

**Coding, Robotics, and Dash & Dot  
Wonder Workshop**

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## Wonder Workshop

Concepts are more concrete to children when they are expressed in tangible, real-world ways. Wonder Workshop offers fun robots, apps, content, and accessories that students can use to learn creative problem solving, computational thinking, and the basics of how to code.

### Our mission statement

To empower every child to question, think, and create. We want to encourage children to be curious and to find their own joy in learning. Coding enables creativity and helps students learn about the world around them. By learning to code, they are becoming shapers of their own world.

### Our robots

Dash & Dot are smart robots for curious minds! Targeted at teaching creative problem solving and computational thinking, Dash & Dot help students learn fundamental cognitive processes relevant to all 21st century skills that they'll carry on throughout life.

Students can define how they want to play – whether solo, in pairs, or in small groups. Dash & Dot are characters that ignite curiosity and confidence while providing fun and engaging ways of learning the essential skills of collaboration, communication, and digital literacy. Teachers are using Dash & Dot to teach a variety of subjects including Math, Science, Social Studies, and English Language Arts.



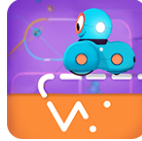
Dash & Dot come with four free apps enabling students to explore a variety of learning experiences at different levels depending on their age and ability. Wonder Workshop accessories from Dash's Xylophone to Building Brick Connectors (including LEGO™) bring endless creative possibilities, plus students can involve their existing resources around the classroom into the fun. The apps are compatible with more than 20 iOS and Android devices including the iPad 3, iPad mini, iPad Air 1 & 2 and a variety of Nexus and Samsung Galaxy devices.

### Our apps

Students send commands to the robots to move them, light them up, and have them detect the world around them using 4 free coding applications.



**Wonder** (Ages 8+)  
The first creative programming tool specifically designed for robotics!



**Path** (Ages 5+)  
Draw a path to Dash's next adventure!



**Blockly** (Ages 7+)  
Program Dash & Dot by snapping together puzzle pieces of code.



**Xylo** (Ages 5+)  
Compose your own musical masterpiece. Requires Dash's xylophone.



**Go** (Ages 5+)  
Getting started with Dash & Dot is a breeze with Go.

## Our curriculum

Wonder Workshop offers lesson plans to be used in classrooms with Dash & Dot. The lesson plans are teacher-tested, cross-curricular and align with the Common Core standards for math, ELA, and science. Each lesson includes a coding component in which students program Dash & Dot to help solve a problem.

Group work is a big part of student learning, both for socialization and for matching students who have different strengths and weaknesses so they can learn from each other. The activities are done in groups of at least two students. Lesson plans are broken into class-length segments.

## **Robotics and its importance**

A robot is a machine that may gather information about its environment and use that information and any pre-programmed instructions to complete tasks. Robots are controlled using coding (computer programming) to outline specific instructions and ranges of actions. These tasks could be a very specific set of movements, like cutting a piece of wood to a certain length, or extremely complex instructions that allow the robot to actually learn how to respond in new situations.

Dash & Dot are robots that can gather a variety of information about what is happening around them and then react to that information in fun and educational ways. Dash & Dot can be specifically programmed to complete tasks using the Blockly app, or can be remote controlled using the Go app.

### **How is robotics used in our everyday lives?**

Robots are an integral part of students' everyday lives and most of them don't even know it! From making breakfast, doing chores, and playing games, to buying a snack, robots are everywhere around them.

Modern toys have some of the most obvious forms of robotics at use. Remote-control cars, planes, and drones allow you to control the robot's movement in real-time. Sometimes robotics is used in a less obvious way. Vending machines use robotics to decide which snack to dispense based on what buttons you press, and automatic doors open when they sense someone in front of them.

Even some regular household items use robotics. Toasters use robotics to decide how long to toast the bread, programmable thermostats use robotics to decide when to turn on the furnace, washing machines use robotics to decide when to start the spin cycle, and so on.

Modern cars use robotics for rear-proximity alerts, to sense a crash and deploy airbags, for anti-lock braking, and much more.

In manufacturing, robots repeat a task to build a piece of a product, or fill a container with food or drink. Robotics help businesses create their products faster and cheaper!

### **Why are robotics and coding important for students to learn?**

As robotics and computers become increasingly prevalent in students' lives, understanding programming and programming concepts is becoming very important for students' success. Robots are a fun, easy, and effective way to learn about computer programming. Programming a robot has tangible, observable effects. Testing the robot's code can be done in a hands-on way with visual results.

#### **Hands-on application of knowledge**

In primary grades, students still learn using their eyes and hands, drawing, molding, and manipulating objects. At this age they are starting the tough transition to learning by reading. Having the robots to work through problems visually helps many students with

complex concepts. Robots are a fun way for students to apply and experiment with concepts that they are learning.

### **Fun form of problem solving**

The robots provide another opportunity for creative problem-solving. Students should learn to look at a problem in many ways, rather than applying a formula that they are given. When programming robotics, there can be many solutions to a single problem, and different students may take different paths to arrive at a solution. Students get to discuss their processes and the logic that they used to understand different methods and solutions. This opens students to the real world process of problem solving!

### **Algorithm creation and use**

One way that coding is useful to students is by teaching them to create and use algorithms. An algorithm is a sequence of steps that should be followed in a particular order to achieve a goal. Most students are unaware that so many algorithms are used in their everyday lives. Algorithms like addition in math class are more obvious, but students use algorithms every day when they get ready in the morning or take a certain path to get to school. Even the way they make a sandwich or tie their shoes is an algorithm!

By seeing a task in terms of a set of steps, students learn to break tasks and problems into smaller pieces. This makes problem solving easier! Problem solving involves the skill of breaking complex problems into simpler ones. Once they have broken down a problem, they can see which parts they already know how to solve.

Algorithms also help students understand the passage of time, and learn to relate steps or tasks to each other in terms of time, which is a key lesson at this age. Like the plot of a story, the steps of an algorithm must be performed in a particular order, and students should be encouraged to use words like “first,” “then,” and “finally” when writing algorithms.

### **Building logic skills**

Computer coding helps teach students how to use and explain their logic. Coding involves making choices: about the best command to use, the best order of events, or the best structure of the code itself. Students can learn to reason through these decisions and be able to defend their choices when explaining their code to others.

Coding also involves teaching logic to the computer. For example: if an action is taken, then a reaction occurs. Students learn how to connect events logically while constructing if statements and while loops.

### **Preparing for future jobs**

As technology becomes an ever more important part of our lives, an increasing number of jobs are available that involve writing code and using robotics.

Many jobs in different fields are made easier by using code. For example, scientists who understand statistical programming can quickly calculate results, and engineers who use computer generated virtual models can view their designs without having to build them.

Learning robotics and computing at a young age can also help encourage more girls to become interested in STEM fields (science, technology, engineering, and mathematics). Even as their numbers grow, women are still very underrepresented in STEM jobs. Learning early that science and technology is both fun and accessible to them can help encourage girls to get interested and involved with STEM!

## The Next Generation Science Standards

The Next Generation Science Standards (NGSS) are a framework and set of curriculum standards in science education that focus on preparing students for college and careers. The NGSS are aligned, by grade level and cognitive demand, with the English Language Arts and Mathematics Common Core State Standards. The NGSS were developed by bringing together practicing scientists, cognitive and science education experts, and policy experts to first develop a framework for the standards with the focus on getting the science right.

The framework organizes science education around three dimensions:

1. Key scientific and engineering practices: key practices students should learn, such as planning and implementing investigations, defining problems, asking questions, and making arguments about and using evidence
2. Crosscutting concepts: specific concepts that students need to learn that cut across disciplines, such as “cause and effect”
3. Core disciplinary ideas: core ideas in the four main disciplinary areas of life sciences, physical sciences, earth and space sciences, and engineering, technology, and the applications of sciences

The full standards were then developed with the framework as a strong foundation.

### How do robotics and coding factor into the NGSS?

Robotics is a fun and engaging way to tackle science standards. Students focus on key practices by, for example:

- identifying challenges and problem solving solutions
- engaging classmates in discussions about procedures and results
- conducting experiments following scientific methods
- recording data, methods, and results

Additionally, students can use the robots to tackle specific standards and topics, such as magnetism, speed, and force.

For more information, explore their website <http://www.nextgenscience.org/>.



## Teaching standard curriculum using robotics

Robotics can be used to help students learn important core topics such as English Language Arts, Science, Social Studies, and Mathematics. As personable characters that ignite curiosity and confidence, Dash & Dot are especially useful in project-style lessons that are cross-curricular and exploratory. Students may need to program Dash to complete a science experiment, using mathematics to calculate distances and angles, and then write a report on their findings to present to the class. Robotics is a great way to keep kids engaged in topics that they might not find interesting on their own.

Below are some example lessons:

**Mathematics:** Students can compare fractions on a number line by programming one Dash to move some distance to model a fraction and another Dash to model the other fraction. Which is larger? After recording a number of fractions with a common numerator, how can you tell which fraction is larger just by looking at it?



**English Language Arts:** Students can write a story starring the robots. Then students can sketch storyboards for their story and film it, programming the robots to act out the story and using other fun props. Students can be as creative as they like, but once the play has been programmed, it can't be changed on the fly.

**Science:** Students can study magnetism by attaching magnets to two Dashes. Students will program the Dashes to move toward each other. They can see that when opposite poles are lined up, the Dashes will snap together, and when similar poles are lined up, the magnets repel each other. Students can design and conduct experiments to test the strength of the magnets and their attractive/repulsive properties on different objects. They can then write a report on their use of the scientific method to test their hypotheses.



## Find Out More

For more information on Wonder Workshop, visit our website at [makewonder.com](https://makewonder.com)

- Interested in purchasing Dash & Dot for your home or school? Check out the Wonder Workshop store at [makewonder.com/store](https://makewonder.com/store)
- Learn more about specific apps for Dash & Dot in the app division of our website [makewonder.com/apps](https://makewonder.com/apps)
- Are you a teacher? Learn more about the Teach Wonder project and how to bring coding into your classroom or school at <https://teachers.makewonder.com/>