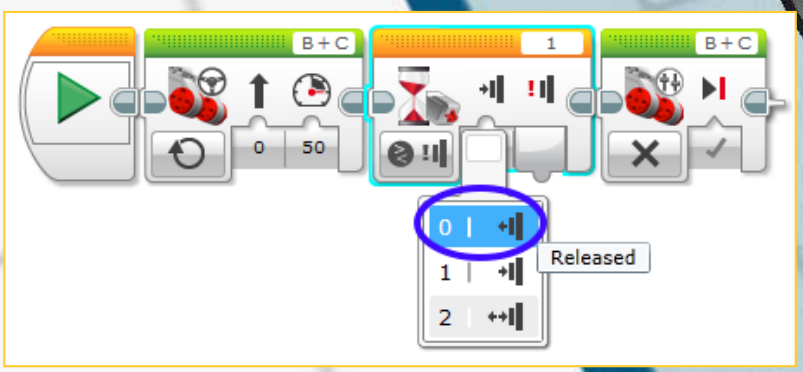
A guide to setup and use the Virtual Brick

Using the Virtual Brick with Robot Virtual Worlds

"Virtual Tools to teach mathematics, computational thinking practices, and programming"



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- **How do I navigate and use the Robot Virtual World Interface?**
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- **What types of Robot Virtual Worlds are available?**
  (See Introduction to Programming EV3, page 25; Operation Reset, pages 26; Ruins of Atlantis, page 27; Palm Island, page 28; and the Level Builder, page 29)

Is this software Mac Compatible?
The Virtual Brick is not Mac compatible, but it will work on a Mac with the following Windows Virtualization/Emulation software packages: Parallels, VMWare Fusion, and Boot Camp

Checklist

- [ ] Make sure that you have LEGO NXT-G, EV3, or LabVIEW programming software on your computer, page 6.

- [ ] Before you commit to using the Virtual Brick make sure that your computers has the capacity to run the Robot Virtual World (RVW) software by checking your computer's specifications against the required system requirements, see System Requirements, page 9.

  Note: If you are unsure, you can always download a trial copy and test it on your computers.

- [ ] Make sure the Virtual Brick and RVW software is properly installed. See the Installation Guide, page 9.

- [ ] Adjust your computers for optimal RVW performance. RVW software allows you to adjust the graphics in the game based on your computer's performance. Slower computers can be set to lower graphics, page 21.

- [ ] Learn how to login and save your progress when using the RVW software. Test the computers in your classroom to make sure that students can log in, save their progress, and log out, page 20.

  Note: You save your programs the same way that you save any LEGO program.

- [ ] Prepare to demonstrate or use the Virtual Brick. Practice navigating between the LEGO programming software and the Virtual Brick and RVWs, page 8 and pages 16 - 22.

- [ ] Select the proper RVW type for your students to practice with, pages 23 - 27.

- [ ] Be prepared to teach your students how to log in and save their progress, page 21.

What are Robot Virtual Worlds (RVWs)?

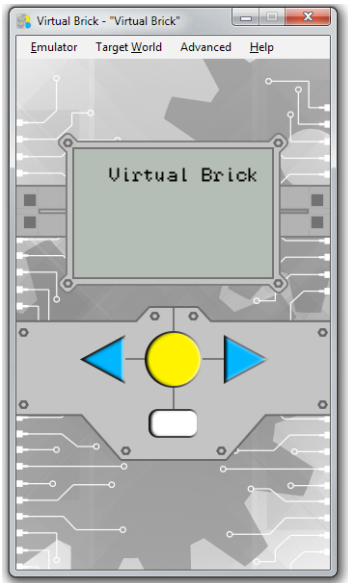
Robot Virtual Worlds are simulation environments designed to help students learn how to program. Once students learn to program in a RVW environment they can use the exact same code to program their physical robots. The RVW environment is available in fantasy world formats (under the sea, outer space, on a tropical island) or classroom like formats and is perfect for home, classroom, and virtual programming competitions! Additionally, research has shown that learning to program in the RVW environment is more efficient than learning to program using physical robots.

What is the Virtual Brick?

The Virtual Brick is designed to help teach mathematics, computational thinking practices, and programming. It is not designed to replace real robots and cannot teach the iterative design and hands-on engineering that real LEGO hardware teaches.

The Virtual Brick allows programmers to program virtual robots using the same programming language as they can to program real LEGO robots. This allows students additional practice programming and when used appropriately can help students increase their understanding of scale and rate two BIG IDEAS in mathematics (see page 30).

The Virtual Brick works with the following LEGO compatible software: NXT-G, EV3,and LabVIEW for LEGO Mindstorms. The Virtual Brick looks and acts like another LEGO Brain, or Brick to these programs. When you open up the Virtual Brick and the programming software the programming software will automatically select the Virtual Brick. When you download a program to the Virtual Brick, that program is run by a robot in the Robot Virtual Worlds.



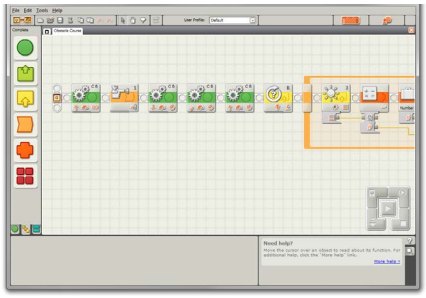
Robot Virtual Worlds are also available for ROBOTC. ROBOTC controls the robots in the virtual worlds directly, and does not require the Virtual Brick software. Go to www.robotvirtualworlds.com to learn more.

Licensing

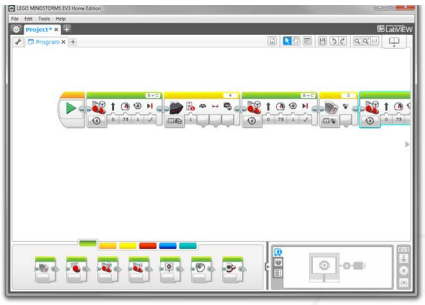
The Virtual Brick programming solution works with NXT-G, EV3, and LabVIEW for LEGO MINDSTORMS software. This means that with one license you can use any combination of the different programming languages! Licenses for the Virtual Brick can be purchased at http://robomatter.com/ and are available in Classroom (up to 30 seats in one classroom), Team (6 seats), and Single (1 seat) configurations.

One Virtual Brick License works with NXT-G, EV3, and LabVIEW!

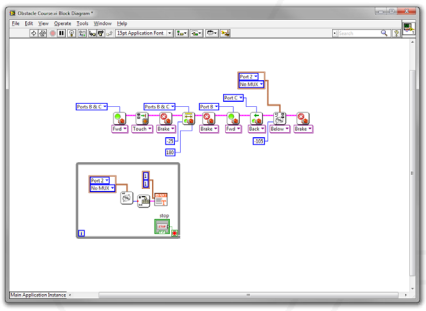
NXT-G Software



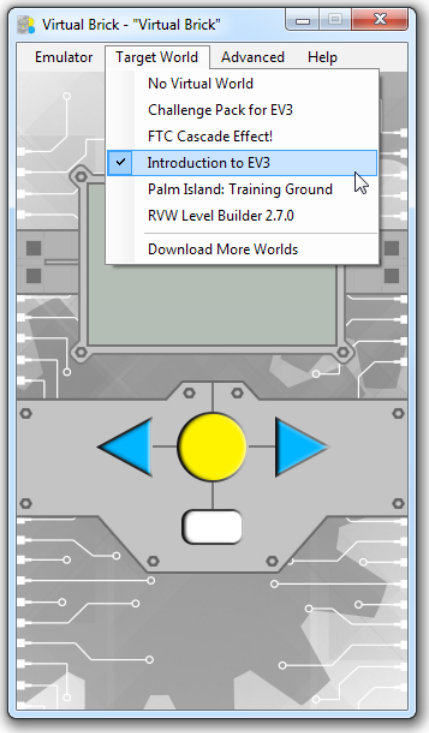
EV3 Software



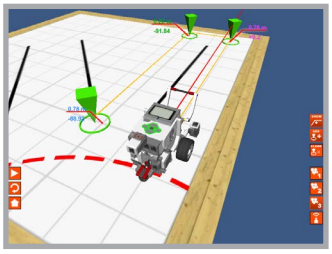
LabVIEW for LEGO MINDSTORMS



Virtual Brick



Intro to Programming EV3



Ruins of Atlantis

Operation Reset

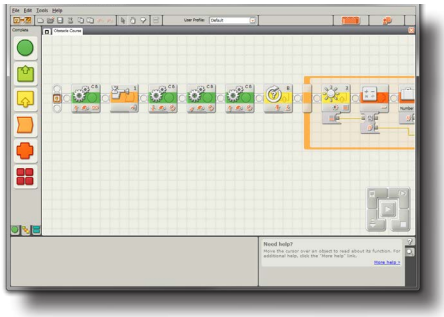
You also get access to all of the LEGO Compatible Robot Virtual Worlds!

Compatible Programming Languages

What programming Languages Work with the Virtual Brick software?

You must have a copy of one of the following LEGO MINDSTORMS programming languages on your computer to use the Virtual Brick with the Robot Virtual Worlds

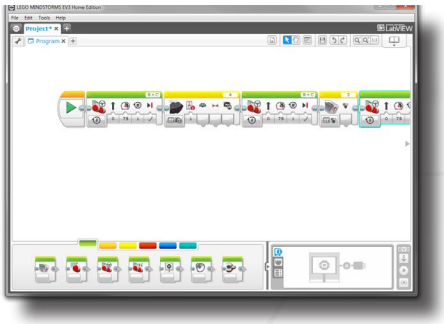
NXT-G Software



NXT-G is a graphical, drag-and-drop style programming language that can be used with the LEGO NXT. Schools can purchase a site license through LEGO Education. Hobbyist can downloaded the software through LEGO at: http://www.lego.com/en-us/mindstorms/downloads/nxt/nxt-software/

Training materials can be found at: http://www.education.rec.ri.cmu.edu/content/lego/curriculum/

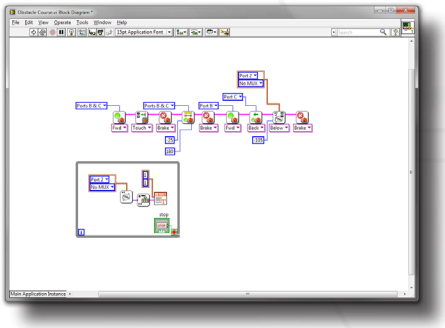
EV3 Software



EV3 is a graphical, drag-and-drop style programming language that can be used with the LEGO NXT and EV3 robots. Schools can purchase a site license through LEGO Education. Hobbyist can downloaded the software through LEGO at: http://www.lego.com/en-us/mindstorms/downloads/software/ddsoftwaredownload/

Training resources for the EV3 can be found here: http://www.education.rec.ri.cmu.edu/content/lego/ev3/

LabVIEW for LEGO MINDSTORMS Software



LabVIEW is an industry standard, graphical, drag-and-drop style programming language. The Mindstorms version includes blocks that can be used with the LEGO NXT. A free 30-day trial is available from National Instruments at: http://www.ni.com/academic/mindstorms/

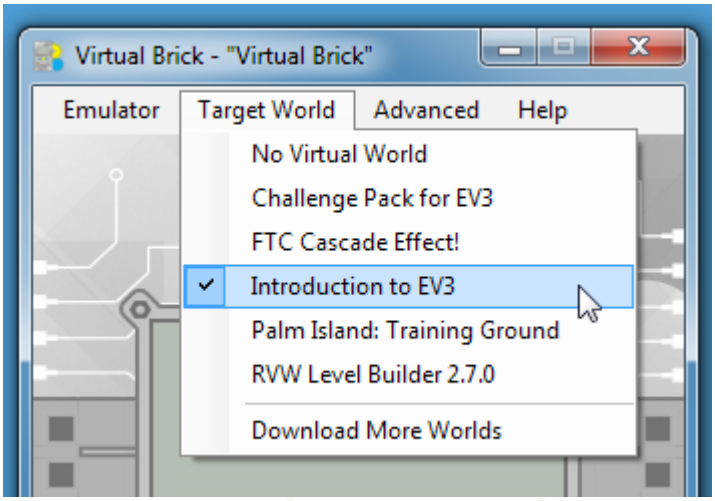
Training materials for LabVIEW can be found here: http://cs2n.org/activities/cs2n-learn/labview-robotics-programming-fundamentals-i

How Do I Download a Program?

We recommend a 4-step process no matter which programming language you choose to use with the Virtual Brick and Robot Virtual World software:

1. Launch the Virtual Brick Software.

2. Choose your Target World

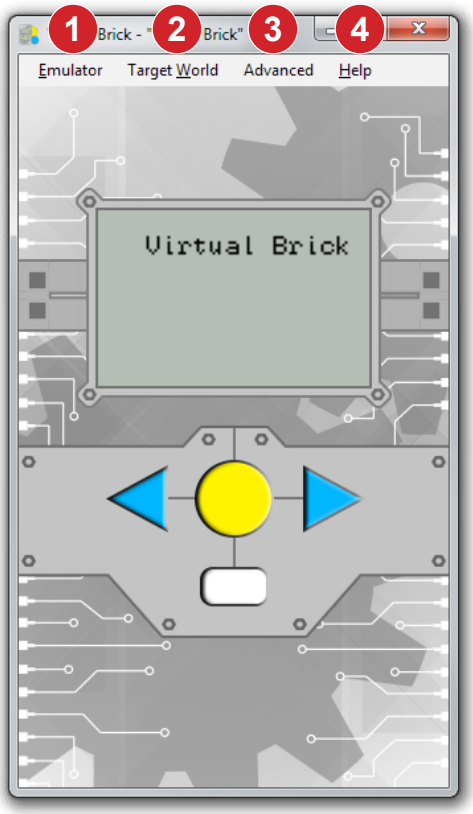


3. Launch your Programming Software (NXT-G, EV3, LabVIEW, etc.)

4. Write your program and download it to the Virtual Brick the same way you would download a program to a physical robot.

Navigating the Virtual Brick Menus

The Virtual Brick software resembles a real LEGO Brick, with additional menu options.



1. The Virtual Brick Emulator menu allows you to rename your Brick, enable/disable update checking, and close the software.

2. The Target World menu allows you to choose from the Robot Virtual Worlds currently installed on your computer. This selects which virtual environment (and types of virtual robots) your programs will run in.

3. The Advanced menu contains specialized options you won't normally need to interact with.

4. The Help menu connects you to help resources and opens menu to activate (or deactivate) your software.

The menu option that you will interact with most often will be the Target World menu which allows you to select the virtual environment that you will program in.

Notes:

- Always open your target world before uploading a program.
- The on screen LCD and buttons (yellow, white, right arrow, left arrow) on the Virtual Brick are fully functional and can be used the same way that you use a physical LEGO Brick.
- The Virtual Brick will allow one Target World to be open at a time. Selecting a second world will close the first. This is important as each world is resource intensive.
- Additional worlds can be downloaded from http://robotvirtualworlds.com/

System Requirements

- PC Compatible OS: Windows XP, Windows Vista, Windows 7, or Windows 8
- Processor: Intel Core 2 Duo processor family or better, AMD Athlon X2 processor family or better
- Memory: 2 GB RAM
- Graphics: NVIDIA® GeForce® 8800GTS or better, ATI Radeon™ HD 3850 or better
- DirectX®: DirectX® 9.0c and DirectX® 10
- Hard Drive: 350 MB free hard drive space
- Sound: Standard audio device

The Virtual Brick may run on older computers, but it is highly recommended that computers have a dedicated graphics card for superior performance.

Installation

1. You will need Administrator Level Access to the computer to install the Virtual Brick and Robot Virtual Worlds software.
2. Use your Internet browser to download the latest version of the Virtual Brick Bundle at: http://robotvirtualworlds.com/virtualnxt

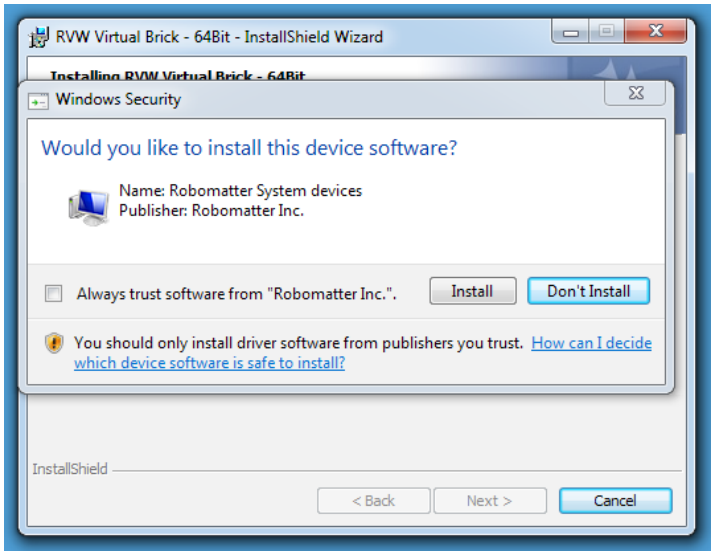
   The installation file includes 4 primary components:

   - The Virtual Brick Software
   - The Virtual Brick USB Driver
   - The LEGO NXT Driver
   - The **Introduction to Programming EV3** Robot Virtual World

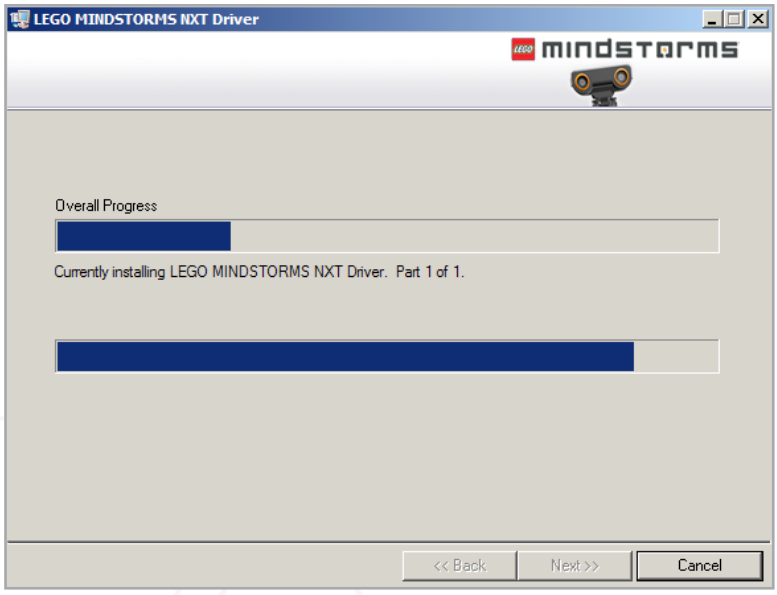
   Note: To use the Virtual Brick and RVWs, you will also need a LEGO programming software (NXT-G, EV3, LabVIEW, etc.) installed on your computer. See page 6 for more information.
3. When the file download is complete, double-click on it to run the Virtual Brick installer.
4. Follow along with the on-screen prompts, pressing Next and Continue when needed.

5. The setup wizard will launch a second installer for the Virtual Brick software specifically for your Operating System (64bit or 32bit). This is expected; continue to press the “Next” and “Yes” buttons when prompted.

6. You may need to give permission for a driver for the Virtual Brick to be installed. Choose “Install” or “Yes” to continue the installation.



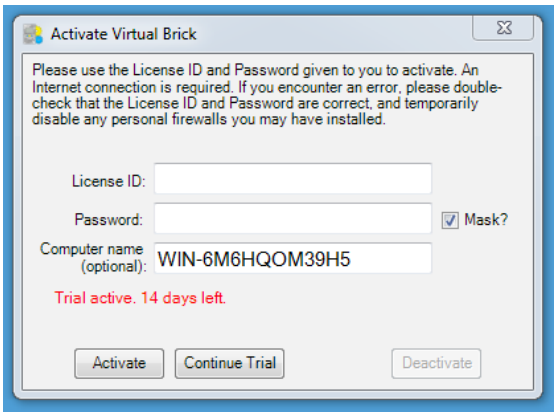
7. If the latest version of the LEGO NXT driver is not detected on your system, it will also be installed. Be sure to choose “Next” or “Yes” if prompted.



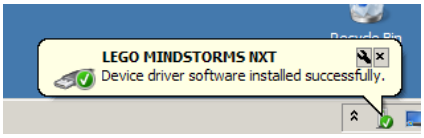
8. Once the installation of the software and drivers are complete, you may need to press “Finish” to close them

9. The installation creates shortcuts to “Launch Virtual Brick” on the Desktop and Start Menu. Double-click the shortcut to launch the Virtual Brick software.

10. The first time the software is run, you will be prompted to enter your License Information or begin a free trial. Enter your License Information if available.



11. You may notice that the driver for the LEGO MINDSTORMS NXT finishes installing the first time the software is run. The Installation is now complete.

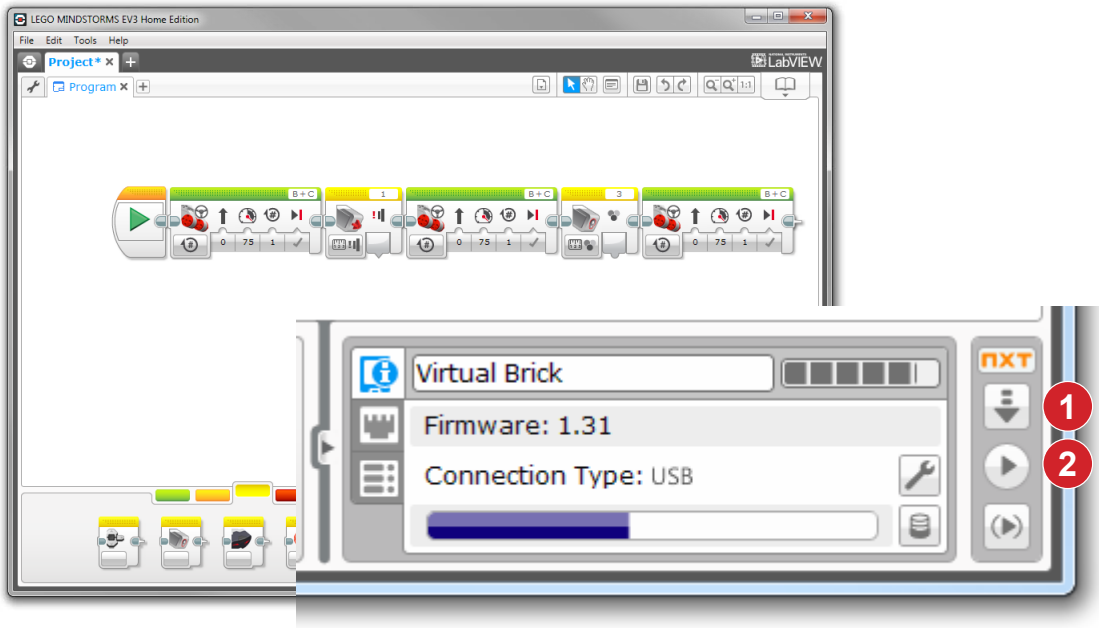


Normally installation is very straight forward, but if your computer notifies you that it should reboot before starting the software, we recommend that you do so.

If the installation did not complete for any reason, double-clicking the installation file and going through the process should resolve most issues. If prompted when running the installer a second time, choose the “Repair” option given.

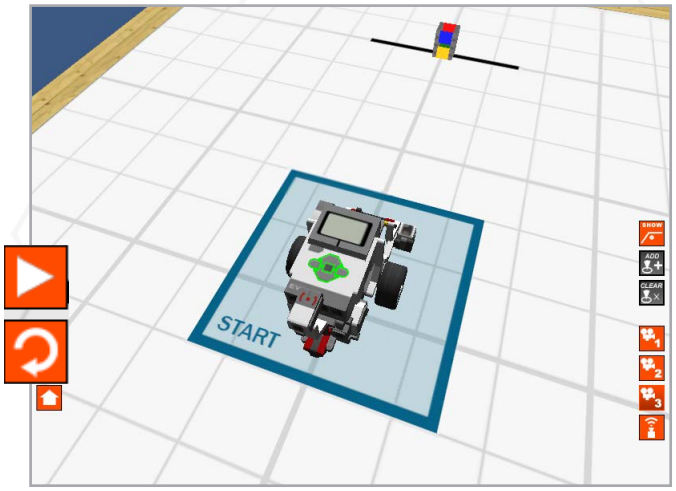
Programming - EV3

Programming in EV3 for the Virtual Brick is very similar as for a real LEGO robot. For a list of blocks that are not currently compatible with the Virtual Brick, see page 13. The EV3 programming software will automatically connect to the Virtual Brick if it is open on your computer, and you don't have any real LEGO robots connected. In the lower-right corner of the interface, there is a series of control buttons. The button with the LEGO Brick silhouette will allow you to see the Virtual Brick, named "Virtual Brick" by default.



1. The Download (downward arrow) button will download programs to the Virtual Brick.

2. The Download and Run (right arrow) button will download a program to the Virtual Brick AND start running it in the virtual world. When working on a challenge, we recommend getting the virtual robot into a start position in the virtual world, then pressing the Download and Run button.



Remember that you can press the reset button (circular arrow) on the left side of the virtual world to reset the robot to its original position.

Pressing the Play button (right arrow), will run the program most recently downloaded to the Virtual Brick.

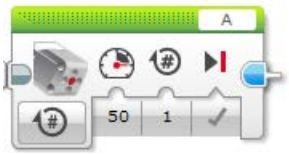
Programming - EV3

There are some blocks in the EV3 programming software which are currently only compatible with a physical EV3 robot, and you should avoid using them with the Virtual Brick. If you attempt to use these blocks in your program with the Virtual Brick, the software will fade them out and display a symbol with an exclamation point:

Below are the known blocks and block configurations which are only compatible with a physical EV3 robot.

Action Palette:

Brick Status Light



Medium Motor

You can substitute the Large Motor block for the Medium Motor block when programming with the Virtual Brick and RVWs.

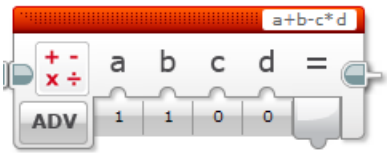
Sensor Palette:

Infrared Sensor

Gyro Sensor

You can substitute the RVW Gyro Sensor block for the Gyro Sensor block when programming with the Virtual Brick and RVWs. See pages 32 - 36.

Data Operations Palette:



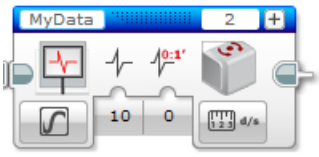
Math Block (Advanced)

Math Block (Exponent)

Array Operations

Advanced Palette:

Messaging



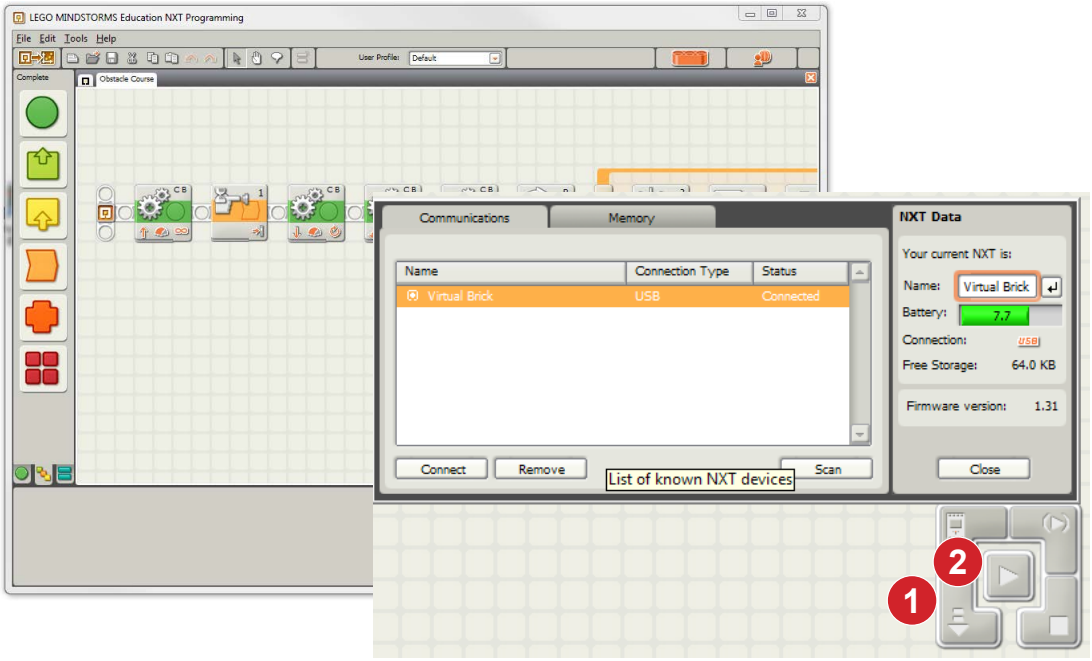
Data Logging

Invert Motor

Bluetooth Connection

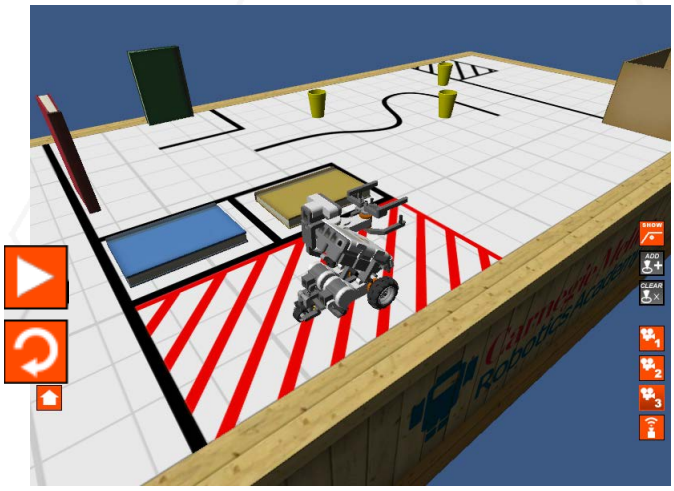
Programming - NXT-G

Programming in NXT-G for the Virtual NXT is very similar as for a real LEGO robot. NXT-G will automatically connect to the Virtual Brick if it is open on your computer, and you don't have any real LEGO robots connected. In the lower-right corner of the interface, there is a series of control buttons. The button with the LEGO Brick silhouette will allow you to see the Virtual Brick, named "Virtual Brick" by default.



1. The Download (downward arrow) button will download programs to the Virtual Brick.

2. The Download and Run (right arrow) button will download a program to the Virtual Brick AND start running it in the virtual world. When working on a challenge, we recommend getting the virtual robot into a start position in the virtual world, then pressing the Download and Run button.



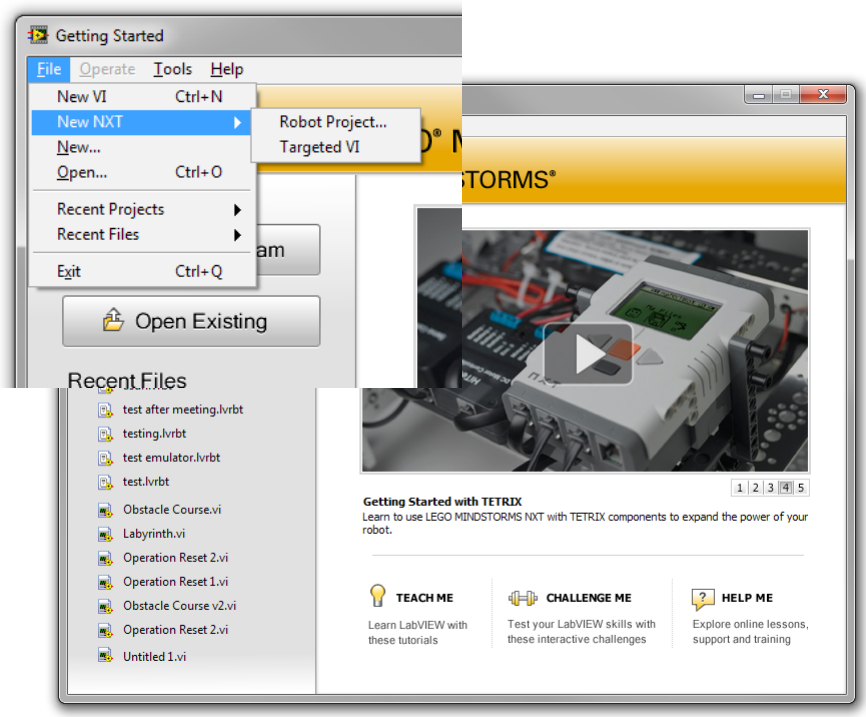
Remember that you can press the reset button (circular arrow) on the left side of the virtual world to reset the robot to its original position.

Pressing the Play button (right arrow), will run the program most recently downloaded to the Virtual Brick.

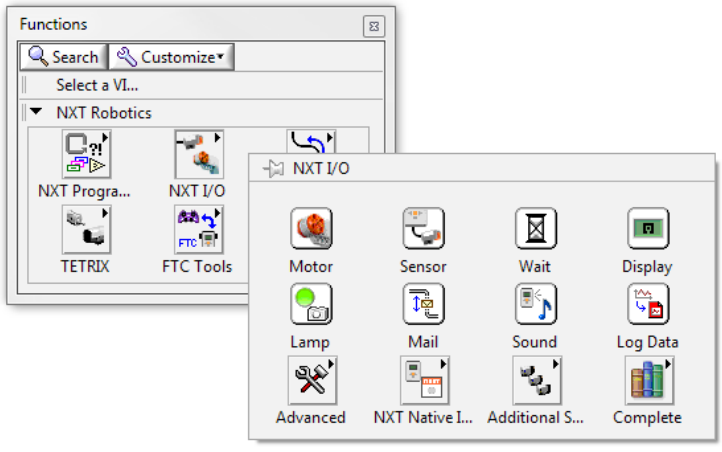
Programming - LabVIEW

LabVIEW is a programming language used in industry, and consequently presents a wider variety of programming flexibility than the EV3 and NXT-G programming solutions.

“Robot Projects” as well as single programs, or “VI’s”, can be used with the Virtual Brick and Robot Virtual Worlds.

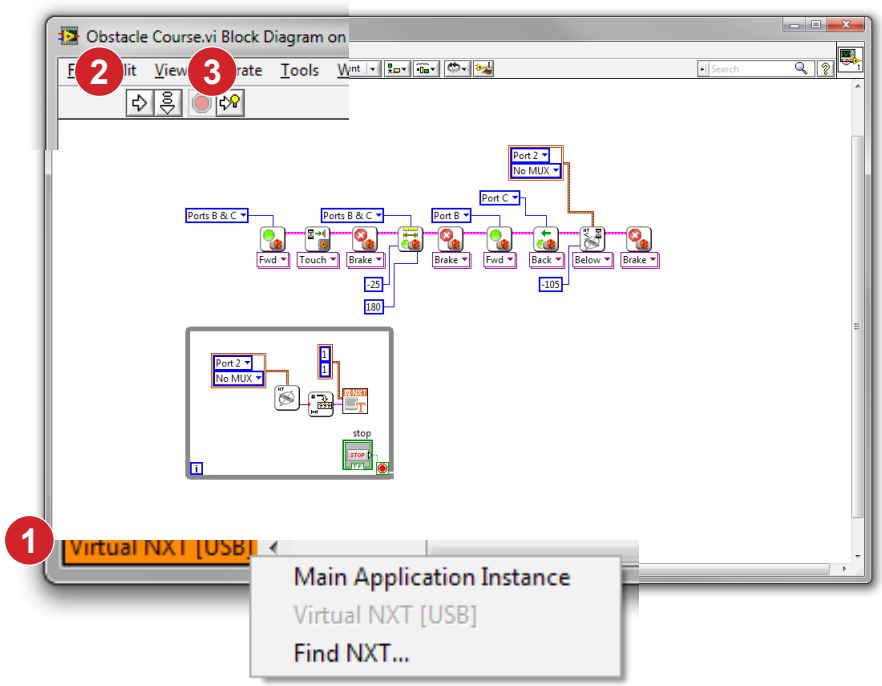


When creating programs for the Virtual Brick, you must be sure to limit the Functions you use to those found in the NXT Robotics category. LabVIEW includes more sophisticated functions which will not run on the Virtual Brick or a real LEGO robot.



Programming - LabVIEW

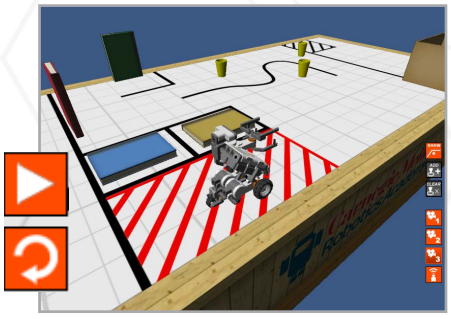
Programming in LabVIEW for the Virtual Brick is very similar to programming for a real LEGO robot , and is primarily done in the “Block Diagram” Window (not the Front Panel Window). The Block Diagram can be selected from the Window menu in LabVIEW if it is not already open.



1. You must target the Virtual Brick in LabVIEW before downloading and running a program. In the lower-left corner of the Block Diagram window, right-click on the area that says “Main Application”, and choose the Virtual Brick (“Virtual Brick [USB]” by default). The color of the section will change to orange.

2. The Download and Run (right arrow) button will download a program to the Virtual Brick AND start running it in the virtual world. When working on a challenge, we recommend getting the virtual robot into a start position in the virtual world, then pressing the Download and Run button.

3. The Download (downward arrow) button will download programs to the Virtual Brick.



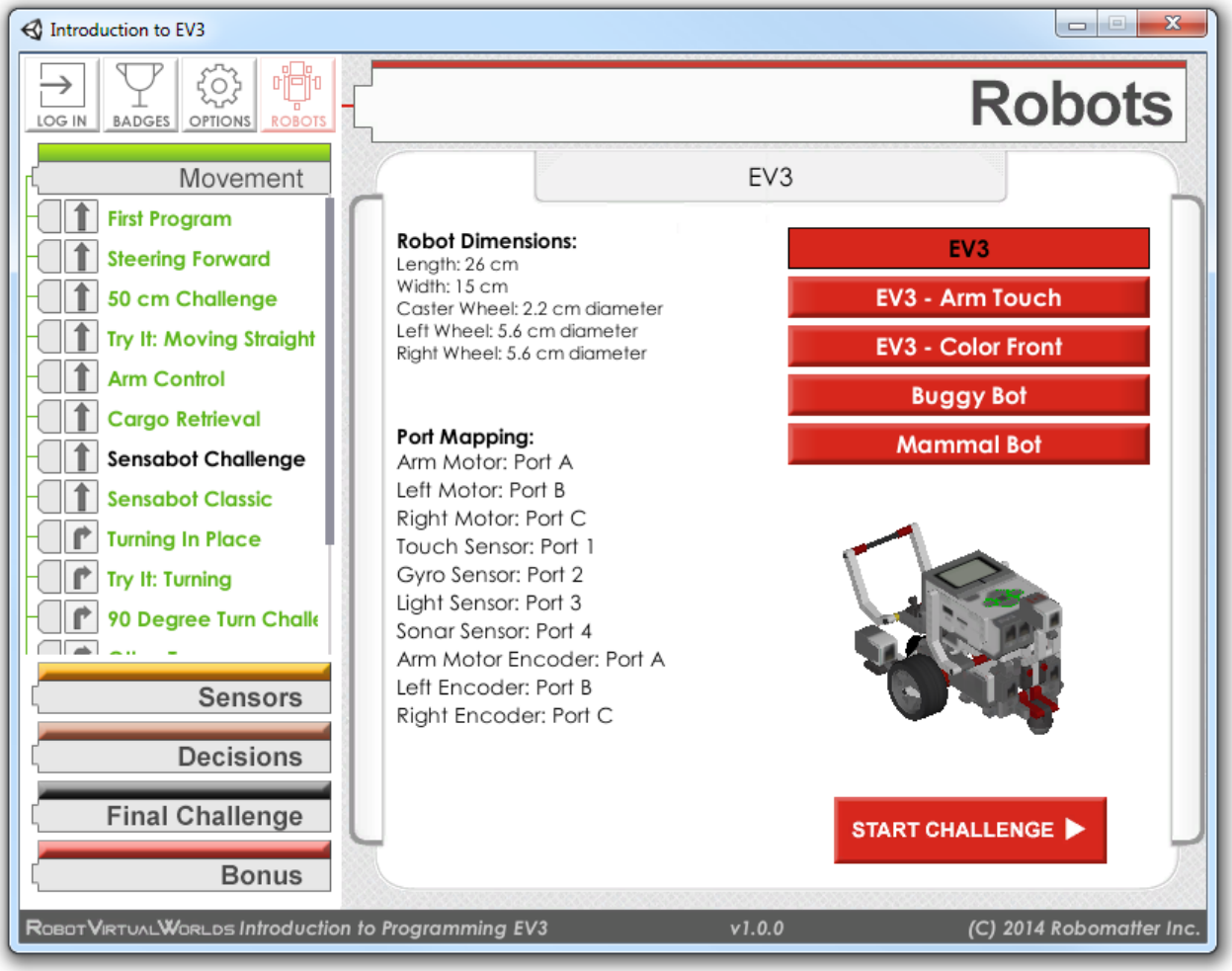
Remember that you can press the reset button (circular arrow) on the left side of the virtual world to reset the robot to its original position.

Pressing the Play button (right arrow), will run the program most recently downloaded to the Virtual Brick.

Using the Robot Virtual Worlds

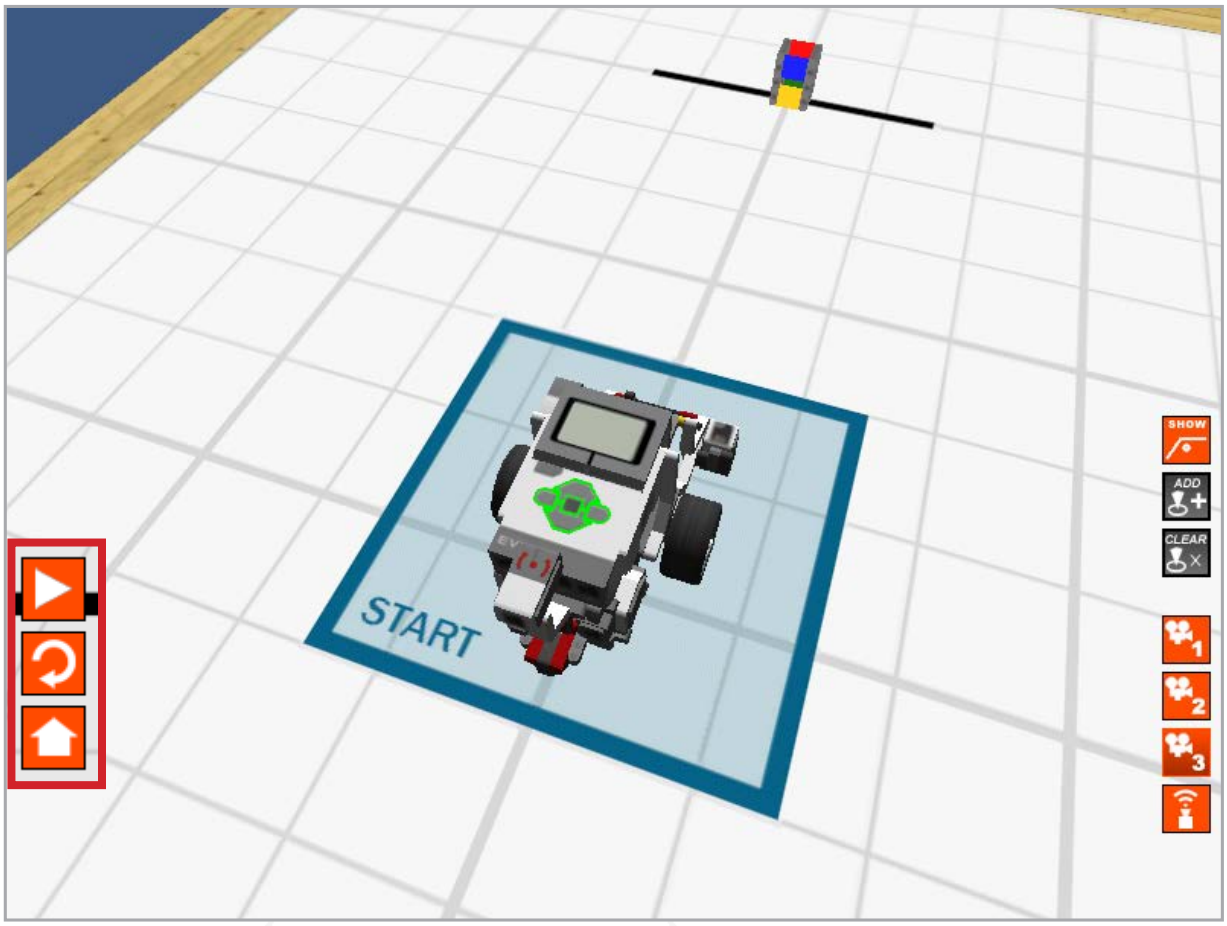
All Robot Virtual Worlds have an interface that you will need to navigate; many components of the different worlds are similar, but each also has several unique game mechanics. The following pages will familiarize you with the common components and briefly introduce you to the unique ones.

In the example directly below, the Introduction to Programming EV3 RVW was chosen from the Target World menu in the Virtual Brick software. One example of a common component across all worlds is the ability to select multiple robot styles. Robot specifications are included in the ROBOTS section. You will need this information when writing programs for the virtual robots.



Common RVW Components: Game Control

Every Robot Virtual World includes Game Controls. Their placement and color vary slightly from world-to-world, but they are generally located in the lower-left corner of the screen.



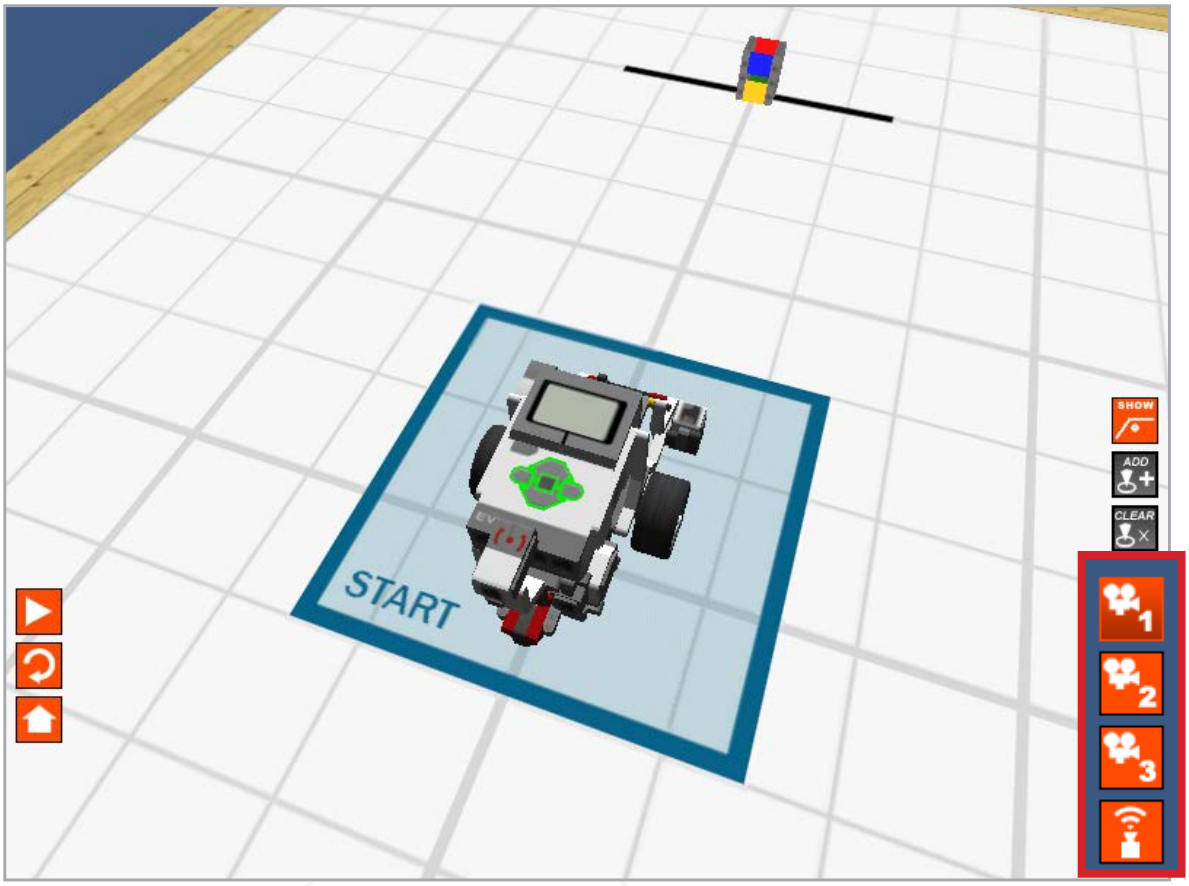
Play / Pause: This button will run the program currently selected (or most recently downloaded) to the Virtual Brick. Once a program is running, it will switch to a Pause symbol; press it to halt a running program.

Reset: This button will stop a running program and reset the robot to its original starting point and orientation.

Home: This button will stop a running program and return you to the main menu of the Robot Virtual World you are using.

Common RVW Components: Camera Control

Every Robot Virtual World also includes Camera Controls. Their placement and color vary slightly from world-to-world, but they are generally located in the lower-right corner of the screen.



Camera 1: This is the default game camera. It will "follow" the robot from behind as it moves in the virtual world. You can zoom in and out using the scroll wheel on your mouse.

Camera 2: This provides a static, top-down view of the robot in the virtual world.

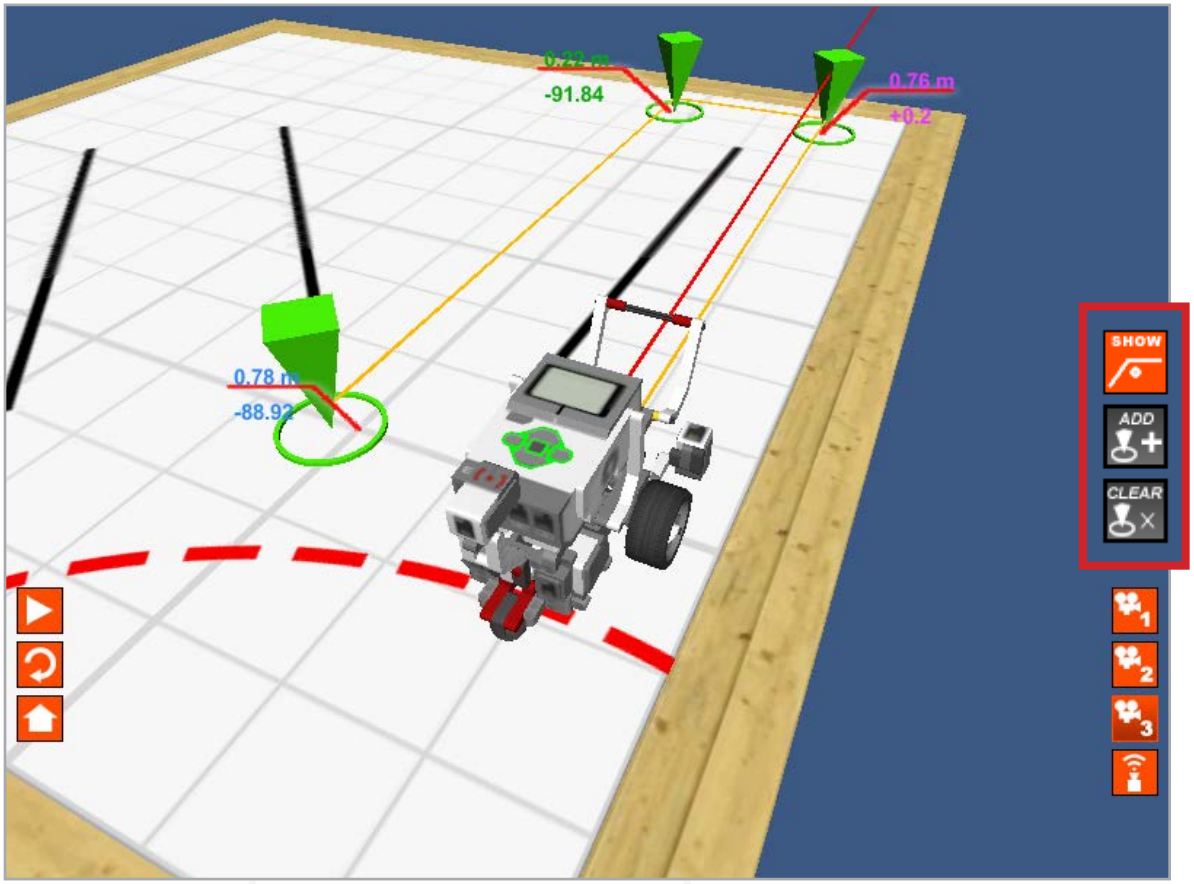
Camera 3: Like Camera 1, this camera will follow the robot as it moves in the virtual world. Using Camera 3, you can also click-and-drag in the virtual world to change your viewing angle of the robot.

Sensor View: This button allows you to see hidden data from sensors such as the Ultrasonic Sensor, and is useful for determining why the robot is "seeing" certain sensor values.

Common RVW Components: Measurement Toolkit

Every Robot Virtual World includes the Measurement Toolkit. The Measurement Toolkit allows you to obtain key distances and angles from the virtual environment, crucial for robot path planning, by placing markers in the world.

The placement and color vary slightly from world-to-world, but they are generally located on the right side of the screen.



Show: This button toggles the Measurement Toolkit on and off. You must press it to enable the Measurement Toolkit. If there are key objects in the environment (goals, scoring objects, etc), the distance and angle to them from the robot will be displayed automatically.

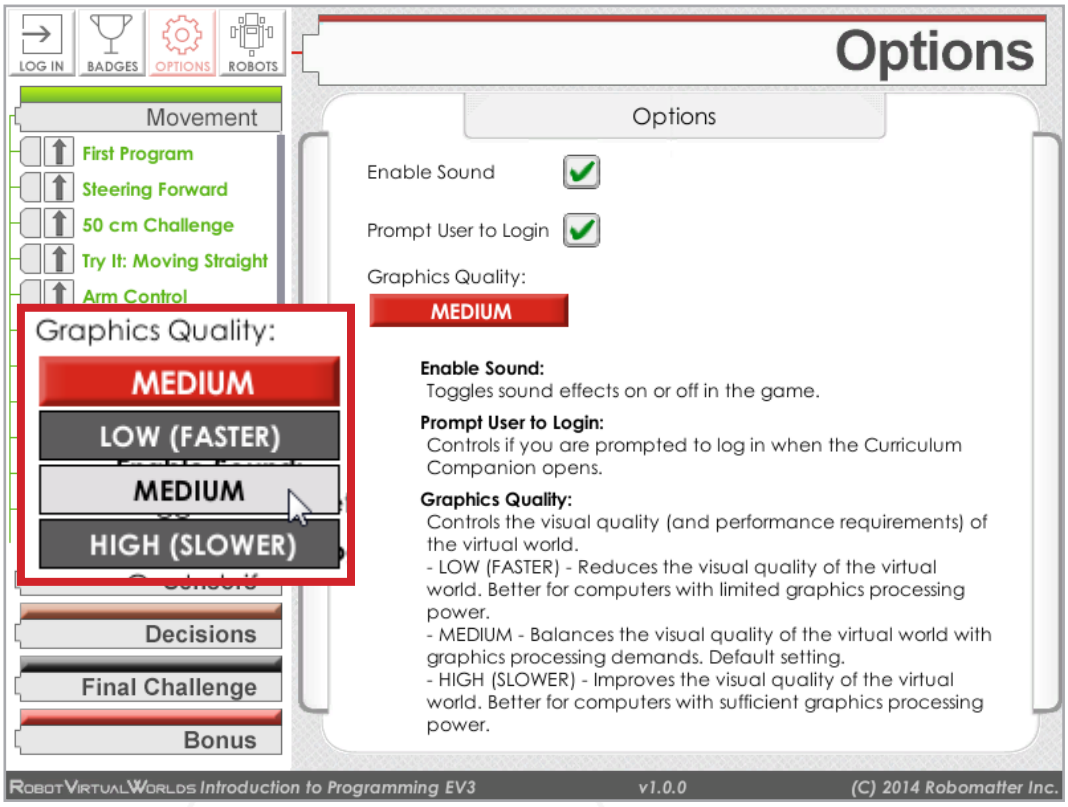
Add: Press this button to put your cursor in “maker adding mode”. Click anywhere in the virtual world to add a marker, which will display its distance and delta angle from the robot. A series of up to 3 markers can be added at a time.

Clear: Pressing this button will remove the markers you have placed in the virtual world. Right-clicking while in “marker adding mode” will also remove the most recently created point.

Common RVW Components: Optimizing Your Computer's Performance

The Robot Virtual Worlds are built using a real physics and gaming engine, and have similar computer processing demands as a video game. To allow the RVWs to be run on a wider variety of computer hardware, graphics quality settings are included.

In the Introduction to Programming EV3 RVW, you'll find these controls in the OPTIONS menu. In the fantasy worlds, you'll find them under SETTINGS.



There are always three quality choices:

- LOW (FASTER) - Reduces the visual quality of the virtual world. Better for computers with limited graphics processing power
- MEDIUM - Default setting. Balances the visual quality of the virtual world with graphics processing demands.
- HIGH (SLOWER) - Improves the visual quality of the virtual world. Better for computers with sufficient graphics processing power

Common RVW Components: Log In To Save Student Progress

These are the first types of screen that you see when you launch a Robot Virtual World. How you log in determines how your progress is saved. Teach your students how to save their progress.

1 Log into CS2N

If a teacher wants to track all of her students' progress on one screen, then they will want their students to setup CS2N accounts. When students log in with their own CS2N account, their progress is tracked and stored via the CS2N network. This lets students continue their progress, even on a different computer.

Create a CS2N account at http://www.cs2n.org/signup (users will need an email address)

For teachers to see all of their student's progress they will need to setup a CS2N Group. Learn more at www.cs2n.org/teachers/groups

2 Log in locally

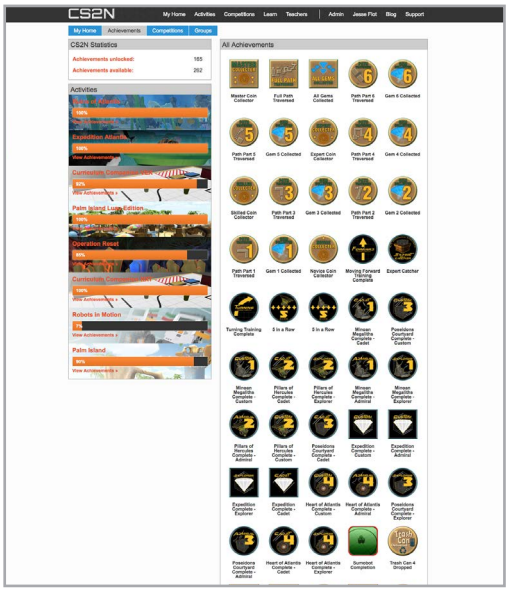
A local log in allows students to save their progress on a local machine. Students will need to use the same computer every day to take advantage of this feature.

3 Log in as guest

Within the LOCAL button, there is an option to log in as guest. Logging in as a guest allows teachers to preview and demonstrate the game easily, but once the game is closed no progress will be saved. This option should not be used with students, as all progress will be lost if the application is closed, even accidentally.

Tracking Student Performance

Badges and Achievements



The Computer Science Student Network (CS2N) contains free activities, courses, and resources for teachers to teach Robotics and Computer Science. Teachers can use CS2N to create a Group and keep track of their students progress.

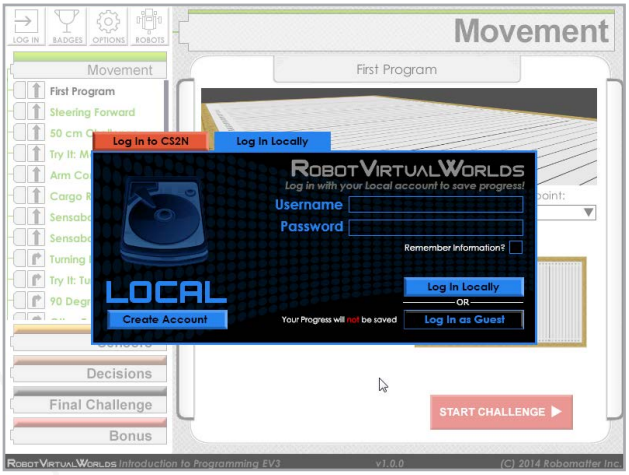
Robot Virtual Worlds give out badges upon completing certain tasks or behaviors.

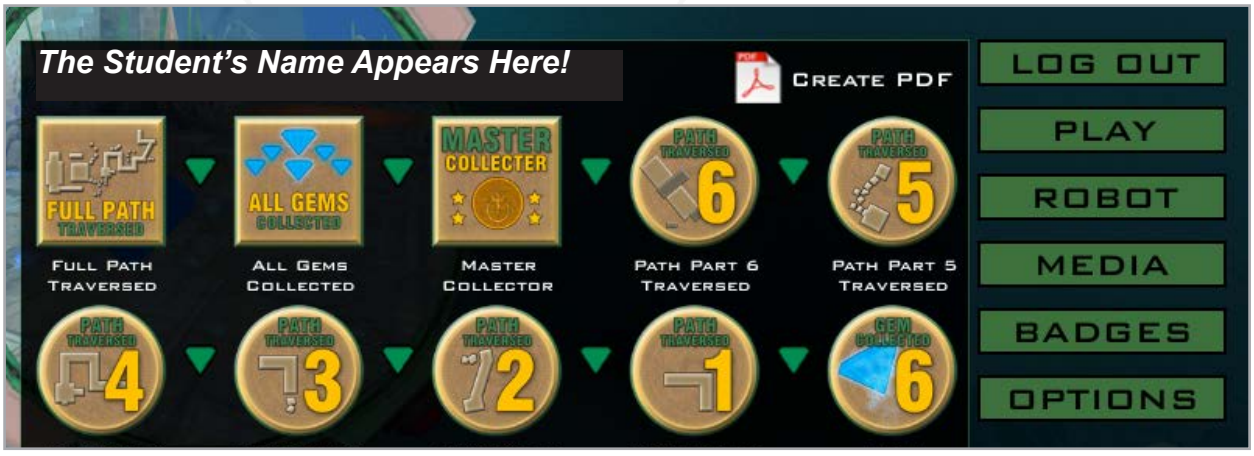
CS2N is able to keep track of your Robot Virtual Worlds Achievements (or badges) once a CS2N account is created. Go to CS2N.org to create an account and begin getting achievements.

No Internet connection? That's okay!

Achievements can also be obtained by creating a Local account. This is useful for computers that cannot connect to the Internet. You can do this by simply selecting the "Create Local Account" option.

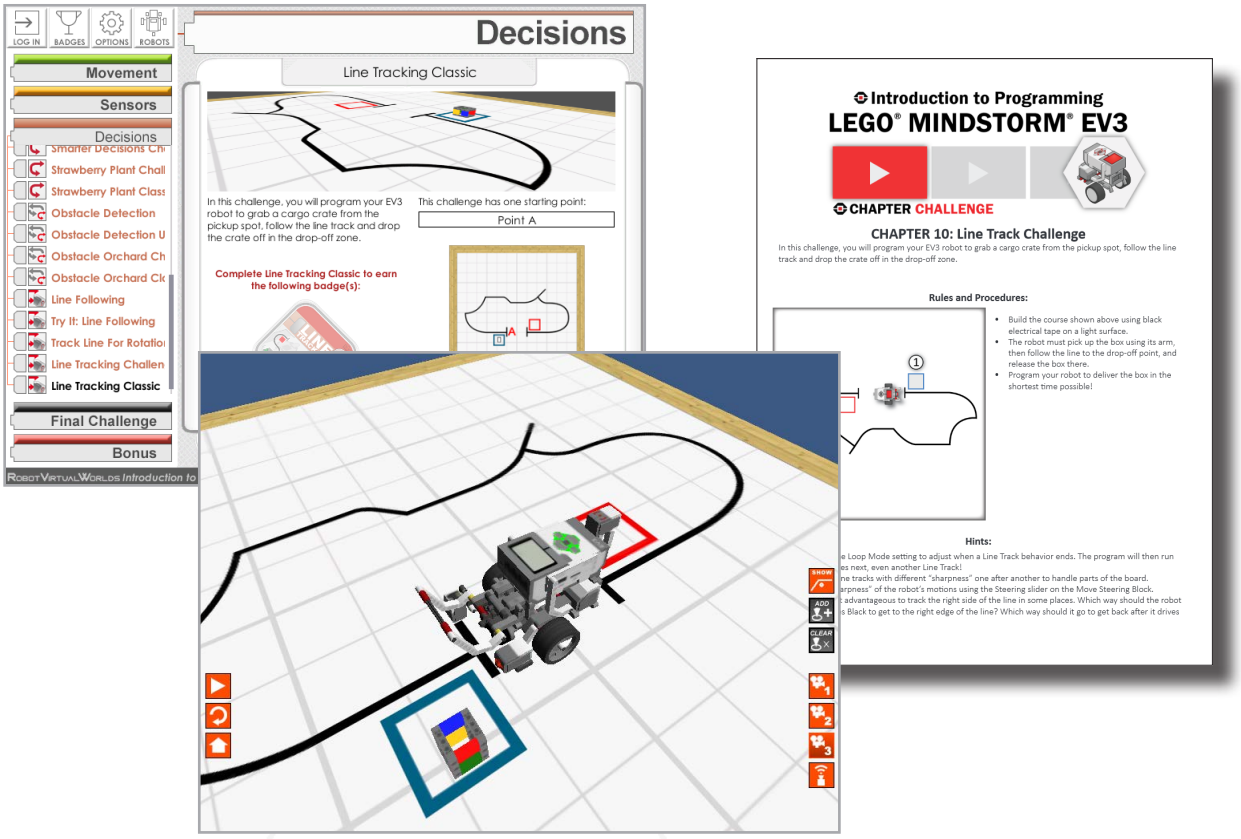
The student's achievements are stored on the local computer and they are able to print a copy and save it in a PDF format.





Introduction to Programming EV3 RVW

The Introduction to Programming EV3 RVW includes several simulated LEGO robots and over 80 classroom themed programming challenges from the Introduction to Programming EV3 Curriculum. The virtual LEGO robots have the same dimensions, features, and sensors as physical LEGO robots. The Introduction to Programming EV3 RVW is a great place to start for teaching how to program and works well in classrooms using both real and virtual robots.



Additional details about the Introduction to Programming EV3 RVW:

- Use the navigation buttons on the top to choose between the Badges you've earned, Options available, and Robot selection.
- Use the navigation on the left to select the different programming challenges.
- Every challenge corresponds with an activity in the curriculum and also has some information on their challenge page.
- Challenges that award achievements for completion display the badge to be earned on the challenge page.
- More information can be found here: http://robotvirtualworlds.com/

Operation Reset

The mining colony of Alpha Base H99 needs your help! A terrible storm has damaged the colony's equipment and we need you to use your programming skills to complete the mission!

- Explore the surface of Planet H99 with two different rover models.
- Use the Vacuum attachment on the rover models to collect Unobtanium Crystal samples.
- Transport Ion Propulsion Fuel Barrels to Fuel Stations so that the Enigma Rocket can return to Earth with the crystals.
- Deliver Charge Cubes to the colony's Communication Towers to enable direct robot control and additional mission insertion points.

Operation Reset is one of several free additional Robot Virtual Worlds you can download from RobotVirtualWorlds.com. Additional details and resources for Operation Reset, including Mission Tutorials, Maps, and lesson plans can be found at: http://robotvirtualworlds.com/operation-reset/

Ruins of Atlantis

We thought Atlantis was a myth. We were wrong. With the emergence of new robotics technologies we are now able to explore areas of the world we've never seen before. According to legend, Atlantis was a center of trade and commerce in Eurasia thousands of years ago.

Your mission is to explore the Ruins of Atlantis, 6,000 meters below the surface of the ocean, collecting data and treasure as you do. Ruins of Atlantis is designed to teach and reinforce introductory programming concepts such as path planning and encoder based movements.

Ruins of Atlantis is one of several free additional Robot Virtual Worlds you can download from RobotVirtualWorlds.com. Additional details and resources for Ruins of Atlantis can be found at: http://robotvirtualworlds.com/ruins-of-atlantis/

Palm Island

Welcome to the Rescue Bots Training Ground on Palm Island! Seagulls calling. Palm trees swaying. Waves lapping at the beach. Palm Island is a floating oasis for you to explore.

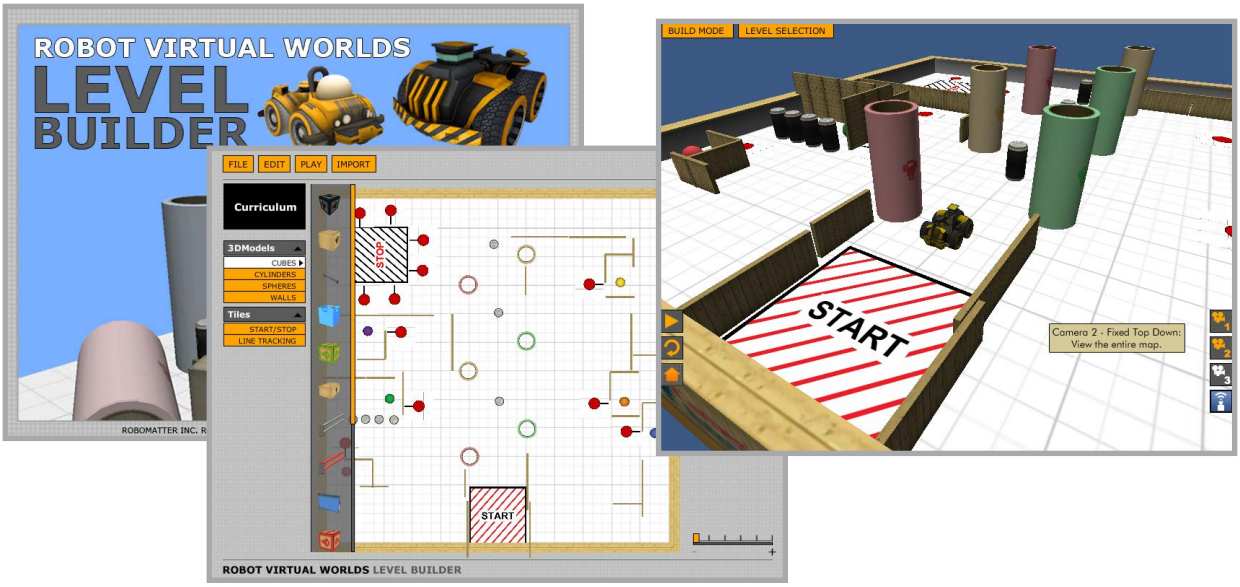
Palm Island is designed to teach and reinforce introductory and intermediate programming concepts involving sensor based robot movements. Learn to program while helping Commander Roxie-Rivet-minder prepare for a Luau:

- Use your robot to collect coconut clusters and set lobster traps.
- Control your robot's movement to stay on the island boardwalk.
- Use the robot's gripper to drop off trash cans before the big party.

Palm Island is one of several free additional Robot Virtual Worlds you can download from RobotVirtualWorlds.com. Additional details and resources for Palm Island can be found at: http://robotvirtualworlds.com/palm-island/

Level Builder & Model Importer

Robot Virtual Worlds like the Introduction to Programming EV3 contain many challenges targeted to teach specific concepts, but we know that teachers have their own ideas and teaching goals. The Robot Virtual Worlds' Level Builder provides an empty area and a large selection of classroom objects that you can use to design challenging, unique, and fun levels!

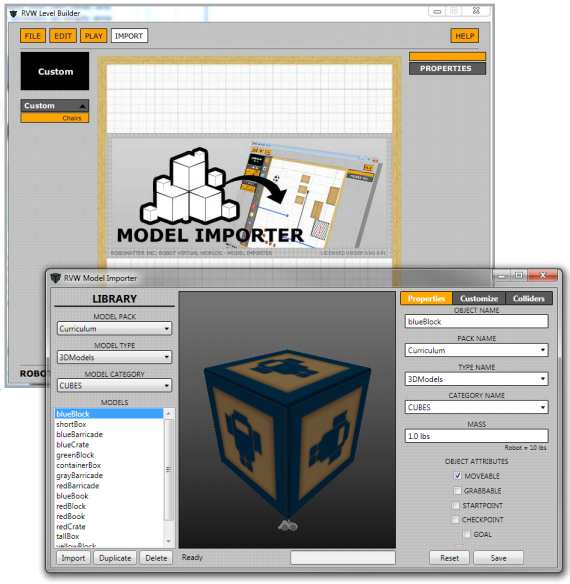


The Level Builder has two primary modes, Build Mode and Play Mode:

- Build Mode includes an empty 12' x 12' space with props that students can use to design programming challenges - balls, walls, line track tiles, etc.
- Props can be configured to behave like obstacles, checkpoints, or goals.
- In Play Mode, the designed level can be tested out quickly with keyboard controls or the robots can be programmed to solve the final challenges.

Additional details about the Level Builder:

- Teachers can easily share custom challenges for each of their students.
- Students can challenge other students by building their own level designs.
- An included Model Importer also allows you to import and use your own models from Inventor, Solidworks, and SketchUp!
- More information on the Level Builder can be found here: http://robotvirtualworlds.com/levelbuilder/
- A full set of tutorials on the Model Importer can be found here: http://robotvirtualworlds.com/model-importer/



Additional Resources

- **Robotvirtualworlds.com**
  This is the home of Robot Virtual Worlds. Here you can find all of the level packs available as well as resources and information about the worlds.

- **Virtual Brick (http://robotvirtualworlds.com/virtualnxt)**
  Download or Learn more about the Virtual Brick.

- **Curriculum Companion (http://robotvirtualworlds.com/curriculumcompanion/)**
  The Curriculum Companion is a level pack for Robot Virtual Worlds that contains all of the challenges boards you find in the "Teaching ROBOTC" curriculum.

- **Level Builder (http://robotvirtualworlds.com/levelbuilder/)**
  The level builder allows you to create and share a custom level to use in RVW.

- **Model Importer (http://robotvirtualworlds.com/model-importer/)**
  Create a custom model and use the Model Importer to import the model into your level.

- **Operation Reset (http://robotvirtualworlds.com/operation-reset/)**
  The mining colony of Alpha Base H99 needs your help! A terrible storm has damaged the colony's equipment and we need you to use your programming skills to complete the mission!

- **Ruins of Atlantis (http://robotvirtualworlds.com/ruins-of-atlantis/)**
  We thought Atlantis was a myth. We were wrong. Your mission is to explore the Ruins of Atlantis, 6,000 meters below the surface of the ocean, collecting data and treasure as you do.

- **Robomatter.com**
  Robomatter.com is an online educational store where you can get curriculum, software, hardware, or training for robotics education.

- **CS2N.org**
  Home to free activities and courses for Robotics and Computer Science.

Research Studies

Carnegie Mellon University and the University of Pittsburgh's Learning Research and Development Center. study how people learn with robots. Directly below are papers and articles that they've written on learning with Robot Virtual Worlds.

Liu, A., Schunn, C. D., Flot, J., & Shoop, R. (October, 2013) *The role of physicality in rich programming environments.*. Computer Science Education, 23(4), 315-331.

Liu, A., Newsom, J., Schunn, C., Shoop, R. (March, 2013) *Students Learn Programming Faster through Robotic Simulation.* Tech Directions , 16-19.

Liu, A., Newsom, J., Schunn, C., Shoop, R. (May/June 2013) *Learn to program in half the time!. Robot Magazine*, 49-51.

Download copies of the articles at http://www.cs2n.org/teachers/research

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Computer Science Education

The role of physicality

Students Learn Programming Faster Through Robotic Simulation

By Allison Liu, Jeff Newsom, Chris Schunn, and Robin Shoop

EDU BOTS

Learn to Program in Half The Time!

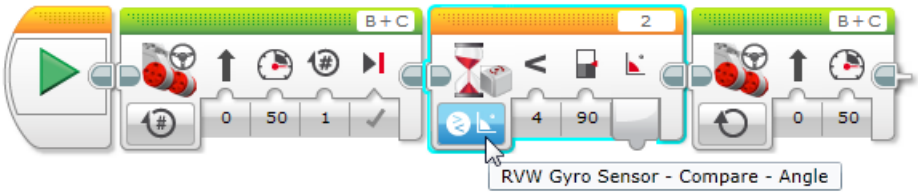
Virtual Sims make students smarter

by Allison Liu, Graduate Student, University of Pittsburgh; Jeff Newsom, Technology Teacher, Penn Trafford High School, Pittsburgh, Pennsylvania; Chris Schunn, Cognitive Scientist, University of Pittsburgh; Robin Shoop, Director, Carnegie Mellon Robotics Academy

RVW Gyro Block Overview

The Gyro Sensor Block in the LEGO MINDSTORMS EV3 Programming Software supports the LEGO Gyro Sensor connected to a physical EV3 Brick. If you attempt to write a program for the Virtual Brick with this block, the software will warn you that it is incompatible:

To use a Gyro Sensor as part of your Virtual Brick programs in the LEGO MINDSTORMS EV3 software, you can use the **RVW Gyro Sensor Block**. This block looks and acts exactly the same way as the default Gyro Sensor Block, but will work with the Virtual Brick and Robot Virtual Worlds:



The RVW Gyro Sensor Block is installed along with the Virtual Brick. Only follow these instructions if the RVW Gyro Sensor block is still unavailable to you after installing the Virtual Brick.

Checklist

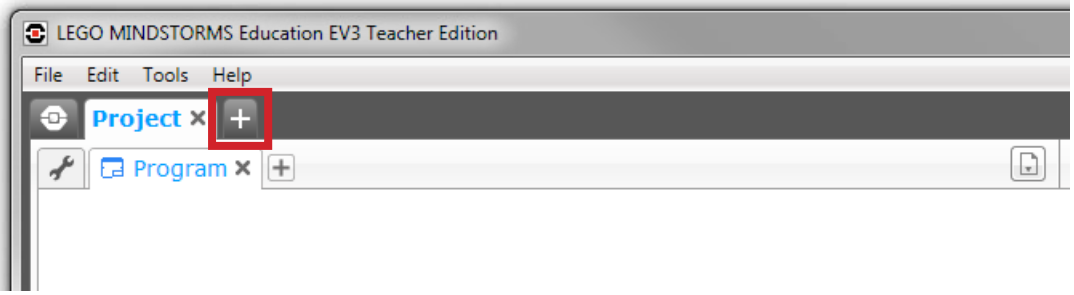
- ☐ Make sure that you have the LEGO MINDSTORMS EV3 Home Edition or Education Edition version 1.1 or newer installed on your computer.
- ☐ Make sure that you have the Virtual Brick version 2.5 or newer installed on your computer. The latest version of the software can be downloaded here: http://robotvirtualworlds.com/virtualnxt/
- ☐ Make sure that you have at least one LEGO compatible Robot Virtual World level pack installed. Valid worlds include the Introduction to Programming EV3 (installed by default, with the Virtual Brick), Curriculum Companion, Challenge Pack for EV3, Level Builder, Ruins of Atlantis, Palm Island, and Operation Reset. The latest versions of the Robot Virtual Worlds can be found here: http://robotvirtualworlds.com/download/

RVW Gyro Block Installation

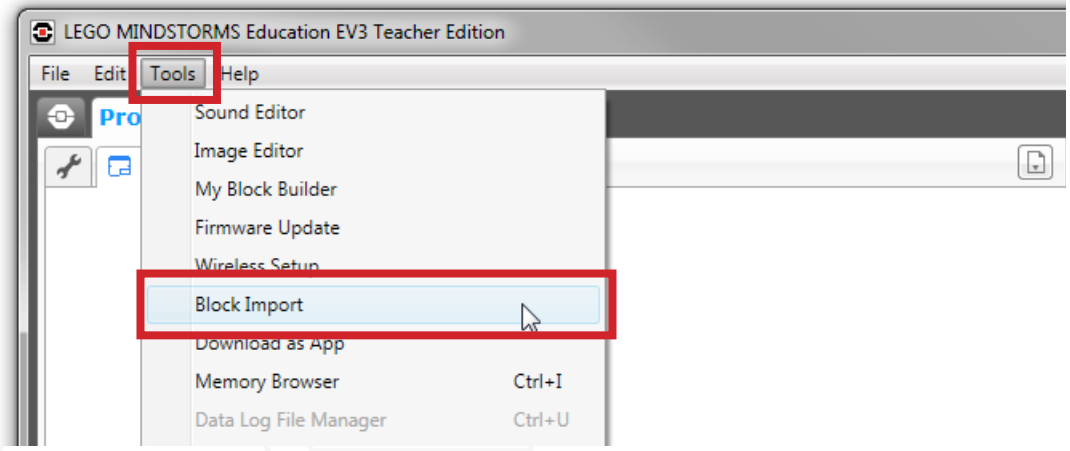
Note: The following guide assumes that you have completed the steps located in the Checklist.

1. Launch the LEGO MINDSTORMS EV3 Home Edition or Education Edition software.

2. Press the + button to create a new Project.

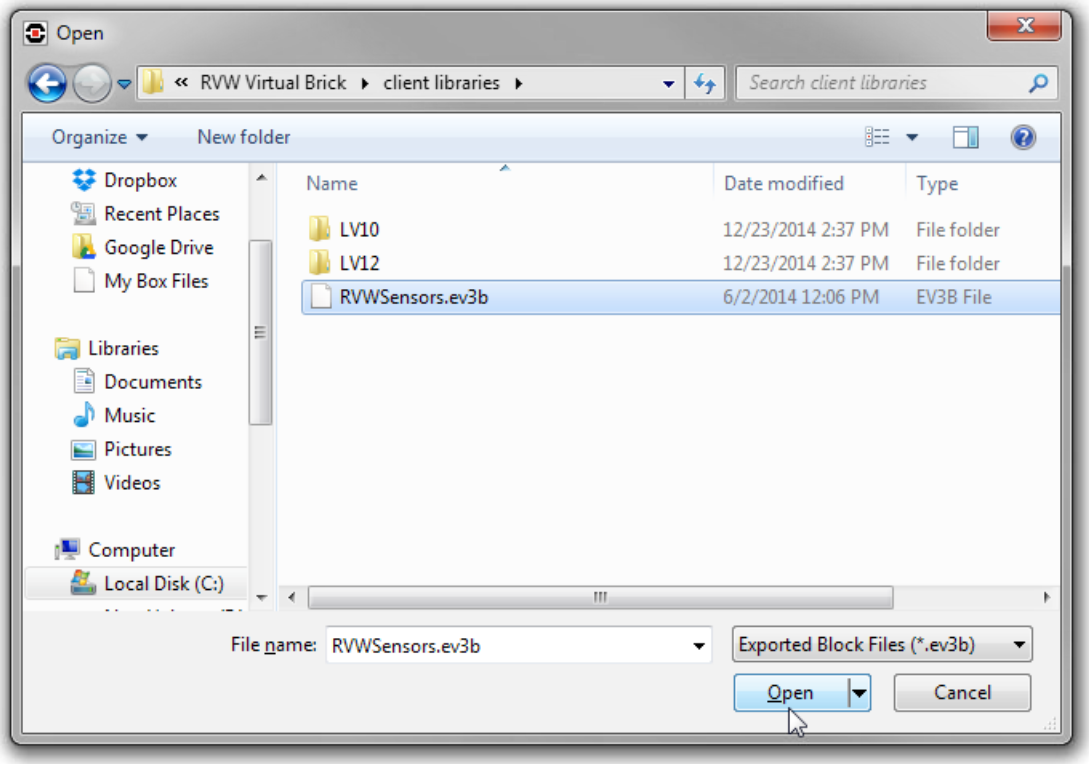


3. Go to the Tools menu, and select Block Import.

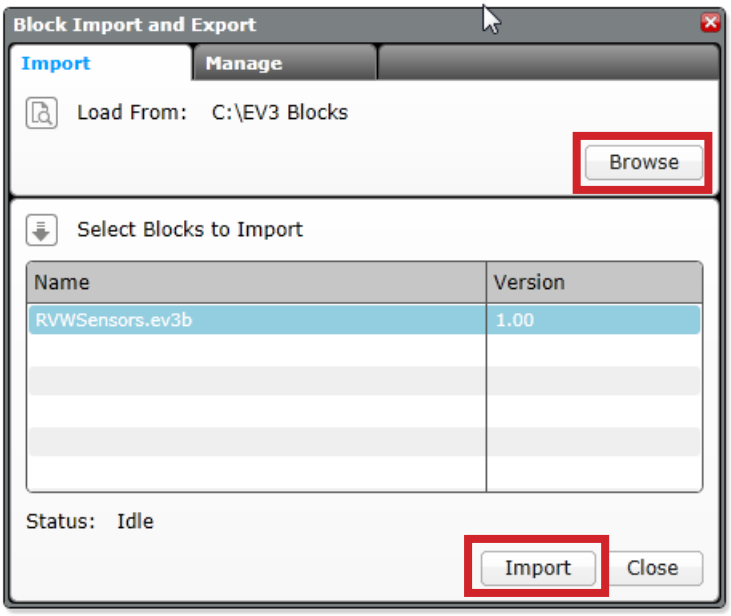


RVW Gyro Block Installation

4. The Block Import and Export window will appear. Click Browse and navigate to the "RVWSensors.ev3b" file, located in "C:\Program Files (x86)\RVW Virtual Brick\client libraries" and then Open it.

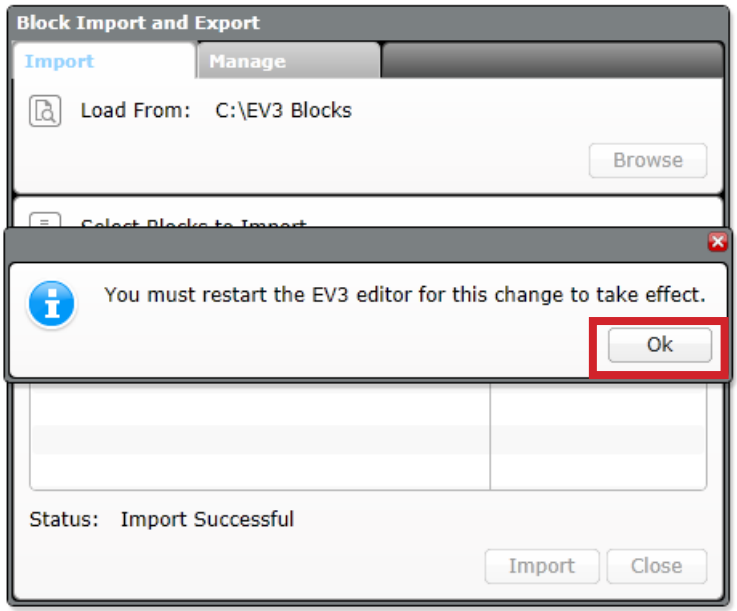


5. Select it and press Import on the Block Import and Export window.



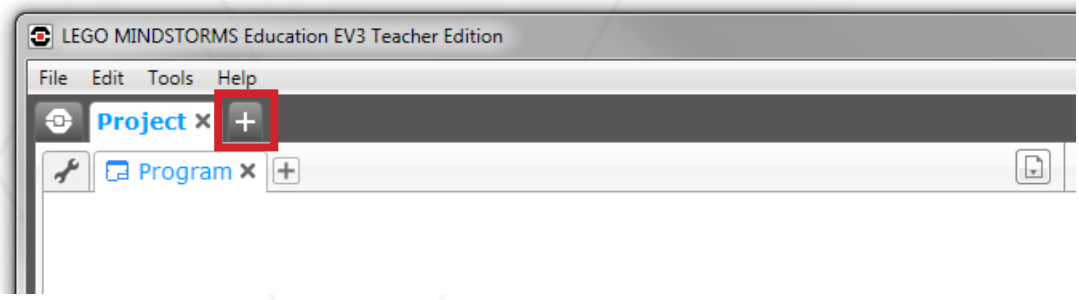
RVW Gyro Block Installation

6. Once the block has been imported, the LEGO MINDSTORMS EV3 software will inform you that you must restart the software to complete the installation. Press Ok, Close the Block Import and Export window, and close out of the software. You do not have to save the Project that you started.



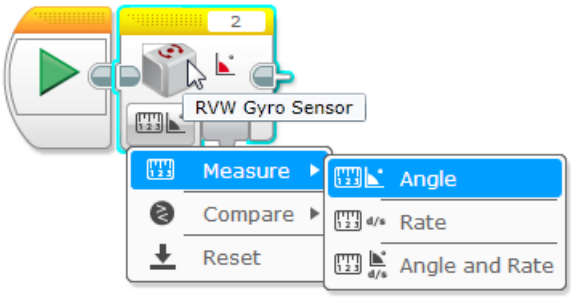
7. Once again, launch the LEGO MINDSTORMS EV3 software.

8. Press the + button to create a new project.

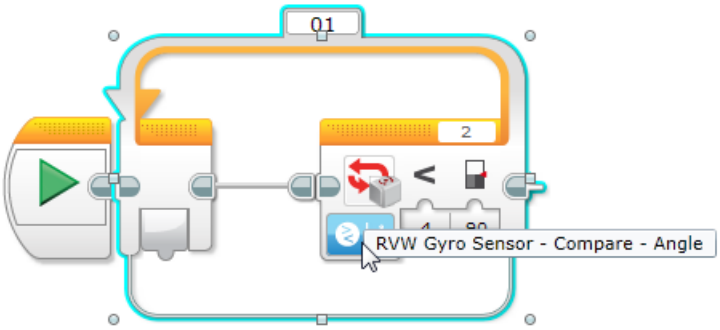


RVW Gyro Block Installation

You should now have a new RVW Gyro Sensor block in the Sensor palette of the programming software, which you can add to your programs.



The Wait, Loop, and Switch blocks in the Flow Control palette should also be configurable with the RVW Gyro Sensor.



Your installation of the RVW Gyro Sensor Block is now complete! You can use the block as part of your programming solutions with the Virtual Brick and Robot Virtual Worlds.

For information on how to use the Gyro Sensor Block, check out the Turn For Angle lessons in the Introduction to Programming LEGO MINDSTORMS EV3 curriculum: http://curriculum.cs2n.org/ev3/lesson/5-1Gyro1.html

For information on how to program virtual robots in the Robot Virtual Worlds, read through the guides on the Virtual Brick web page: http://robotvirtualworlds.com/virtualnxt/