet, and that your robots are powered on. Each robot will have to be set up separately.

3 **Charge your robots.** Dash & Dot have rechargeable batteries, so you never need to replace them. Simply plug them into the wall or a computer! A full charge cycle takes about 60-90 minutes. We recommend a 5 port or 10 port charging station from Amazon for the USB plug if you have multiple robots in your space.

When the light on the charging port turns off, your robot is fully charged!
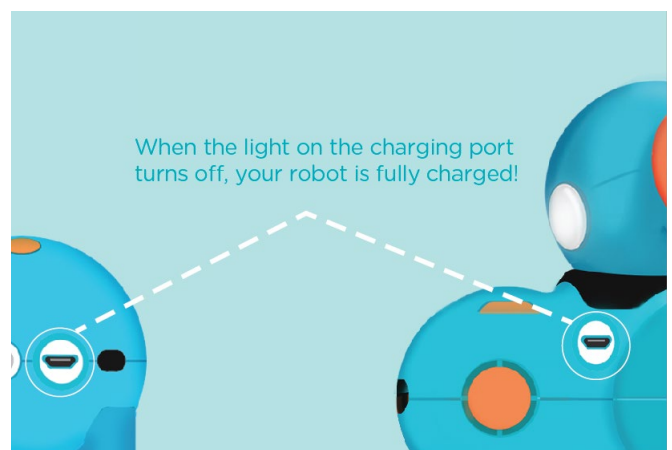
Applications to Download

Dash & Dot's apps work with iOS and Android phones and tablets as well as the Kindle. Check out our compatibility here: http://makewonder.com/compatibility

Wonder

Wonder is the primary app that we use in robotics club activities, and it is the required app for the Wonder League Robotics Competition. Wonder is a language designed for children to program robots. Learn more and download. For grades 3-7.

Blockly

If you use Scratch or Code.org, you are already familiar with Blockly! Our version is designed for Dash & Dot and has visual inputs that help younger children get familiar with block based programming! Learn more and download. For grades 2-6.

If you are working with **younger children (ages 5-7)**, we recommend getting started with one of these apps before moving on to Wonder:

Path

Program Dash to follow a path! Teaches basic sequencing and spatial reasioning. For grades K-4.

Xylo

Conduct a musical performance for family and friends using Dash's Xylophone! For grades K-3.

Go

Controlling your robot is easy with Go. Perfect for navigating mats or letters on the floor. For grades K-3.

I've downloaded the apps. Now what?

Each app has challenges that teach how to program. Dive right in! Start there, and ask your students to go there on their first day of robotics club! In Wonder, go to the **Scroll Quest**. In Blockly, go to **Puzzles**.
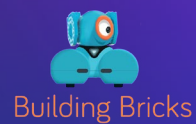
Meet Dash,

your clever robot sidekick.

Dash is a helpful robot who likes going on adventures, dancing, navigating through obstacle courses, and making music! You'll need to program to bring Dash to life! Dash can move, blink lights, make sounds (even ones you record), and sense things in the environment.

See Dot

Pick Up

Distance Sensor Front

Push Buttons

Hear Voice

Push Forward

Accessories

Building Bricks

Launcher

Bulldozer Bar

Dash

Drive - Dash can drive forward, backward, turn left (spin), and turn right (spin). There are two wheels on the left and right side of Dash's body. You can steer Dash by changing the speed and/or direction of either wheel.

**Head Motion** - Dash can look up (25 degrees), down (10 degrees), left (120 degrees), or right (120 degrees).

Lights - There are 12 LEDs in Dash's eye. In Dash's ears (E) and chest (C), there are RGB LEDs. In Dash's tail, there are 2 red LEDs.

Sounds - Dash includes a variety of pre-programmed sounds! You can also record your own sounds for Dash to say.

Microphone - Dash has 3 microphones, allowing Dash to hear claps and identify the direction of your voice.

Distance sensors - Dash has 2 distance sensors in front (F) and 1 in back (B), allowing Dash to detect obstacles in front and objects behind with infrared lights.

Buttons - Dash has 4 programmable buttons on its head.

Top Button

Button 1

Button 3

Button 2

When Top Button

When Dash Bu
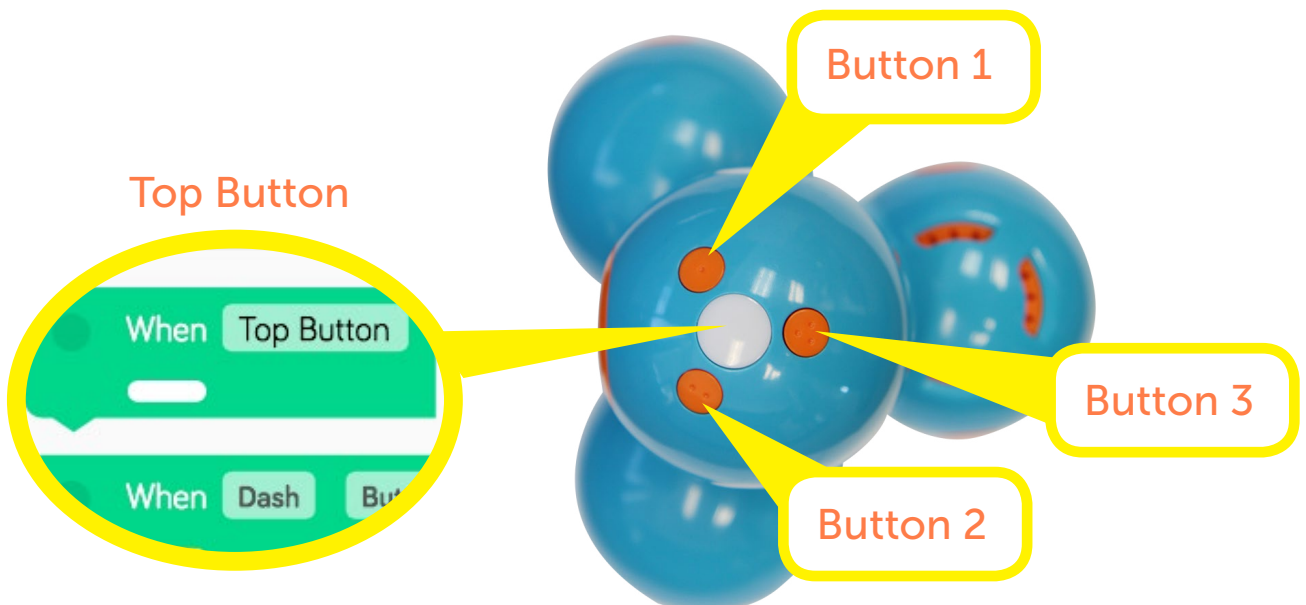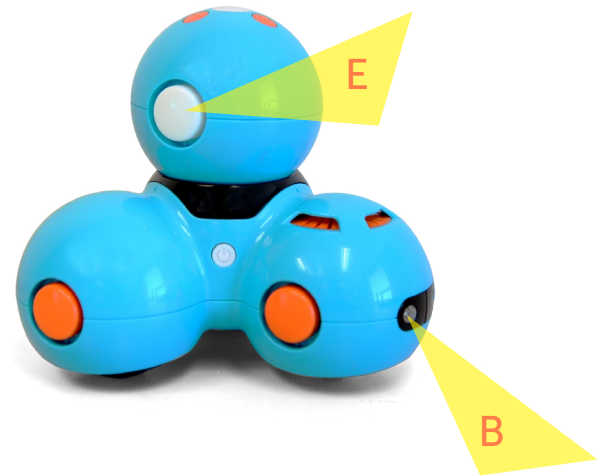
Meet Dot,

your hilarious robot sidekick.

Dot is the brain and can be tranformed into any game or gadget. Little ones can start with changing Dot's colors, and as they get more experienced at coding they can turn Dot into an alarm clock, Magic Dot ball, and even a light sword. Dot might be small but comes with a lot of attitude.
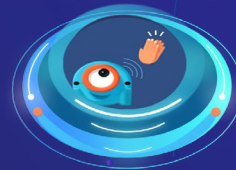
Shake

Toss

Hear Clap

Push Buttons

Hear Voice

Tilt

Accessories

Building Brick Connectors

Bunny Ears & Tail

Tow Hook

Dot

Lights - There are 12 LEDs in Dot's eye, and there are RGB LEDs in both Dot's ears and eye.

Sounds - Dot includes a variety of pre-programmed sounds! You can also record your own sounds for Dot to say.
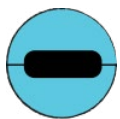
Microphone - Dot has 1 microphone, allowing Dot to hear claps and voices.
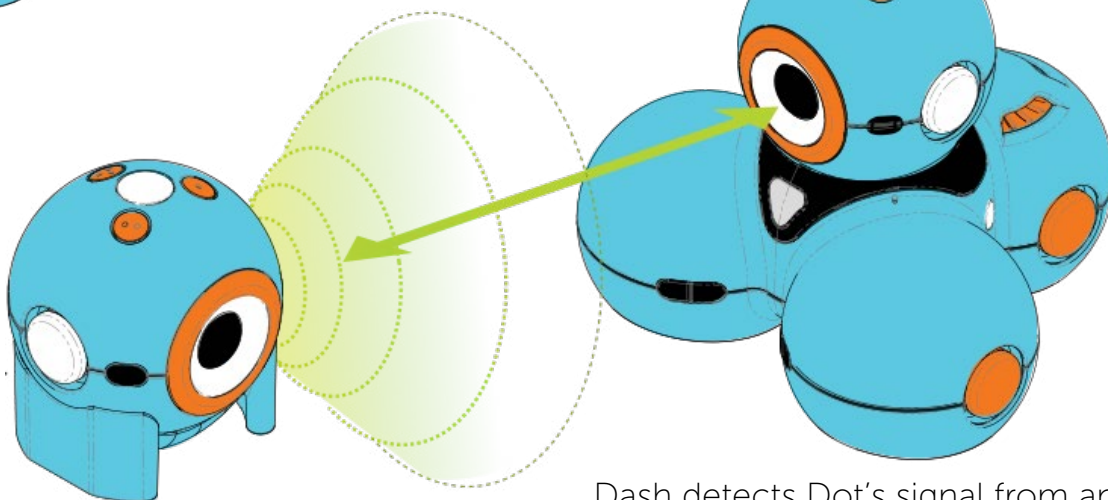
Buttons - Dot has 4 programmable buttons.

Accelerometer - Dot's accelerometer allows Dot to know when you are tossing, shaking, moving, or tilting Dot.

Dash & Dot

Dot sends out an infrared signal from 4 emitters

Dash detects Dot's signal from an IR receiver in Dash's eye. You can use the See Dot event in Blockly to detect Dot!

Wonder makes robotics as delightful as finger painting. A picture based language built for kids, Wonder is the coding canvas that gives kids the joy of creativity as they bring Dash & Dot to life.

There's a lot to learn with Wonder! Start with the Scroll Quest in the app. It will explain everything, and give you lots of practice using Wonder!

Secret Teacher Admin Code
Go to the home screen and do the following to reset progress in the Scroll Quest, remove the controller, unlock free play, unlock cues, and more:
1) Press and hold on Eli's hair
2) Tap Free Play, Inventor's Log, and then Free Play again.

Activities

Visit play.makewonder.com to find activities to do with your club after they've done at least 20 challenges in the Scroll Quest! They can also share their code with other club members!

How programs work in Wonder

Cue - an event that tells the robot when to go to the next state. Events can be when Dash's button is pressed, when Dash sees an obstacle, and more.

Run - tap here to run your program!

Start - connect your first state to the start state. If nothing is attached, nothing happens when you run your program.

Behavior - choose what you want your robot to do! Behaviors become states once you drag it to your program.

State - a behavior that your robot is doing. Your robot can only be in 1 state at a time. Your robot goes to another state when it senses a cue.
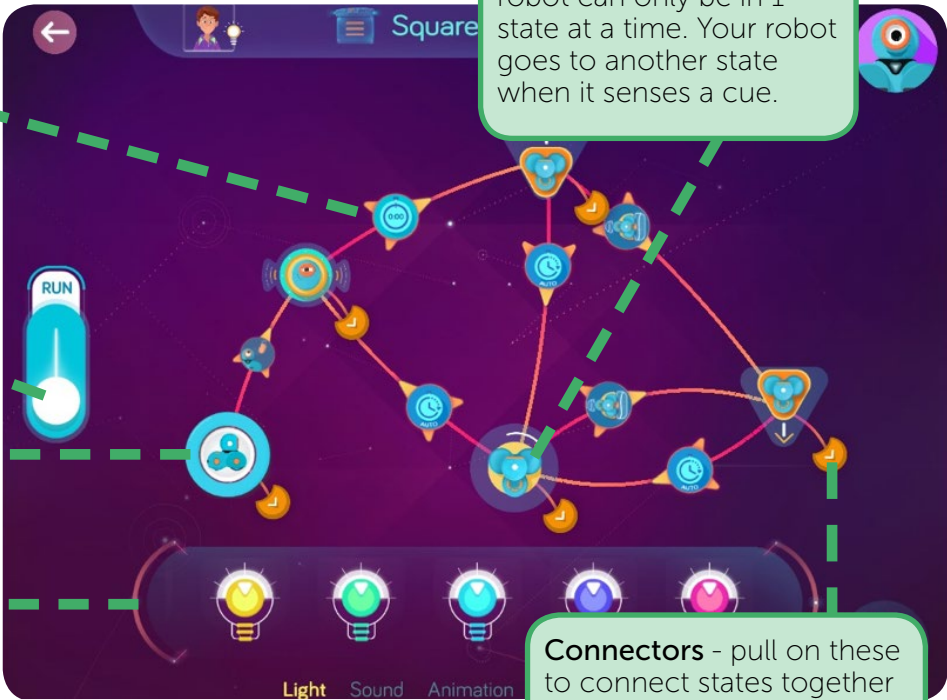
Connectors - pull on these to connect states together with a cue.

Behavior Types for Dash & Dot

Light	Light
Sound	Sound
Animation	Animation
Move	
Launcher	

Special Behaviors

Do Nothing - a placeholder behavior that doesn't make Dash & Dot take any action.

Listener - the Listener stands alone and does not need to be connected to the Start state. The listener is always looking for the cues that are attached to it.

For example, if you attach a behavior with a "see obstacle" cue, Dash executes that behavior no matter what it's currently doing.

Cues in Wonder for Dash and Dot

Auto
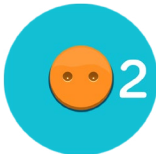Dash or Dot will go to the next state right after finishing the previous action.

Instant
Dash or Dot will go to the next state immediately. Use this when you want to do 2 things at the same time.

Top Button Pressed
Dash or Dot will go to the next state when you press the big white button on Dash or Dot's head.

Clap Heard
Dash or Dot will go to the next state after it hears a clap. Make sure you try this in a quiet room!

Wait For
Dash or Dot will wait for the number of seconds you choose before moving on to the next state. The clock starts when you start the previous state!

Button 1 Pressed
Dash or Dot will go to the next state when you press the orange 1-dot button on Dash or Dot's head. The dot is indented into the button.

Button 2 Pressed
Dash or Dot will go to the next state when you press the orange 2-dot button on Dash or Dot's head.

Button 3 Pressed
Dash or Dot will go to the next state when you press the orange 3-dot button on Dash or Dot's head.

Voice Heard
Dash or Dot will go to the next state after it hears a voice. Make sure to try this in a quiet room so your robot can hear you!

Random Link
Dash or Dot will randomly go to one of the states linked with this cue. Tip: try using this 2x from the same state and see what happens!
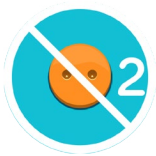
Random Wait
Dash or Dot will go to the next state after waiting for a random time between 0 and the number of seconds you choose. Remember that the clock starts when you start the previous state!

Long Wait
Dash or Dot will go to the next state after waiting the period of time you choose. Remember that the clock starts when you start the previous state.

Top Button Released
Dash or Dot will go to the next state after you release the big white button on the head. Use when you want Dash to do something while you press the button down and then stop after releasing it.

Button 1 Released
Dash or Dot will go to the next state after you release the orange 1-dot button on Dash or Dot's head.

Button 2 Released
Dash or Dot will go to the next state after you release the orange 2-dot button on Dash or Dot's head.
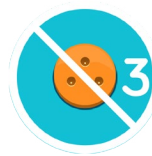
Button 3 Released
Dash or Dot will go to the next state after you release the orange 3-dot button on Dash or Dot's head.

Cues in Wonder for Dash Only
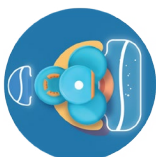
Obstacle Seen
Dash will go to the next state when it sees an obstacle in the front or back. Select the zones that you want activated. If you select "obstacle not seen" and select an active state, Dash will go to the next state when it does NOT see an obstacle.

Dash or Dot Seen
Dash will go to the next state if it sees other robots in front of its eye. You can choose Dot, Dash, or both.
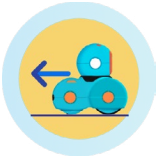
Picked Up
Dash will go to the next state after you pick it up.

Put Down
Dash will go to the next state after you put Dash down.

Stuck
Dash will go to the next state when stuck. This means that Dash is trying to move but can't get anywhere!

Not Stuck
Dash will go to the next state when not stuck. This means whenever Dash can move while its wheels are spinning.

Move Forward
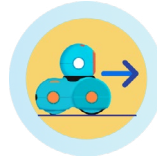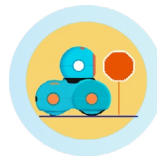Dash will go to the next state if it's moving forward.
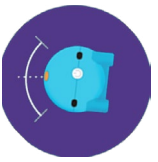
Move Backward
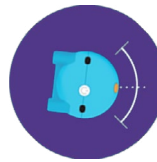Dash will go to the next state if it's moving backward.

Stopped
Dash will go to the next state when it is not moving.

Cues in Wonder for Dot Only

Lean Left
Dot will go to the next state when you tilt it to the left. Make sure you're holding Dot rightside up with the eye looking away from you.

Lean Right
Dot will go to the next state when you tilt it to the right.

Face Down
Dot will go to the next state when its eye is facing down.

Face Up
Dot will go to the next state when its eye is facing up.

Upside Down
Dot will go to the next state when it is upside down, meaning the side with the buttons is facing down.

Right-side Up
Dash will to to the next state when it is rightside up, meaning the side with the buttons is facing up.

Drop
Dot will go to the next state when dropped. What comes up must come down, so it will also trigger after you toss.
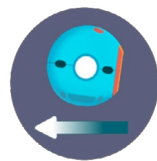
Shake
Dot will go to the next state when you shake it!

Slide Forward
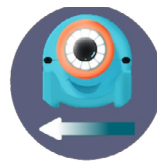Dot will go to the next state after you move it forward, in the direction of its eye.

Slide Backward
Dot will go to the next state after you move it backward, in the direction away from its eye.

Slide Left
Dot will go to the next state after you move it to the left (while the eye is facing away from you).
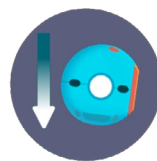
Slide Right
Dot will go to the next state after you move it to the right (while the eye is facing away from you).
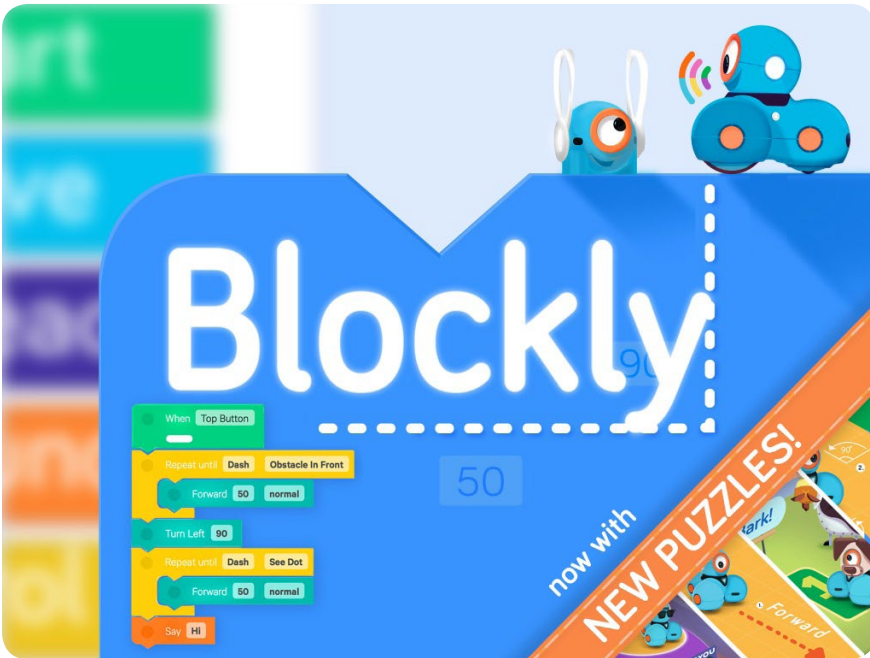
Move Up
Dot will go to the next state after you slide it up, in the direction of its buttons.

Move Down
Dot will go to the next state after you slide it down, in the direction away from its buttons.

Blockly. Take on coding challenges and make your own programs for Dash & Dot using Blockly's block-based coding interface. Programming lets you turn your silliest or most ambitious ideas into reality.

Please note: Wonder is the official app for the Wonder League, but many of you use Blockly so we hope this helps!

How programs work in Blockly

Start with the puzzles to learn about how Blockly works!

Start - connect your first block to the start state. If nothing is attached, nothing happens when you run your program.

Loops - you can put blocks inside of a control block to make a loop! In this case, the blocks inside repeat until there is an obstacle in front.

Block Drawer - select your category and then drag out the blocks you want to use in your code.

Start - tap here to run your program!

Visual input interfaces help guide children in concepts like angles, time, speed, and distance.

Blocks in Blockly

Start

When Dash Button 2

Go to Start

Function Function1

Call Function1

Control how your program will start. Use a block from the Start section to indicate the **event** that will start executing your program. Events in Blockly are the same as Cues from Wonder. Drag and stack additional blocks below a When block to write your program.

Go to Start. This block makes your program go back to the Start block! Usually it will make your program run from the beginning again.

Functions. A function is a mini-program that you can call from anywhere else in your program. Drag a function out, put blocks into it, and then you'll be able to use that program any time you use the "call function" block.

Try making a rainbow color pattern in a function. You can add that entire set of blocks into your program by just using the "call function" block. Functions are friends that make your life easier!

Drive

Forward 50 fast

Backward 50 fast

Turn Left 90

Turn Right 90

Turn to Voice

Stop Wheels

Set Wheel Speed
Left forward fast
Right forward fast

Drive blocks control where and how Dash moves! Forward and Backward blocks use **centimeters** as units, and turns refer to **degrees** as the unit of the turn angle.

Turn to Voice allows you to program Dash to turn towards the sound of your voice. This works best in a quiet room with minimal background noise.

Set Wheel Speed gives you individual control of Dash's wheels. Forward and backward at the same speed makes Dash **spin**. Forward at different speeds makes Dash go in an **arc**. Try different combinations out! Note: to stop Dash's wheels add the **Stop Wheels** block.

Look

Make Dash's head move up, down, left, or right. Units refer to **degrees**. Degree units are absolute, meaning **Left 30** sets the head at 30 degrees left from a neutral straight position.

Look towards Voice allows you to program Dash's head to look towards the direction of the sound of a voice. This works best in a quiet room with minimal background noise.

Look left 90

Look up 22

Look towards Voice

Light

Control Dash & Dot's lights to give your program some color and effects!

All Lights light up Dash's ears and chest with the color you pick. It lights up Dot's ears and backlight.

Left Ear / Right Ear light up Dash or Dot's left or right ear with a color.

Front lights up Dash's chest or Dot's backlight.

Eye Pattern indicates the pattern of the 12 LED eye lights. Tap each light to turn it on in Dash or Dot's eye!

All Lights

Left Ear

Right Ear

Front

Tail on

Eye Pattern All on

Sound

Dash & Dot love to play sounds—go into each category and pick a sound to add some fun effects to your programs!

Say Hi

Animal Horse

Transport Fire Siren

Weird Beeps

My sounds #1

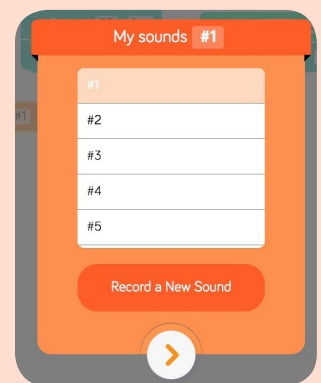## Recording a custom sound in Blockly

Select A Slot

1 2 3 4 5 6

1) Pick a slot for the sound you're about to record. Robots can store 10 custom sounds at a time.
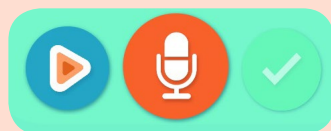
2) Press the **record** button. Press the **play** to test. Then press **check** to transfer to the robot!

My sounds #1

#1
#2
#3
#4
#5

Record a New Sound

3) The # you pick must match the slot for the sound you recorded.

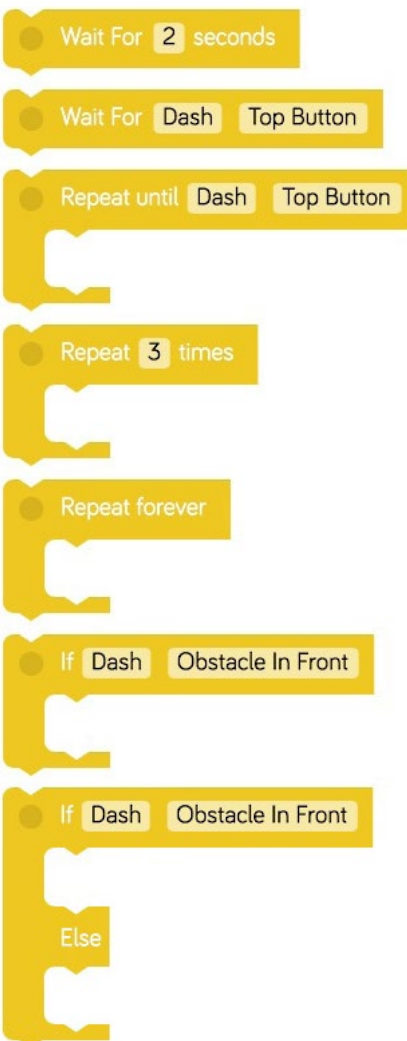# Animations

Use **Animations** to make Dash or Dot do fun dances, greetings, expressions, and more! Try it out!

Greet Dash Hi

Dance Dash Confident

Expression Dash Laugh

Race Dash Take Off

Answer Dot Maybe

Play Dot Hold

Control

Control how Dash & Dot interact with each other and their environment!

Wait For 2 seconds

Wait For Dash Top Button

Repeat until Dash Top Button

Repeat 3 times

Repeat forever

If Dash Obstacle In Front

If Dash Obstacle In Front

Else

Wait for # seconds - Have Dash or Dot wait for a set period of time before continuing your program.

Wait for [event] - Dash or Dot will wait for an event to be triggered before moving to execute the rest of the program.

Repeat until - Dash or Dot will run the blocks inside the brackets until the event you pick is triggered.

Repeat # times - Dash or Dot run the blocks inside the bracket for a set number of loops!

Repeat forever - it's like the song that never ends. Beware!

If - Dash or Dot will run the blocks inside the bracket if the condition is present. This block only checks when your program is passing through it.

If / else - Dash or Dot will run the blocks inside the first bracket if the condition is present. If the condition is not present, it will run the blocks inside the second bracket.

Variables
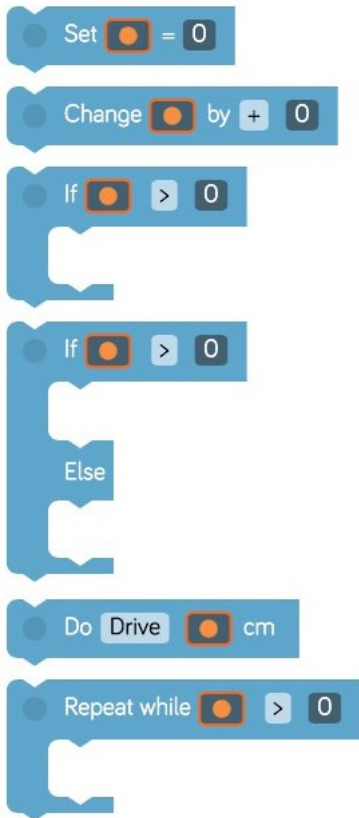
In programming, **variables** act like boxes to hold values. They're called "variables" because what's in them can "vary" or change.

Why would you want to use a variable?
1. They make code shorter.
2. They make code easier to read.
3. They make code easier to change.

For a detailed explanation of how variables work in Blockly, go to this handy PDF!

There are also several puzzles towards the end of the map for Dash and Dot that teach you how to use variables!

Saving and Creating Projects

Blockly allows you to save, create, and load sample projects. This allows students to name their projects and save them to their tablets. If you need to look at their programs for any reason, just tell them what to save it as, and you can easily find it on their tablet.
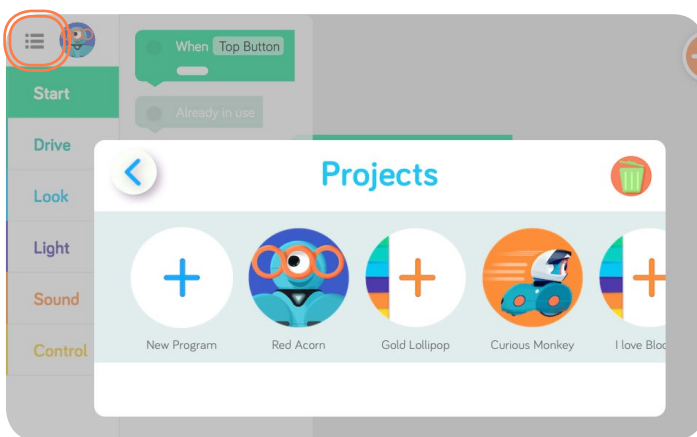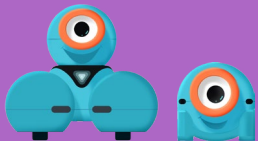
Tap the hamburger menu on the **top left hand side** of the app go to the menu. From here, you can create a new program, load an existing program, or do puzzles!
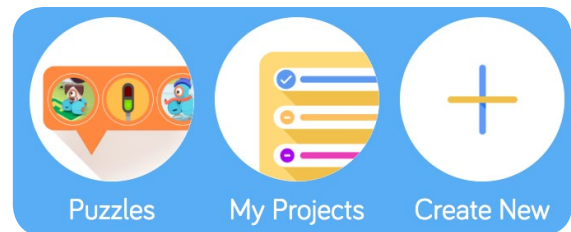
Curriculum

Check out our teacher portal to find lessons for Blockly:
teachers.makewonder.com

Wonder League Robotics Clubs

Inspiring Future Technology Leaders

The **Wonder League** is a worldwide community of clubs inspiring the creators of tomorrow through robotics and coding. Every year clubs participate in the **Wonder League Robotics Competition**, where they design solutions to real-world science and technology challenges. Children will develop problem solving and creativity skills, learn about issues facing the world around them, and build meaningful relationships with their peers.

"The creativity they inspire is boundless and memorable. Students receive practice in developing their ability to think fluently, flexibly, and creatively." **- Julia Dweck from East Penn School District in Macungie, PA**
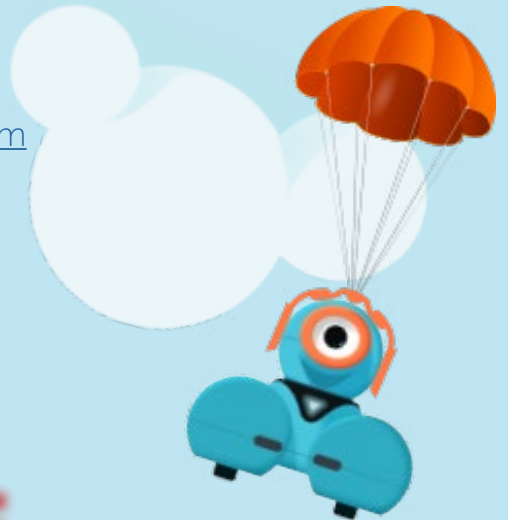
Links to help you get started!

Teacher portal   Lesson Plans   About Curriculum

Videos:
- About coding and robotics
- Getting started in the classroom
- Channel for teachers
- Dash & Dot Show

Programming Challenges (coming soon)

Sign up at clubs.makewonder.com to start your club and lead the movement today.

wonder workshop