Blockly for Dash & Dot

Lesson Ideas

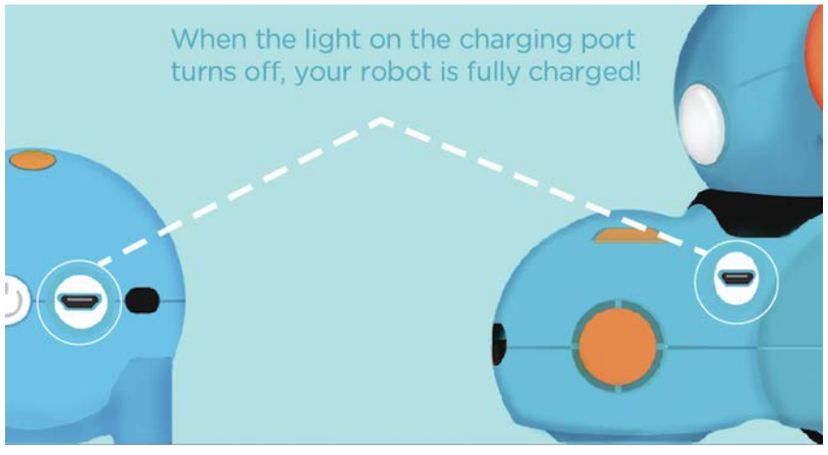
Dash & Dot are exciting, hands-on learning tools for students in grades K-5. Targeted at teaching creative problem solving and computational thinking, they help students learn fundamental processes relevant for all 21st century skills.

This book provides teachers with ideas on how to integrate Dash & Dot in the classroom for coding as well as other STEM subjects. These activities are designed to encourage students to think in new ways with hands-on application.

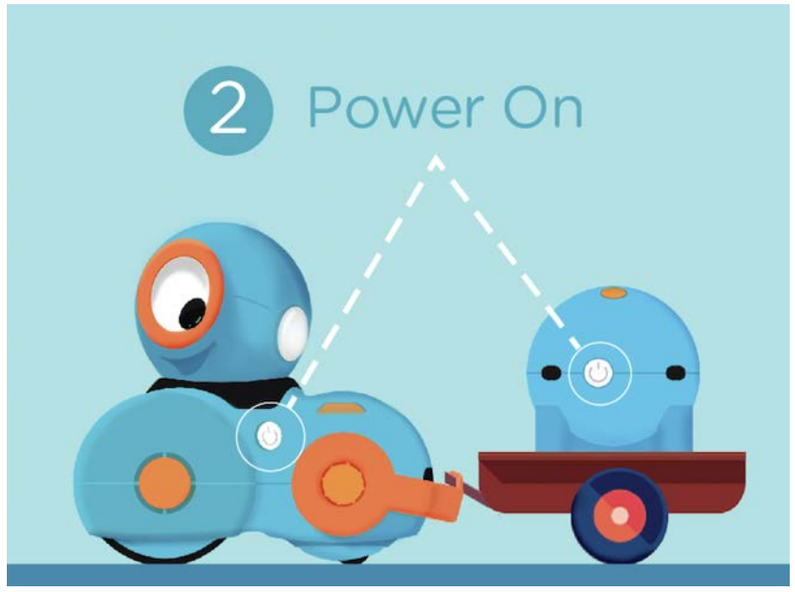
Getting Started

Setting up your robots is easy, and a getting started guide is included in every box! Here are some tips for classrooms that have multiple robots. Check out makewonder.com/start.

1 **Name your robots.** To connect your tablet to the right robot when using multiple robots, we recommend naming each robot 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!

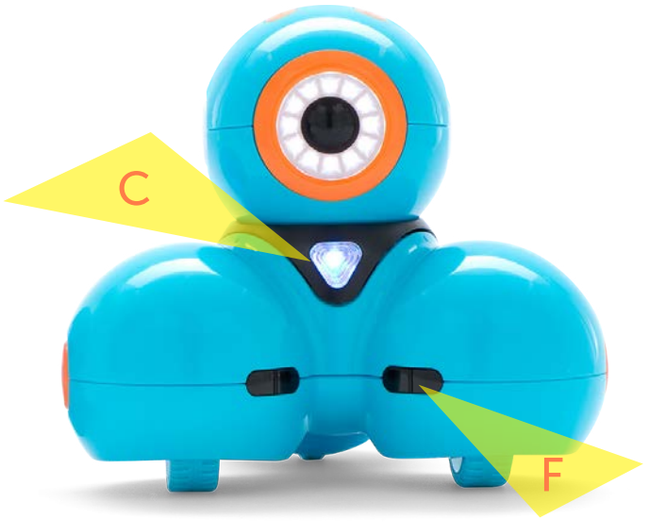


2 **Download** Go for Dash & Dot Robots from the App Store to update and set up their names so that your tablets can identify them. To connect, make sure Bluetooth is enabled on your tablet, and that your robots are powered on. Each robot has to be set up separately.



3 **Charge your robots.** Dash & Dot have rechargeable batteries, so you never need to replace them. Simply plug them into the wall or computer with the included USB charging cable. A full charge cycle takes about 60 minutes and gives about 3 hours of play time. We recommend a 5 port or 10 port charging station if you have multiple robots in your classroom.

How Dash & Dot Work



Dash

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

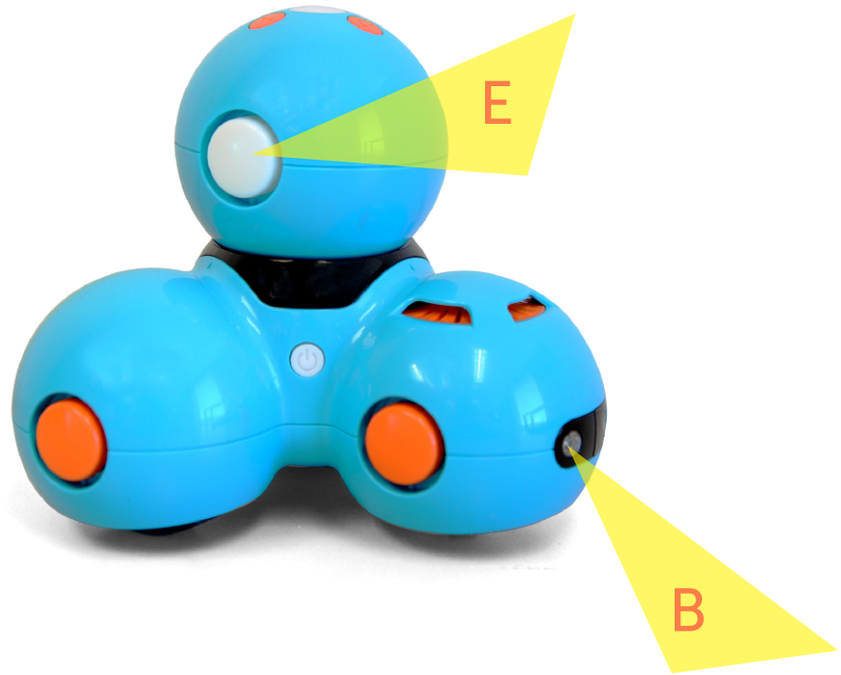
Head Motion - Dash can look up (25 degrees), down (10 degrees), left (120 degrees), or right (120 degrees).

Lights - There are 12 LEDs in Dash's eye that can be turned on or off. In Dash's ears (**E**) and chest (**C**), there are RGB LEDs. In Dash's tail, there are 2 red LEDs.

Sounds - Includes a variety of pre-programmed sounds!

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.



Dot

Lights - There are 12 LEDs in Dot's eye that can be turned on or off. In Dot's ears and eye, there are RGB LEDs.

Sounds - Includes a variety of pre-programmed sounds!

Microphone - Dot has 1 microphone, allowing Dot to hear claps and voices.

Accelerometer - Dot's accelerometer allows Dot to know when you are tossing, shaking, moving, or tilting Dot. Note: Dot's Blockly events are from Dot's perspective, so you should hold it from behind to have the same perspective.

Look Up

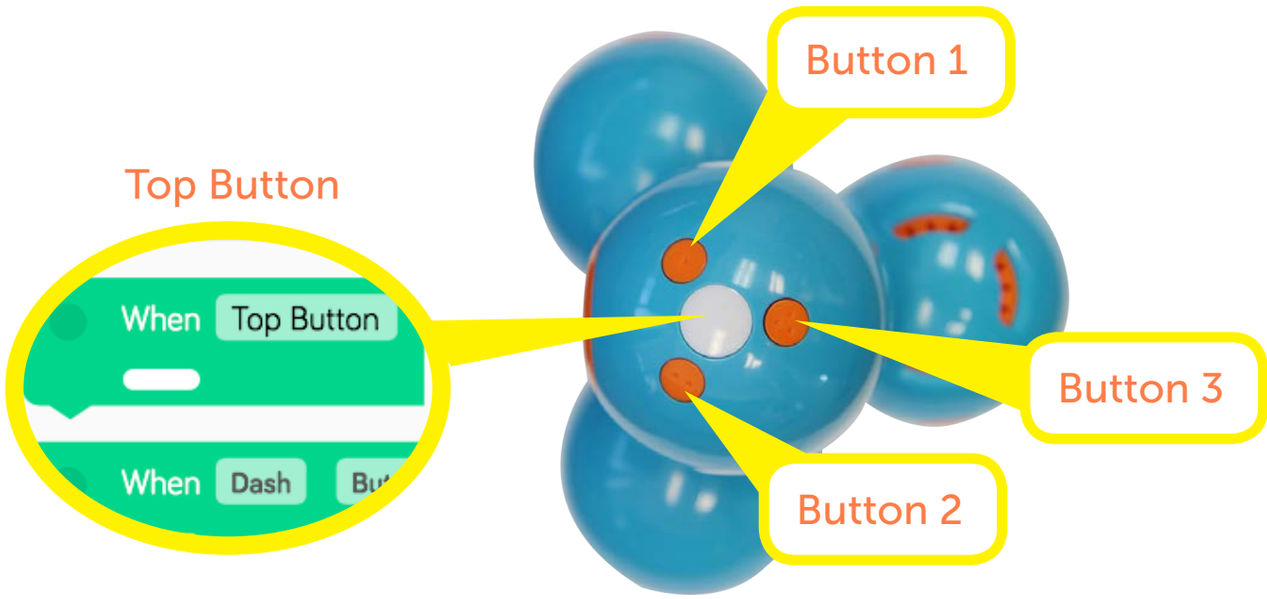
Look Down

Lean Right

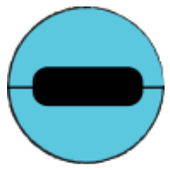
Lean Left

Dash & Dot

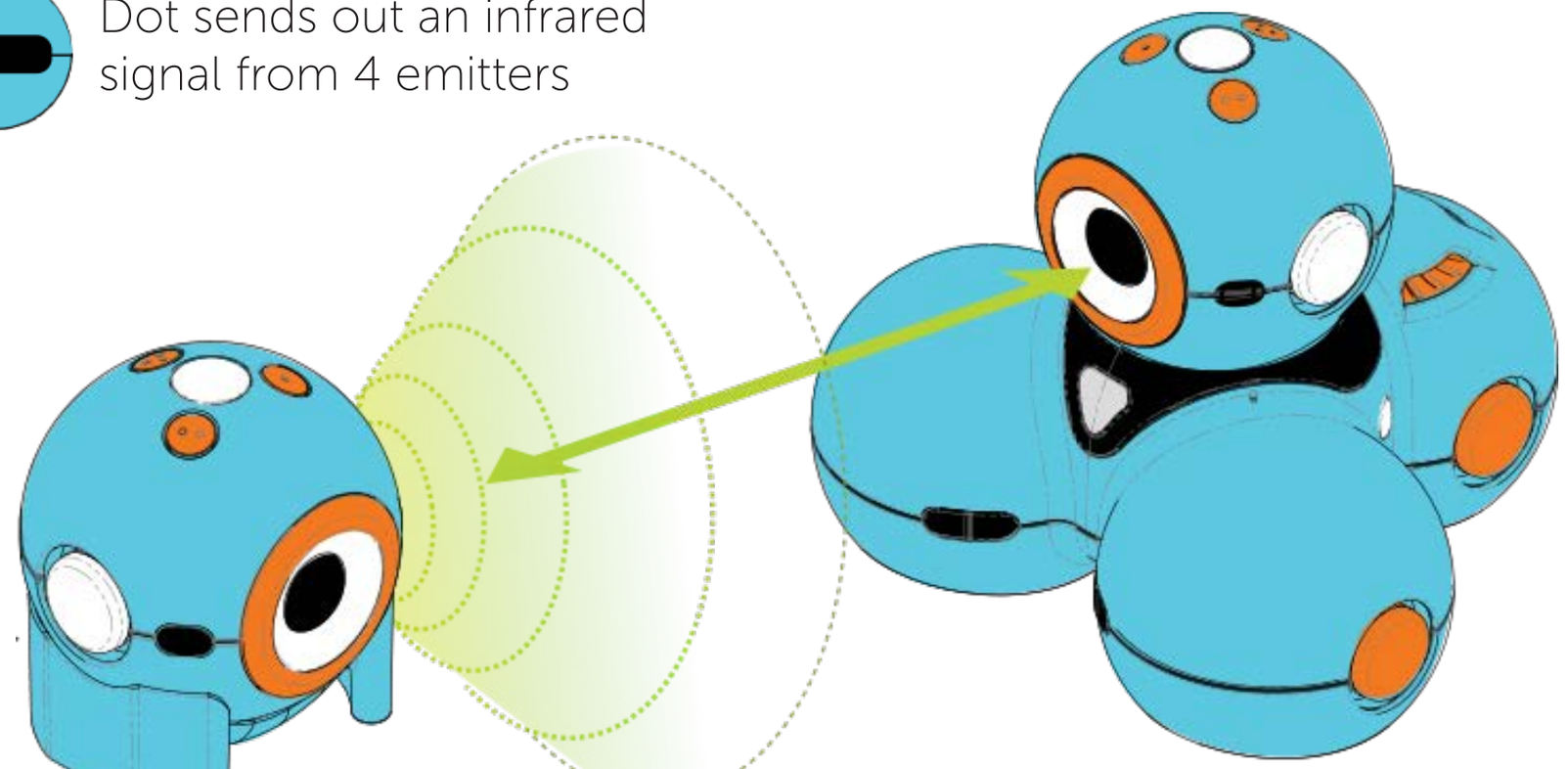
Buttons - Dash & Dot have 4 programmable buttons on their heads.



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!

Please note that Dash & Dot are compatible with the following devices: iPad 3 or newer and iPad Mini.
Due to Bluetooth specifications, they are not compatible with iPad 2 or older.

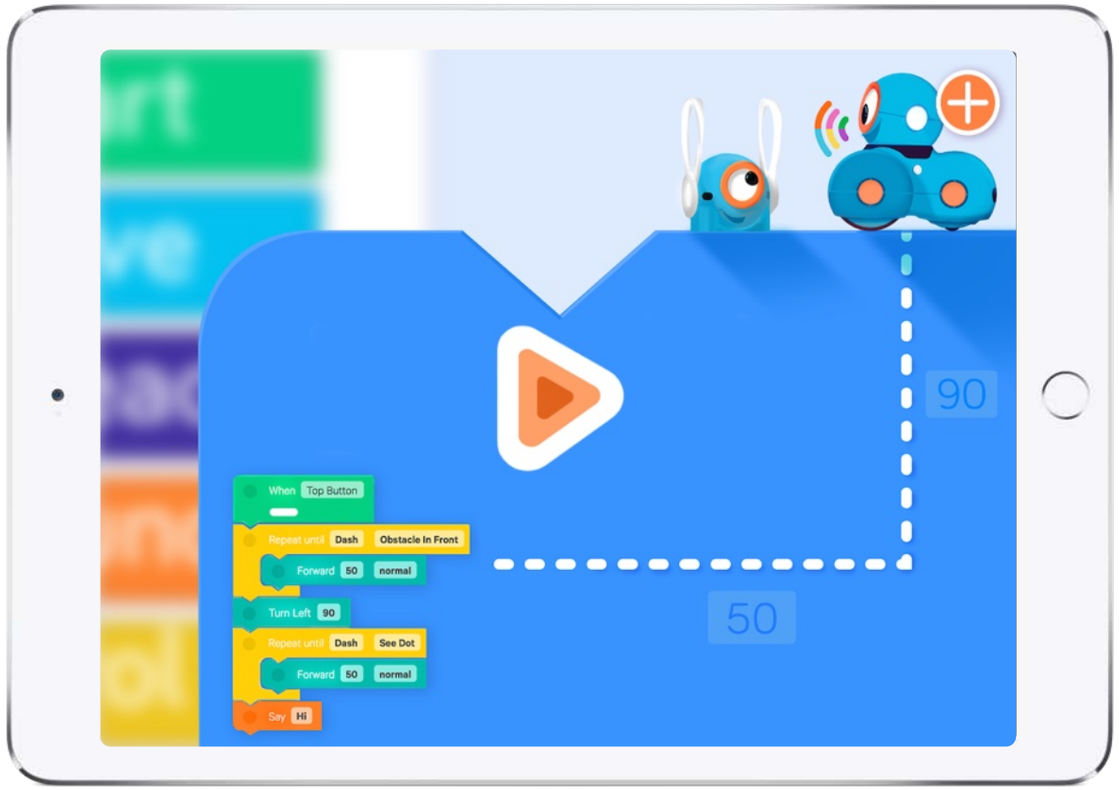
There are four free iPad apps available in the App Store: Go, Path, Blockly, and Xylo

Blockly

Develop creative problem solving and computational thinking skills with a drag-and-drop programming tool, and then bring programs to life with Dash & Dot robots.

BENEFITS

- Easy-to-use, intuitive drag and drop interface lets students and teachers get started quickly and provides a long journey of learning and play.
- Open-ended environment allows for creativity and flexibility.
- Works with iPad 3 (or newer) and iPad Mini. Use with Dash & Dot robots by Wonder Workshop.

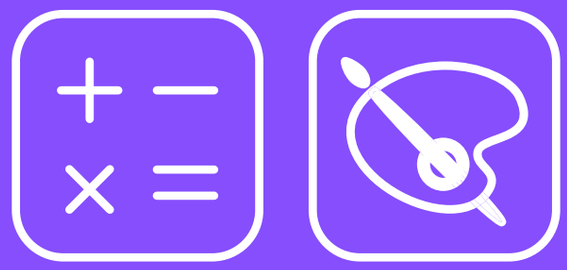


Download Blockly from the App Store

Blockly Glossary

Coding

Ages 5–10



Intro to Dash & Dot

Dash & Dot are ready to meet your students!

OBJECTIVE

In this lesson, students will be introduced to Dash & Dot, programmable robots that help kids learn the fundamental concepts of problem solving and computer science. They will also get an overview of Blockly, a drag-and-drop visual programming tool and begin to think of the possibilities of programming robot behaviors and reactions.

OVERVIEW

Topic	Computer Science
Target age	5-11
Ideal group size	2 students
Time to complete	30 minutes

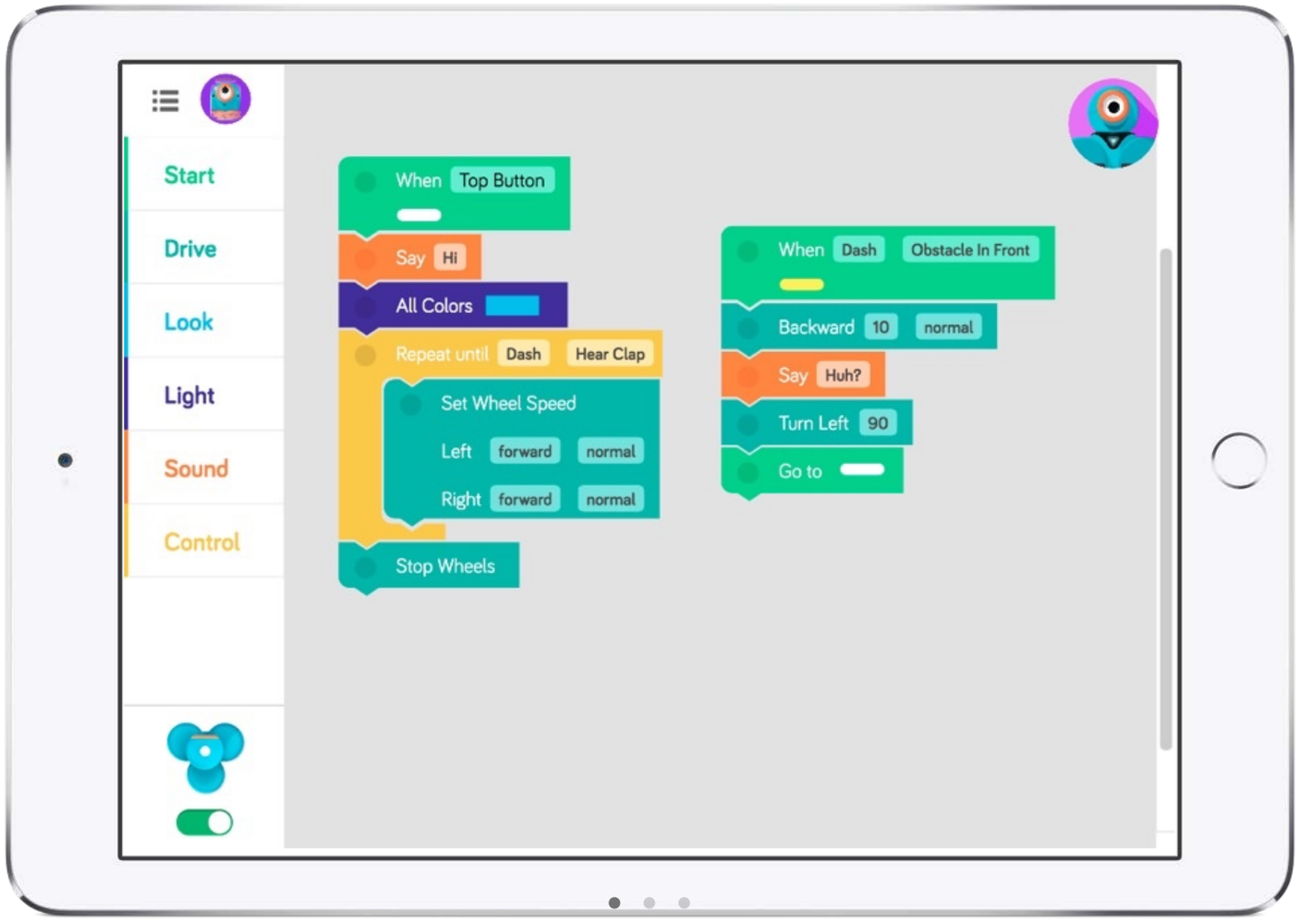
ACTIVITY

1. Introduce Dash & Dot! Explain what robots are and that robots can be programmed. Point out different sensors on the robot.

2. Give students an overview of the Blockly app. Show them how to drag and drop blocks to give commands to the robot, create new projects, and run the programs on the robots.

3. Separate students into groups and give them an iPad, a Dash & Dot, and a handout. Ask students to explore Blockly on their own and write down what they would like the robots to do.

4. After the lesson, have students share what they'd like the robot to do and their thoughts about programming Dash & Dot with Blockly.



Sample brainstorm handout

Creating and Solving Mazes with Dash

Created by Smita Kolhatkar, K-5 tech coordinator at Barron Park Elementary in Palo Alto, CA

OBJECTIVE

In this lesson, students will design their own mazes for Dash to go though and then use the Blockly app to program the robots through it. They will learn about design thinking, spatial reasoning, measurement, angles, sequencing, events, sensors, and loops.

OVERVIEW

Topic	Design Thinking and Computer Science
Target age	6-10
Ideal group size	2 students
Time to complete	30-60 minutes

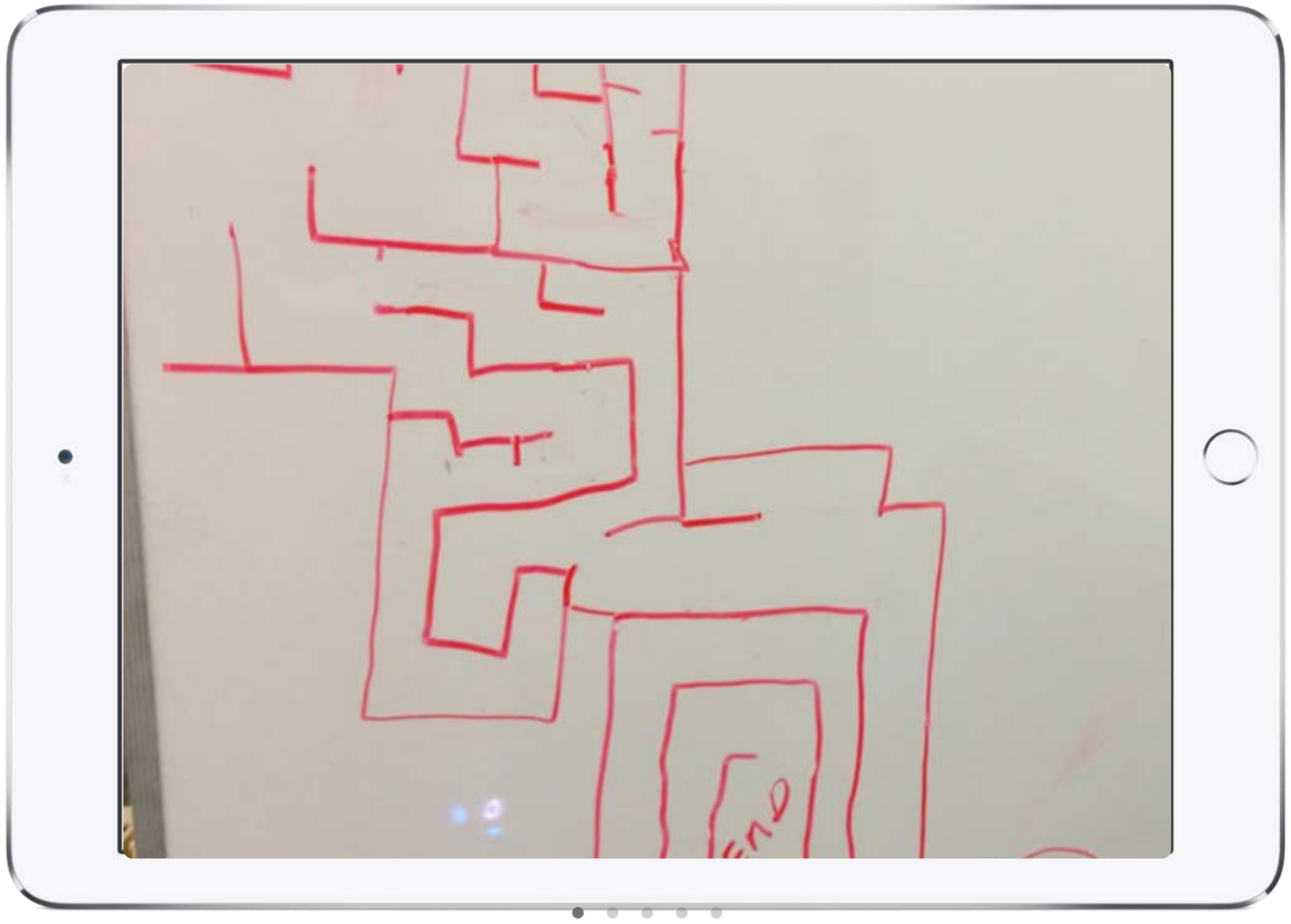
ACTIVITY

1. Ask the students to design their maze using whiteboards or paper. Ask them to come up with their own constraints based on what they know about Dash, or give them constraints (walls must be 11+ inches wide, turns must be 45 or 90 degrees, and so forth).

2. Next, the students will build their mazes using blocks such as Keva Planks in the classroom. Students might have to iterate on their designs as they try programming Dash through the maze.

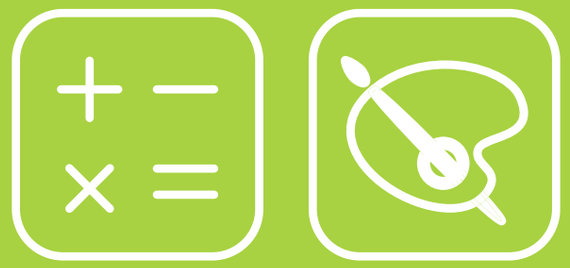
3. Using an iPad and a Dash, students will program Dash through the maze using sequences of Drive blocks. You might want to introduce event sensors such as “Obstacle in Front” so that students can use loops to make their programs more efficient.

4. Wrap up! Ask students about what they learned about designing mazes. Have students share their programs and show how they navigated Dash through the maze.



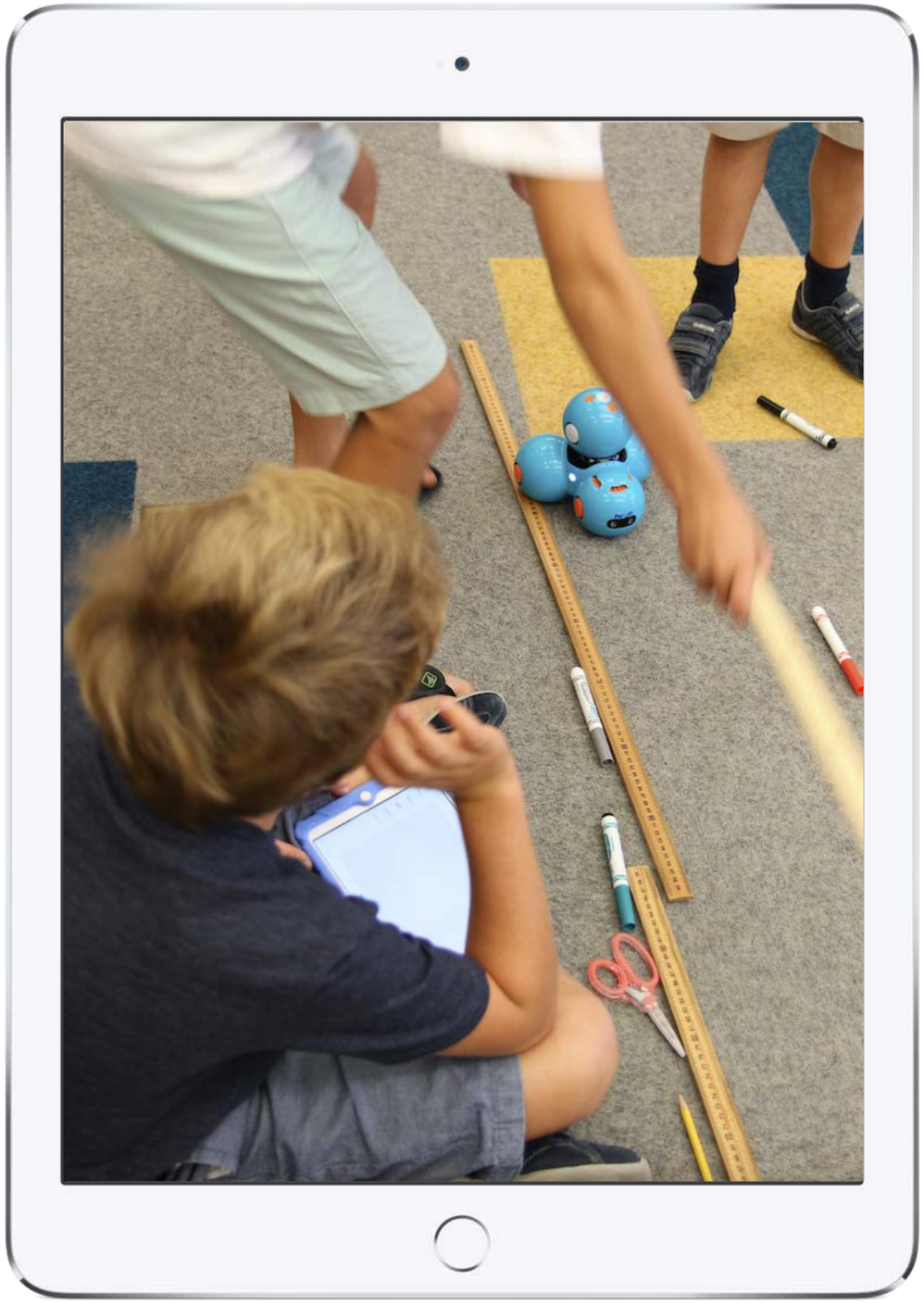
Math

Ages 5–10



Number Line Moves

Created by Michelle Eckstein, 1-5 Tech Teacher at Peak to Peak Charter School, Lafayette, CO



OBJECTIVE

In this lesson, students will create simple sequences in Blockly to program Dash to move forward in a line. They will learn to debug programs, as well as add and subtract by multiples of 10.

OVERVIEW

Topic	Mathematics and Computer Science
Target age	5-7
Ideal group size	2 students
Time to complete	30 minutes

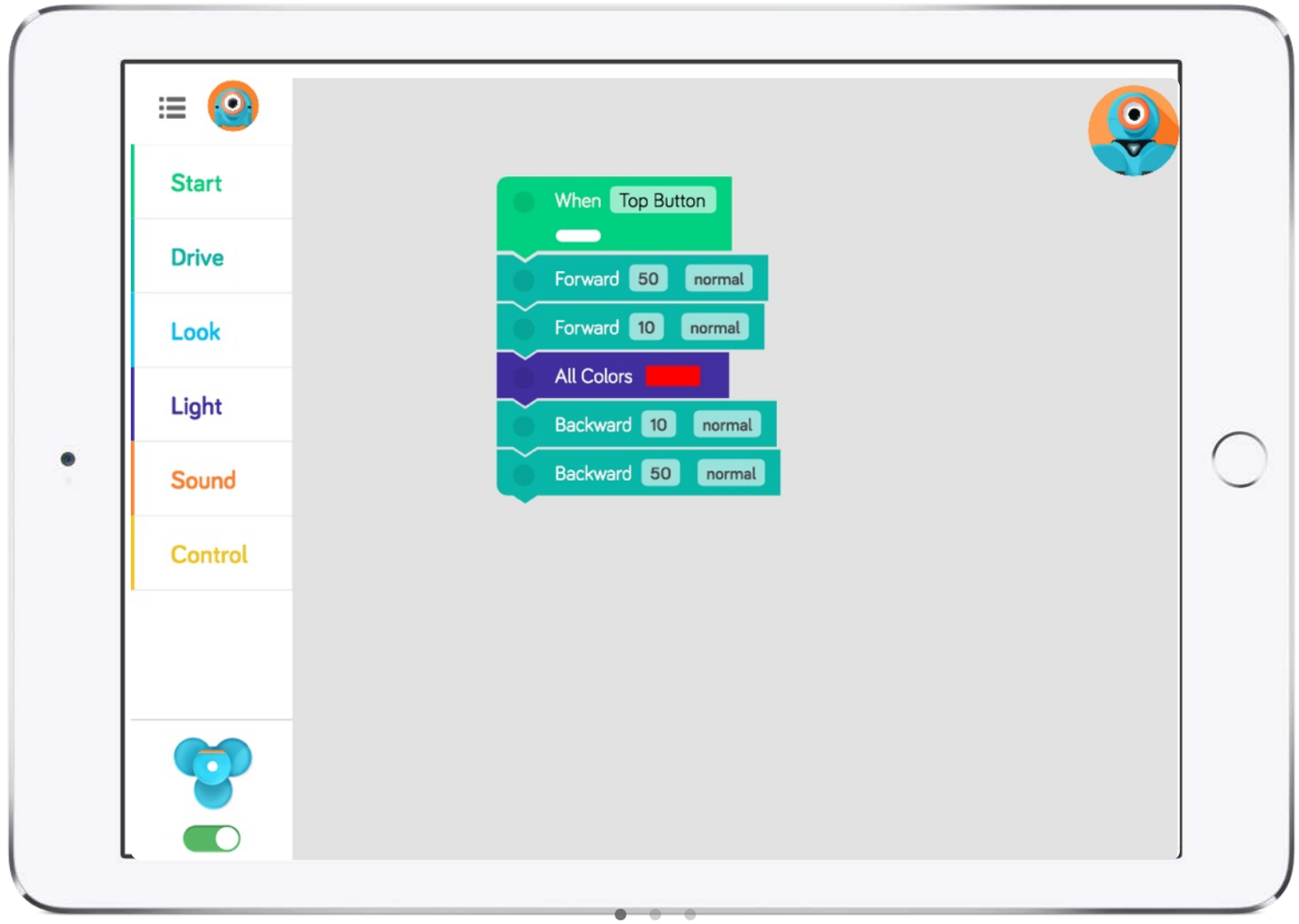
ACTIVITY

1. Create a 120cm number line for each station with each 10cm interval marked. You can scale this up and down - even using negative numbers or loops for multiplication.

2. Give students an overview of how the Blockly app works, where you can find the Top Button, and how you can move the robots with Drive blocks.

3. Each group gets a number line, recording sheet, Dash, a pencil, a numbered dice (in 10s), and an iPad. For more recording sheets and details, check out this slideshow.

4. Upon completion, have students choose where Dash ends up on the number line and create any sequence to get there. Students can present their sequences and what they learned.



Common Core State Standards Initiative: Mathematics

CCSS.MATH.CONTENT.1.NBT.C.4 - Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

CCSS.MATH.CONTENT.1.NBT.C.5 - Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

CCSS.MATH.CONTENT.1.NBT.C.6 - Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

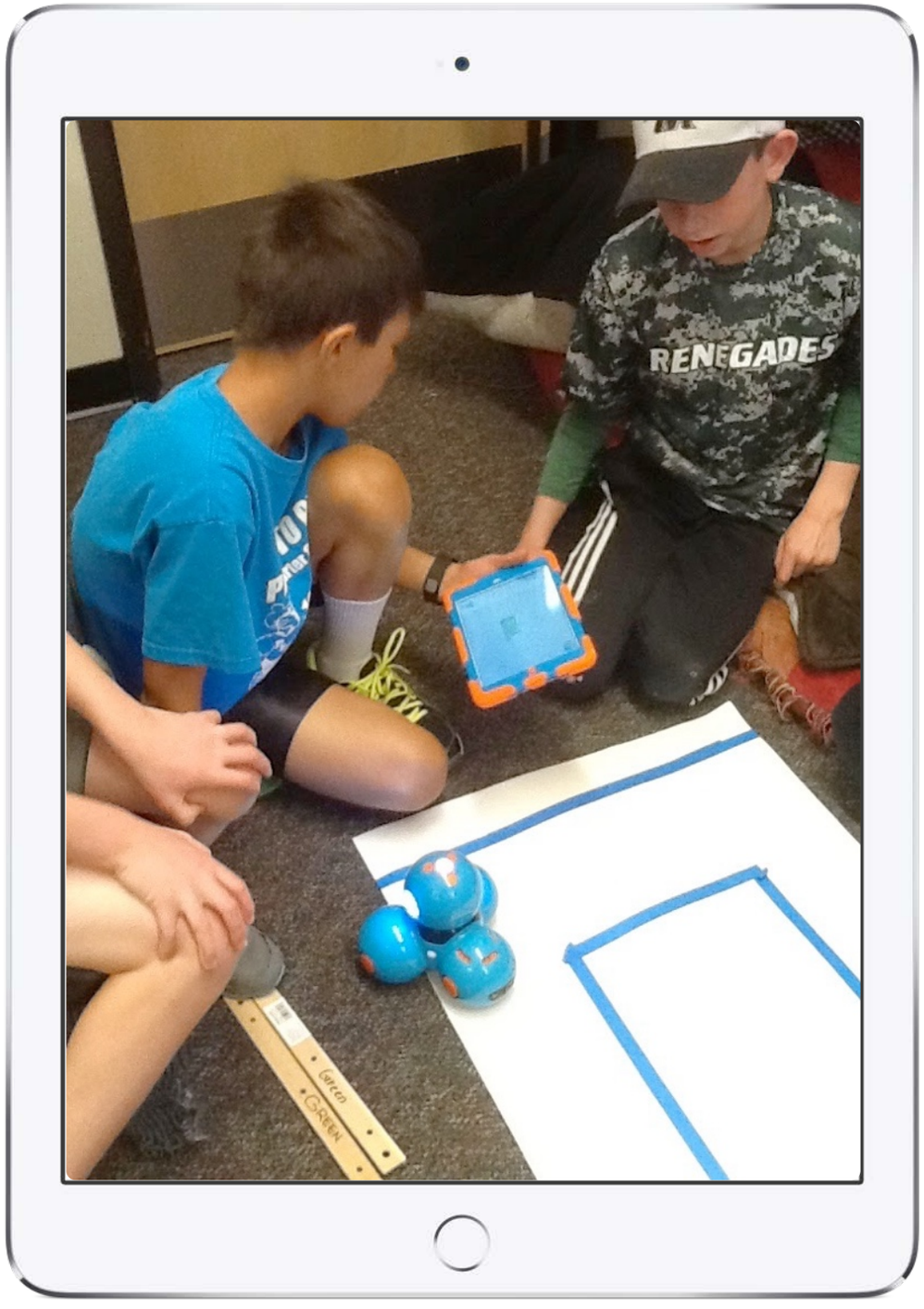
Computer Science Standards

ISTE Standard 4: Critical thinking, problem solving, and decision making:
Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

- Identify and define authentic problems and significant questions for investigation
- Plan and manage activities to develop a solution or complete a project
- Collect and analyze data to identify solutions and/or make informed decisions
- Use multiple processes and diverse perspectives to explore alternative solutions

Loopy Shapes with Dash

Created by Michelle Eckstein, 1-5 Tech Teacher at Peak to Peak Charter School, Lafayette, CO



OBJECTIVE

This lesson is designed to use Dash & Dot robots and programming to support geometry lessons in identifying, classifying, describing, and finding the perimeter of quadrilaterals. Students will create quadrilaterals by building a pen attachment for Dash (optional) and using loops, angles, and distance traveled.

OVERVIEW

Topic	Mathematics and Computer Science
Target age	8-10
Ideal group size	2 students
Time to complete	30-60 minutes

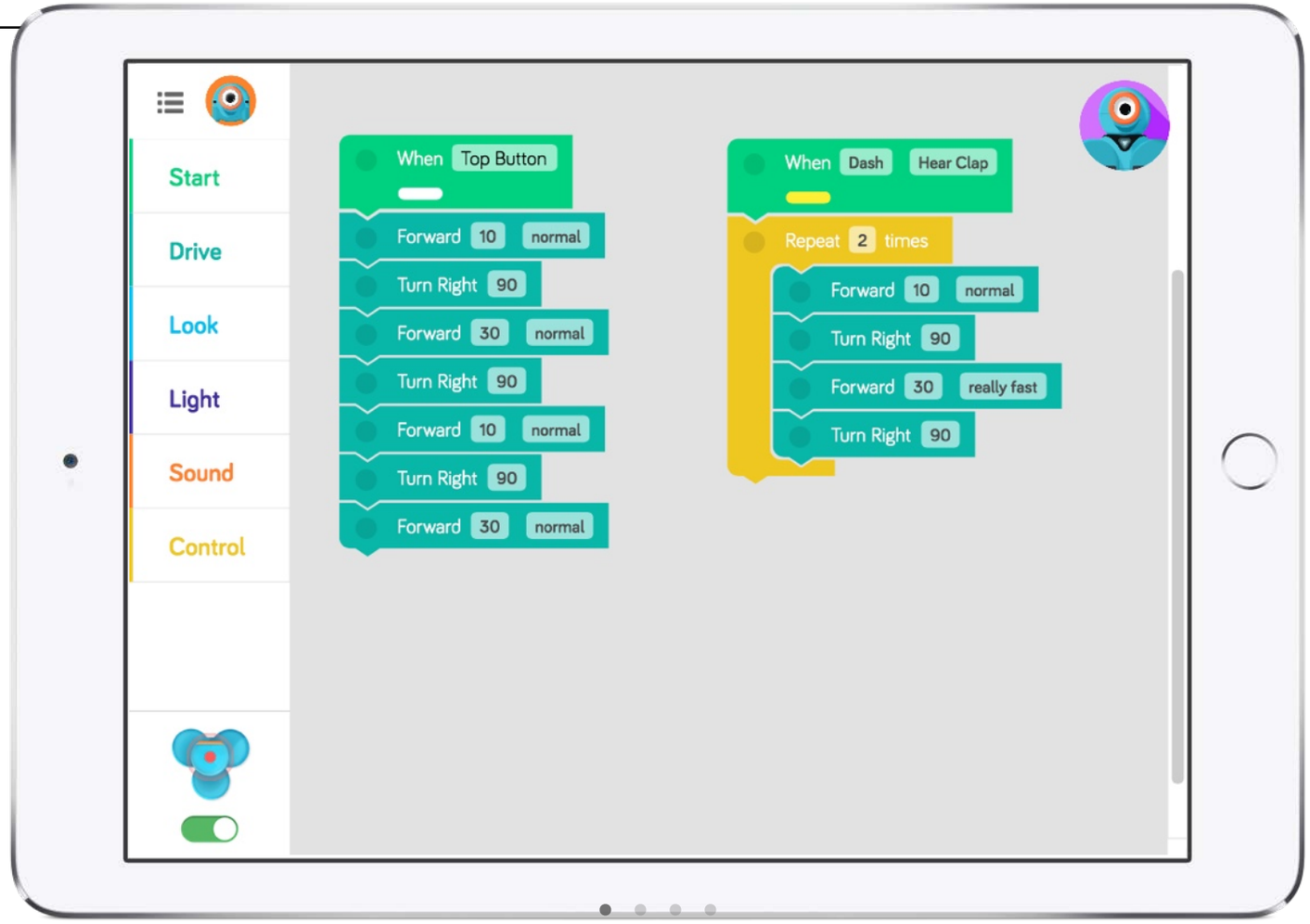
ACTIVITY

1. Review the geometry concepts covered: angles, perimeter, types of quadrilaterals (square, rectangle, parallelogram, trapezoid, triangle, rhombus), and area (if applicable).

2. Give each group a meter stick, masking tape, a Dash robot, and an iPad. Use these challenge cards (with varying levels of scaffolding) to provide instructions for the students.

3. Upon completion, here are some extension questions: What shapes can you make with loops? What shapes can only be created with individual lines of code and no loops? What patterns did you notice?

4. Design thinking and engineering extension: create a pen holder to draw the shapes on butcher or poster board paper. Students will need LEGO brick connectors, standard LEGO bricks, 2 rubber bands, and markers.



Common Core State Standards Initiative: Mathematics

CCSS.MATH.CONTENT.3.MD.D.8 - Geometric measurement: recognize perimeter. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

CCSS.MATH.CONTENT.3.G.A.1 - Reason with shapes and their attributes. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

Computer Science Standards

ISTE Standard 4: Critical thinking, problem solving, and decision making:
Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

- Identify and define authentic problems and significant questions for investigation
- Plan and manage activities to develop a solution or complete a project
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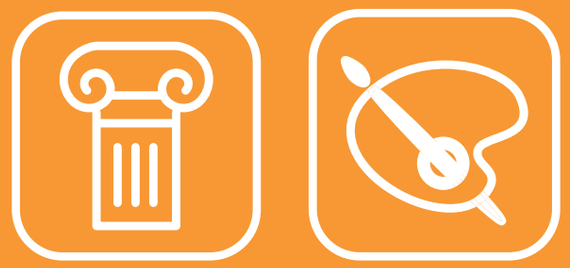
- Use multiple processes and diverse perspectives to explore alternative solutions

English Language Arts

Ages 5-10



Dash's World Adventure

Created by Terri Eichholz, K-5 Gifted Teacher at North East Independent School District in San Antonio, TX

OBJECTIVE

Students will use Dash & Dot to support their learning about countries and continents around the world. In addition, students will incorporate creative writing and storytelling and learn how programming can be an avenue for creative expression.

OVERVIEW

Topic	Geography, Creative Writing, Computer Science
Target age	6-9
Ideal group size	2 students
Time to complete	30-60 minutes

ACTIVITY

1. You will need a world map for the floor, or have students cut out their own continents and countries. Give each group a Dash & Dot, an iPad, and a story prompt.

2. Read the Dash for a Treasure story out loud and pause at each scene so students can complete the programming challenge. Alternatively, higher grade level students can write their own stories. Make sure they incorporate diverse map locations and Blockly commands in the narrative.

3. Allow students to come up with their own endings. Review concepts learned in this activity, such as locations of continents, cardinal directions, as well as angles and programming concepts in Blockly.

Robot Storyteller

Create your own puppet show with Dot at the helm as the puppetmaster.

OBJECTIVE

In this lesson, students will combine coding with creative writing and storytelling. Concepts learned include algorithm design, command sequences and control flow, as well as creative storytelling with reinforcement of an episodic story arc structure.

OVERVIEW

Topic	Creative Writing, Computer Science
Target age	7-10
Ideal group size	2 students
Time to complete	30-60 minutes

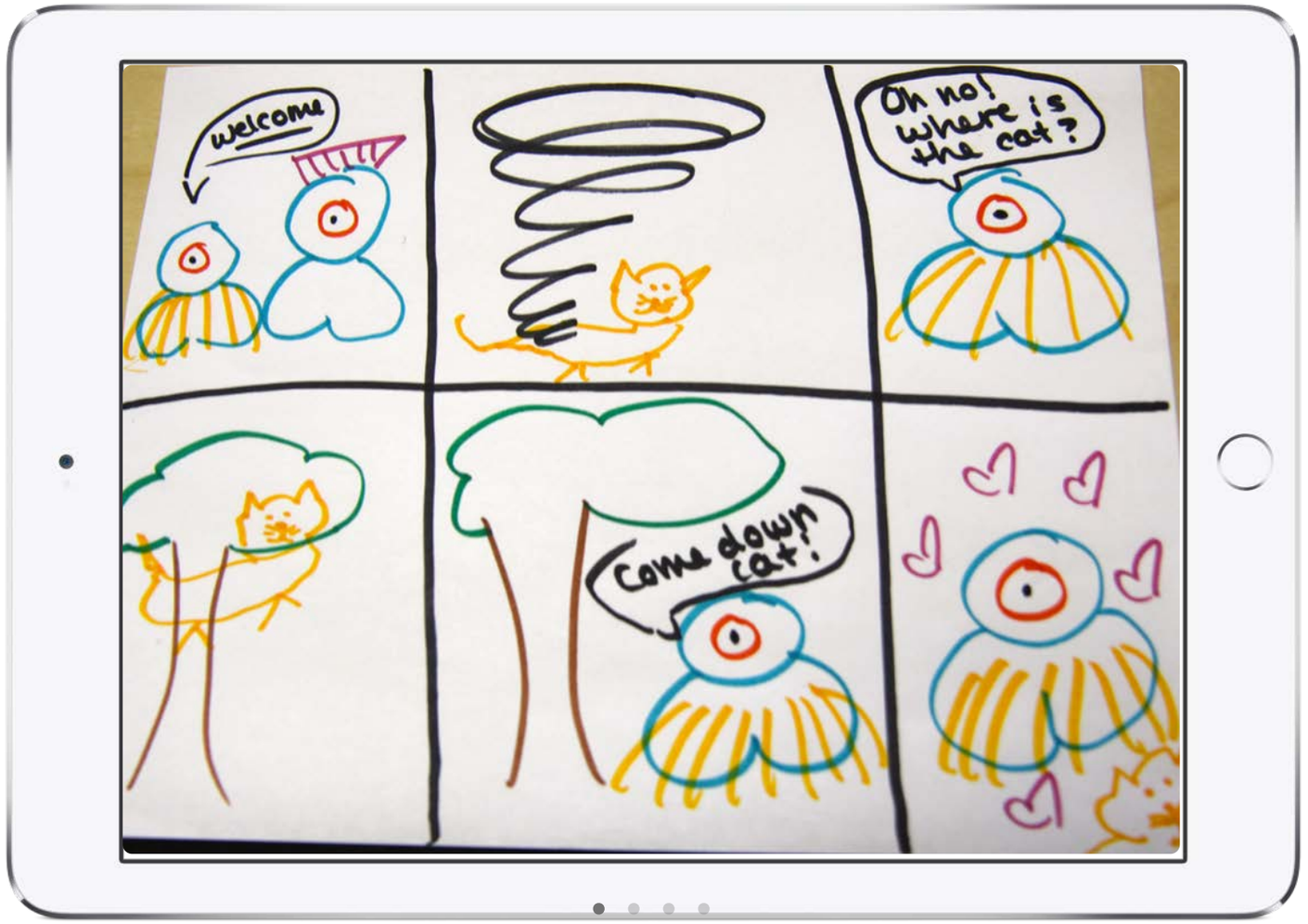
ACTIVITY

1. Have students plan out the story they are going to tell with Dash & Dot as the main characters by writing or sketching out the following parts: setting, conflict and challenge, climax, and resolution.

2. Students will then create the setting and dress up their robot characters using various props around the classroom. Some supplies can include: construction paper, pipe cleaners, fabric, scissors.

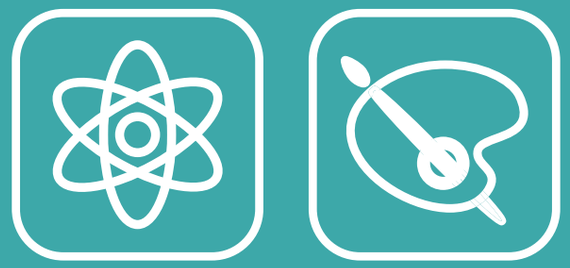
3. Next, it's time to bring the story to life with the robots! Give each group an iPad. Students can create a program that follows a plot line or allows for some improvisation by using Dot as the puppet master.

4. After the lesson, have a show & tell where students can share their videos with the class along with a brief summary of their story arc and the process they used when planning their storytelling adventures.



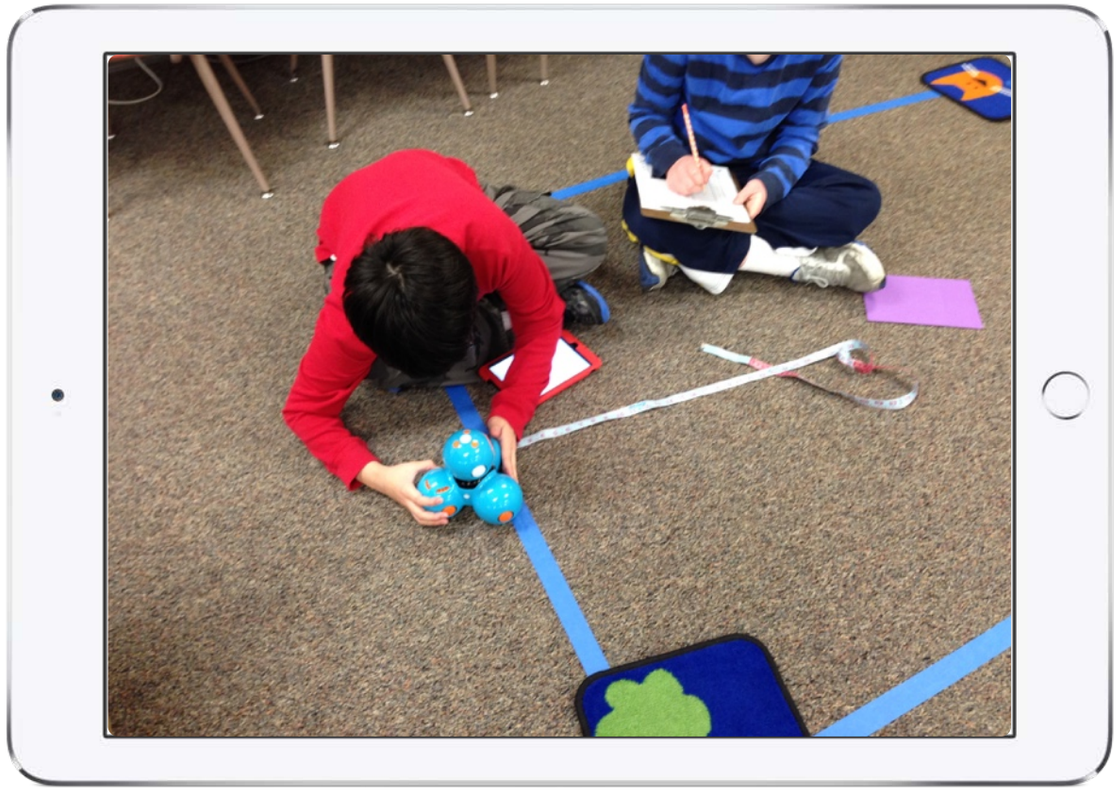
Science

Ages 5-10



How fast and how far with Dash

Created by Susan Prabulos, K-5 tech teacher at Meadow Lane Elementary in Lincoln, NE



OBJECTIVE

In this lesson, students will learn the steps of the scientific method through hypothesis testing using Blockly programming and Dash robots. They will learn about defining variables, formulating hypotheses, data collection, analysis, and interpretation.

OVERVIEW

Topic	Science and Computer Science
Target age	8-10
Ideal group size	2 students
Time to complete	30 minutes

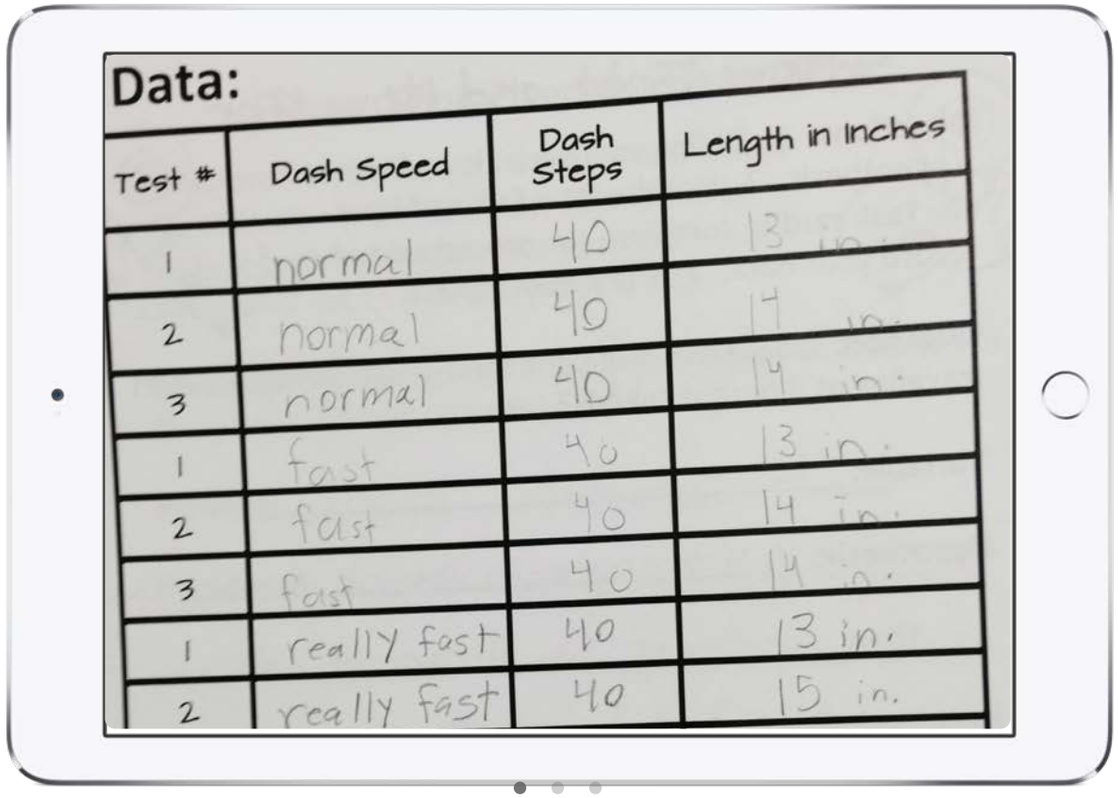
ACTIVITY

1. Review the scientific method. Either define a research question for the students, or have them define their own. In this example, the question was: Does Dash travel different distances at different speeds?

2. Divide the students up in groups and give each group an iPad, a Dash, measuring tape, a push pin to secure the tape, a recording sheet, and pencil. Ask students to define their variables and create their hypothesis.

3. After the students designed their experiments, it is time to collect data. In this case, we asked each group to select a consistent distance to move (e.g., 40 cm). For the chosen distance, run three tests with Dash set at each speed (i.e., very slow, slow, normal, fast, really fast). Measure and record each observation in the recording sheet.

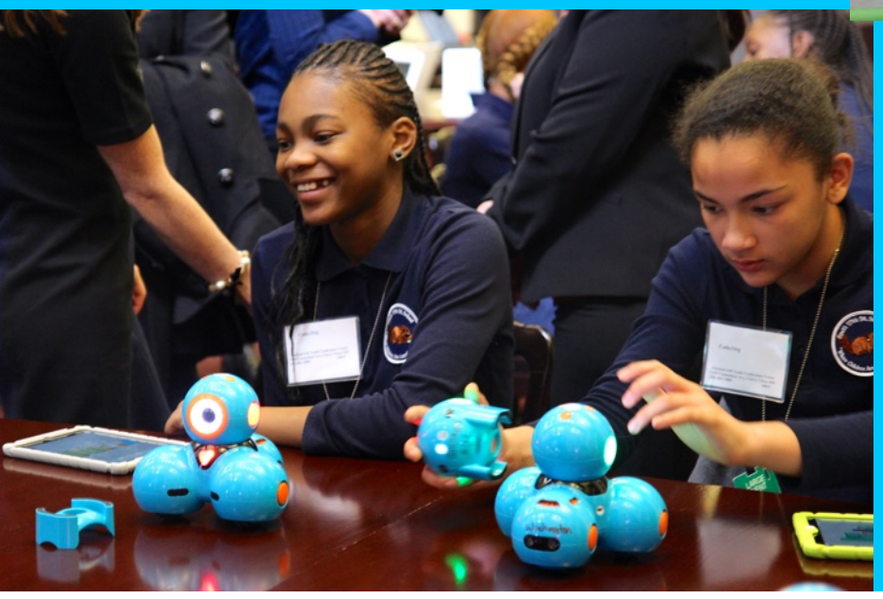
4. Have each group look at their data recording sheet and look for patterns among the data. Have each group of students report if their results supported their hypothesis, and why or why not? In scientific studies, results typically raise additional questions. As a learning extension, ask students to think of what further questions they might want to ask using the scientific method and Dash & Dot.



Why Dash & Dot?

Introduce students to STEM, coding, and robotics from a young age, before they enter middle and high school.

Highly engaging across both genders, as Dash & Dot are equally appealing to girls and boys.



Students practice project based learning applications for core subjects like Math, Science, and English Language Arts.

"Student engagement and motivation has been one of the highest I have seen with any electronic device to hit an elementary school campus. They have been instrumental in teaching students empathy, cooperative play, teamwork, patience, resilience, persistence and taking risks. If you want your children to start enjoying programming young, if you want your children to learn the life skills mentioned above, if you want your children to become bold thinkers, I would highly recommend these robots."
- Smita Kolhatkar, Barron Park Elementary, Palo Alto, CA

Tips & Resources for the Classroom

Wonder Magazine

Each month we publish a free digital magazine full of curated ideas, projects from the community, and featured classrooms around the world.

Ideas from the Community

Explore our Play Ideas for activities, our YouTube Channel for community projects, and Teacher Portal for updated curriculum and news for teachers.

Dash & Dot are designed for everyone.

You don't have to be a coding expert, and getting started is a snap. Lots of teachers in our community learn alongside their students.

Have questions? Check out our FAQ or give us a shout at teachers@makewonder.com

wonder
workshop

Smart robots for curious minds.

Thanks to the wonderful teachers who have shared their support,
classroom lesson ideas, and feedback.