

Lego WeDo 2.0

What are Lego WeDos?



WeDos are lego sets that come with a power source and a motor that allows students to create lego constructions that move like robots. Once students create the robots, they can be paired with a device that is Bluetooth enabled which will allow students to control the robots. Students use simple block coding to program the robots as they desire.

The WeDo kits include all necessary building pieces and the WeDo software/app has built in tutorials for students to follow in order to complete their robot. The tutorials show students which lego pieces to choose in order to build their robot and also shows students a sample program for how they can move their robot. Although these are suggested models and programs, students have the ability to create anything they want once they understand how the building process and programming work.

The WeDo kits also come with curriculum connections and add-on packs so that students can learn concepts based on the [Next Generation Science Standards](#) (NGSS). Guided questions are built into the tutorials. In addition, there are short videos inside the tutorials that show students how the concepts they are learning relate to real world scenarios.

The Lego WeDo software/apps also have a built in portfolio area where students can add images or text to describe or explain how their robot was programmed. This space also allows students to capture video of the robot, or of themselves explaining what the robot is doing. The portfolios can then be shared with the teacher or other students.

Lego WeDos are meant for students in grades 3-6, and are typically the building blocks (no pun intended) for moving students from simple robot construction to more complex sets like the Lego Mindstorms EV3 or the Mindstorms NXT. These advanced sets even come with attachments like temperature sensors, solar panels, infrared sensors, and more. There are also elementary kits that focus on math, language arts, and simple machines.

For more information about the types of lego kits and curriculum materials available, visit the Lego education website at <https://education.lego.com/en-us>.

Lego wedo curriculum pack- lego wedo full app

<https://le-www-live-s.legocdn.com/sc/media/files/curriculum-previews/wedo-2/45300-curriculum-preview-enus-2017-2d73c14f093bc43758360795be817226.pdf>

What is needed to run the Lego WeDos?

The WeDo kits are self-contained with all the pieces you need to complete the curriculum activities that come with the set. There are several options for how to run the WeDos ranging from chromebook apps, the iOS and Android Apps, to software that can be installed on a Mac or PC computer.

The software or apps needed to run the lego Wedos can be found at <https://education.lego.com/en-us/downloads/wedo-2>

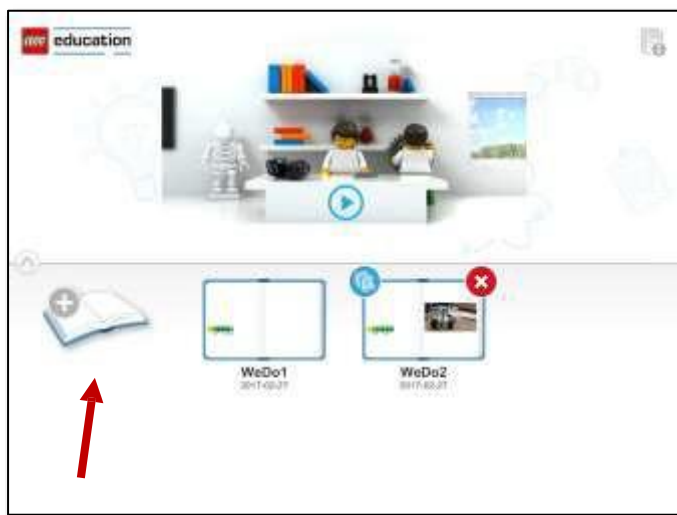
The necessary item that is needed with any of these platforms is Bluetooth. Bluetooth is a short range wireless system that allows two devices to connect to each other. Bluetooth uses radio waves to make these connections. When the devices find each other and connect, this is called pairing.

The system requirements can be found at <https://education.lego.com/en-us/support/wedo-2/system-requirements>. This site also lists one option for installing Bluetooth into a PC machine. Bluetooth dongles can be purchased from most electronics stores like Best Buy. Typically chromebooks, macs, and your iOS or Android devices will already have Bluetooth capability built into them.

Using the Lego Wedos



First, open the Lego WeDo 2.0 app (we are using iPads)



Then, click on the book icon on the page. This will bring you to a screen where you will see the option of activities to create that are aligned to the Next Generation Science Standards.

Note: In this image, there are 2 open books also shown on the screen. Each time you complete a project, it will automatically save in this location so you can easily return to it.



Projects to complete are shown on the next screen. Students should complete the Getting Started A-D projects if they have never used the WeDos before. (plan for 45 minutes to complete these)

The guided projects relating to the NGSS are then listed below in the Guided Projects section. Students will be shown how to build each robot step-by-step in these projects



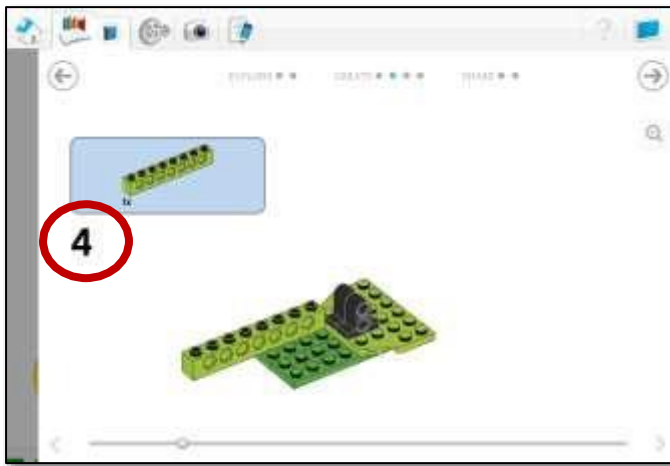
Once students choose which project they would like to complete, they are taken to this EXPLORE screen. Here, they are guided through questions relating to the topic they chose and can view a short video that relates the topic to some real world applications of the topic.

To move through the EXPLORE screens, students click the arrow in the upper right corner.



After students move through all of the EXPLORE screens, they will then be taken to the CREATE screens. Here, students have the option to watch another short video to show what the finished robot will look like.

Then students will see an image of what the finished robot will look like. At this screen, there will be a slider bar at the bottom of the screen. Students will click the arrow on the right side of the slider bar to begin building the robot following the step-by-step directions in the app.

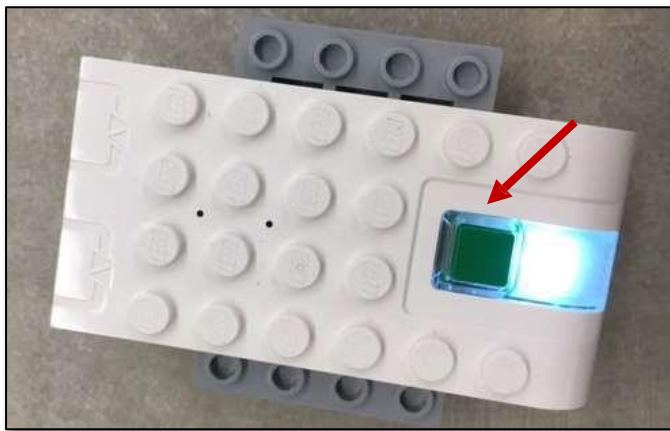


Students continue through the directions until they have completed building the robot. Each page is notated by a number on the left side of the screen.

If students make a mistake, they can click the left arrow to move backwards a step and try to follow the directions again to see what they did wrong.

When students reach the end of the building stage, they are directed to a screen that will show them a video on how to

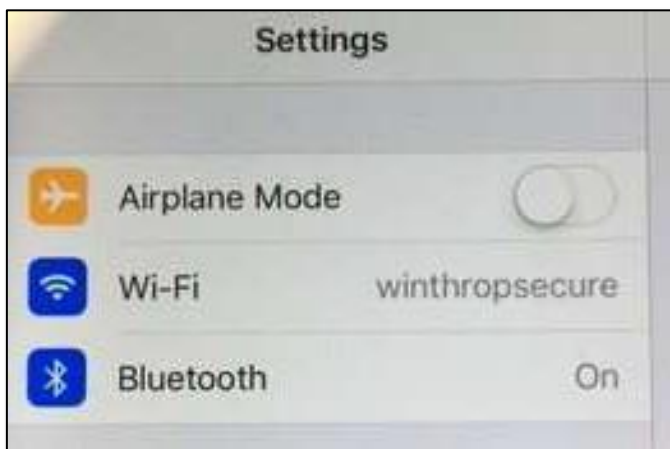
connect their robots to Bluetooth so they can control the robot from their device. There a few steps needed to complete this process.



Step 1- turn on the robot.

The robot should have this Bluetooth power block incorporated somewhere into the design. When you are ready to make the robot move, you will need to turn the power block on.

Click the green button to turn the block on, and wait for the light to start blinking. The blinking light indicates that the block is on and waiting to be paired with a device.



Step 2- on the iPad

Go to Settings and make sure the Bluetooth connection is enabled.



Step 3- in the WeDo app on the iPad

Click the Bluetooth connection icon in the lower right corner of the screen of the WeDo 2.0 app

This will enable the device to look for the Bluetooth power block.



This will open a small window on the screen. Click the name of the Smart Hub to begin the connection process.

You will know that the device is connected to the Bluetooth power block when the light on the power block is a solid blue color and the name of the Smart Hub is highlighted blue on the device. Close the connection window by clicking the red X in the upper right corner to see your program again.

Note: If you need more help with the connection process, watch the short video tutorial on how to connect the WeDo robot with the device.

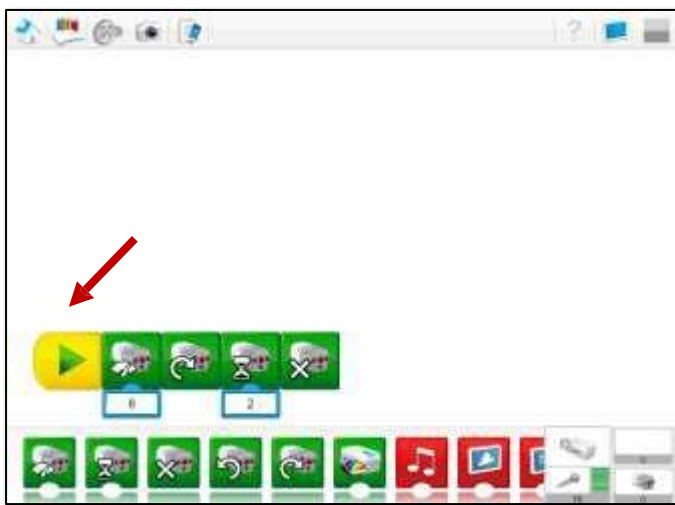
Note: When you turn on the Bluetooth power block, it will be in connect mode for about 30 seconds. If this is not enough time to find the power icon on your device and connect the two, the power block will turn off. If this happens, simply turn it on again so that it goes back into discover mode to be recognized by your device.



Once your device is connected to the WeDo, you can begin programming it and allowing it to move around.

Use the arrows in the upper right corner to move to the last CREATE screen where you will see a model program to try.

The model at the top of the screen is just a suggestion for how you can program the robot.



Your program will begin with the yellow START block at the bottom of the screen in the white workspace.

Below the yellow block you will see the other available blocks to choose from.

Drag the blocks from below and connect them to each other in order to model after the suggested program or use them to create your own program.



If the block has a number associated with it to show time, click on the number underneath the block to open an area where you can choose a different number (time) for that block to run.



Green blocks allow the robot to complete various movements by telling the motor how to perform.



Red display blocks change how the screen looks in the software or app, so they don't control the movement of the robot.

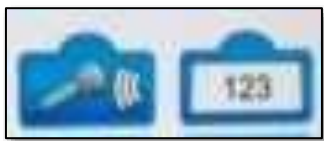
Some red display blocks like the sound or color blocks allow the robot to make sounds, or changes the color of the light on the robot's power block.



Yellow blocks allow students to start or repeat their programs.



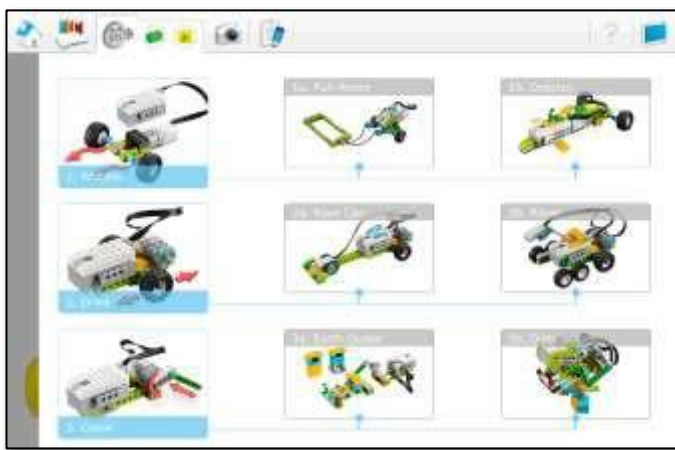
Orange blocks work with specific sensor bricks.



Blue blocks allow for input into the robot.

Once you program the robot, click the Play button to test the program. Modify it and test it again so that it eventually performs the tasks that you would like it to complete.

Note: To turn off the WeDo, click and hold the green button on the power block. You will see the light on the power block flash several times. Keep holding the green button until the flashing stops and the block turns off.



Note: Another way to view projects is by clicking the gear icon at the top of the screen. This shows robots by the type of movement they make. Looking at the projects this way only shows students what the finished robot and the program looks like. Students would need to figure out on their own how to build the robots.

Activity: Make a robot that pulls objects (30-60 minutes)

LEGO WeDo Pull Robot Exercise

Part A – After you have constructed your robot and a program to move it, answer the following questions.

1. What role do the gears play inside the pull robot? Would the robot be able to move its wheels without them?
2. Add a bottom to the basket and then add objects to the basket until the pull robot stops. What is the heaviest object your robot can pull?
3. What happens to the robot when you add heavier objects? What does the robots movement look like?

Part B – Now create an inclined plane and test your robot’s movement.

1. Write down your observations as the robot moves **down** the inclined plane. Write down your observations as the robot moves **up** the inclined plane.
2. Change the angle of the inclined plane. How does this affect the way your robot moves?
3. What happens to the objects in the basket when you change the angle of the inclined plane?

Part C – Replace the wheels on your robot with the tires. Answer the following questions.

1. Hypothesize what the robot’s movement will be like with the tires on instead of the plastic wheels.
2. What is the heaviest object your Pull robot can pull with the tires on? Is the robot able to pull more or less with the wheels on? Hypothesize why you think so.

3. Write down your observations as your robot moves **up** the inclined plane. How is this movement different from when the robot had the wheels on?

4. Write down your observations as the robot moves **down** the inclined plane. How is this movement different from when the robot had the wheels on?

Challenge 1

1. Try a different set of tires. Which set did you try? How is the movement different from when the robot had the plastic wheels or tires on?

Challenge 2

1. Measure how far your robot moves with different objects inside the basket.

2. Change the way the robot moves and challenge another team to see how far you each can pull the object. Which robot pulled the staples farther? Which robot pulled the paper clips farther?

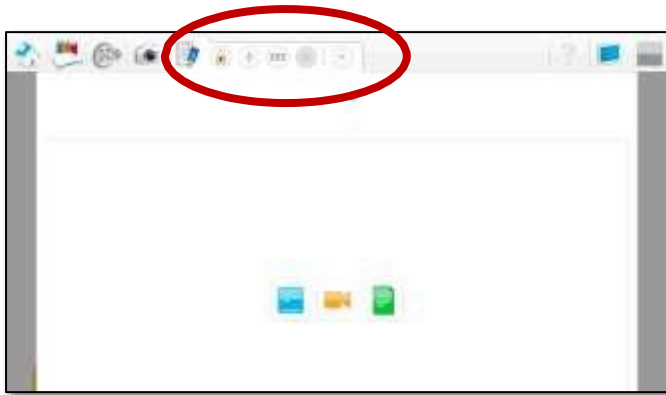
Challenge 3

1. Try changing the speed of your robot in its program on the iPad. Write down your observations as the robot moves slower or faster. Does speed make a change in how much the robot can pull?

2. Does speed affect the robot's ability to move up or down the inclined plane? Write down your observations.

Using the lego WeDo Documentation Feature

The lego WeDos have a journaling feature at the end of the tutorials where students can recount their experiences with building and testing them. This feature is saved in the main screen of the app and can also be shared with others as a .jpeg image or as a .pdf file.



To use the journal, click the Pencil icon at the top of the main screen.

A new screen will open.

Click the blue image icon to take a picture of your robot.

Use the Orange videocamera icon to take a video of your robot. You can also flip the camera around and use the video tool to capture yourself discussing the robot.



Use the Green page icon to write about your robot.

There are several menu items that allow you to alter the way you discuss your robot.

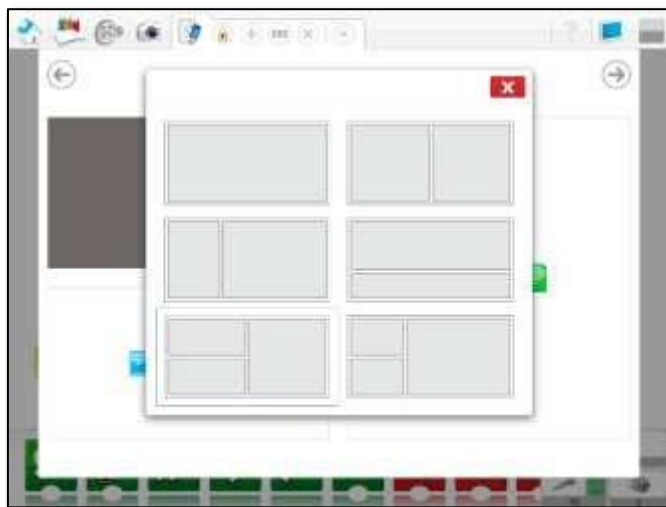
Use the lock icon to lock the journal so that no changes can be made.

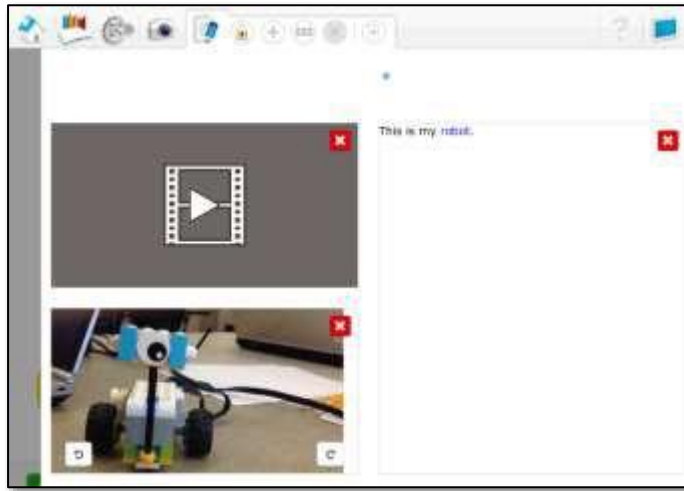
Use the + icon to add pages to the journal.

The icon containing the 6 tiles allows you to change the layout of the page. This will open a window that allows you to choose the layout of the page to include boxes where you can add text, video, and images all on the same page.

Use the X icon to delete pages from the journal.

Use the right arrow icon to share the journal with someone else.





Here is an example of what a page looks like that has all three of these sections completed.

At this stage, clicking the share icon allows you to send this to someone as a .pdf file or as a .jpeg

Note: When you send this as a .jpeg or .pdf file, the video does not send. Only the text and images can be seen.

Changing the Name and Deleting Projects

At the home screen, you will see any projects that have been completed within the app displayed as open books. Here you see a snapshot of the program as well as any images you have captured in the Documentation tool.



To copy a project, click and hold your finger on top of an open book. Choose the copy icon to copy the project.

To delete a project, click and hold your finger on top of an open book. Choose the X icon to delete the project.

To rename a project, click and hold your finger on the name of an open book. Wait for the current name to highlight blue. Use the keyboard to rename the project. The name of the project is limited to 15 characters, including spaces.

Additional Lego WeDo Resources

Elearning segments for teachers on how to use the WeDos. These are great resources to help you learn more. <http://elearning.legoeducation.com/wedo-2-0>

Instructions for building WeDos using the original WeDo 1.0 kits. This would help if you have students that want additional models to build using step-by-step directions. Since these use a different color palette than the 2.0 sets, students may have to look at the shapes of the legos rather than the colors as they are building. <https://education.lego.com/en-us/support/wedo/building-instructions>

Extension projects above what is in the WeDo app. These enable your students to create more projects but still have directions to do so. https://le-www-live-s.legocdn.com/downloads/WeDo2/WeDo2_Computing-Extension-Projects_1.0_EN-GB.pdf

Dr. E's WeDo Challenges. This is a great site that gives a WeDo challenge each month and also has lots of tutorials and ideas for using WeDos. <https://wedo.dreschallenges.com/>

Meeting Standards

3-5 Engineering Design Standards - Students who demonstrate understanding can:

- 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

SC Science State Standards

3.S.1A.1 Ask questions that can be (1) answered using scientific investigations or (2) used to refine models, explanations, or designs.

3.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.

3.S.1A.3 Plan and conduct scientific investigations to answer questions, test predictions and develop explanations: (1) formulate scientific questions and predict possible outcomes, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.

3.S.1B.1 Construct devices or design solutions to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the devices or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results.

5th grade- Physical Science: Forces and Motion

5.P.5A.1 Use mathematical and computational thinking to describe and predict the motion of an object (including position, direction, and speed).

5.P.5A.2 Develop and use models to explain how the amount or type of force (contact and noncontact) affects the motion of an object.

5.P.5A.3 Plan and conduct controlled scientific investigations to test the effects of balanced and unbalanced forces on the rate and direction of motion of objects.

5.P.5A.4 Analyze and interpret data to describe how a change of force, a change in mass, or friction affects the motion of an object.

5.P.5A.5 Design and test possible devices or solutions that reduce the effects of friction on the motion of an object.