

Robot Educator – Introduction

LEGO® Education is pleased to bring you Robot Educator – a selection of tutorial activities that presents a structured and fun way of getting started with your LEGO MINDSTORMS® Education EV3.

Who is it for?

Robot Educator is a valuable tool for students and teachers wishing to learn or teach using LEGO MINDSTORMS Education. Robot Educator is a learning guide for the EV3 programming language and the hardware included with the set.

Regardless of prior programming or building experience, the engaging and motivating Robot Educator learning tool will have everyone constructing, programming and experimenting in no time.

Who is it for?

Regardless of your individual goal, Robot Educator is a great point of reference and gateway to the essentials of the LEGO MINDSTORMS Education EV3 software and hardware. It guides and supports you through the structured tutorials and hones your building and programming skills, from the basics through to more advanced topics.

What is in the Box?

45544 – LEGO® MINDSTORMS® Education EV3 Base Set

The LEGO MINDSTORMS Education Base Set consists of the Intelligent EV3 Brick, 1 Medium Motor, 2 Large Motors, 1 Gyro Sensor, 1 Ultrasonic Sensor, 1 Colour Sensor, 2 Touch Sensors, and a large collection of carefully selected LEGO elements. All 541 elements are listed on the supplied element overview for easy recognition and ease of management.

Combine the elements using the printed building instructions to create a powerful, intelligent and fun robot. The large selection of elements lets you construct, modify and personalise your robot to suit any experiment.



LEGO® MINDSTORMS® Education EV3 Software

The LEGO® MINDSTORMS® Education EV3 software includes a full graphical programming language, Data Logging environment and integrated content editor. With a highly intuitive interface, the software also creates a user-friendly experience for you and your students.

48 engaging and motivating multimedia-rich tutorials will get your students off to the best possible start. They include:

- Multiple model animations of the EV3 robot
- Interactive animations that help make the connection between program and robot behaviour
- 16 modular building instructions
- A 'Modify it' task that tests the students' understanding of the tutorial and helps consolidate the learning outcome
- Links to relevant help text and user guide topics
- Hints and sample solutions for the busy educator

Robot Educator is comprised of the following categories:

Basics

Learn how to control the Driving Base and trigger events based on input from the various sensors.

Beyond Basics

Grasp the fundamentals of more complex topics, such as program loops, switches, multiple switches, arrays and data wires.

Hardware

Familiarise yourself with the Intelligent EV3 Brick and the assorted sensors and motors.

Data Logging

Master various data logging concepts, such as live and remote data logging, graph programming and dataset calculation.

Tools

Learn how to use the various tools that are included.

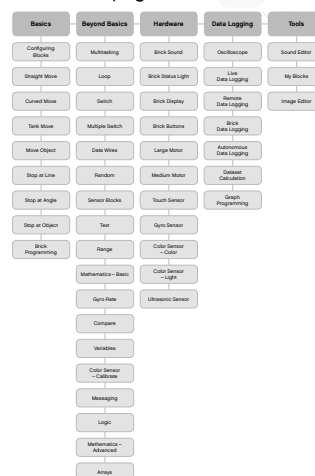


Robot Educator



Robot Educator Overview

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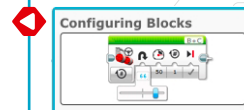


How do I get started?

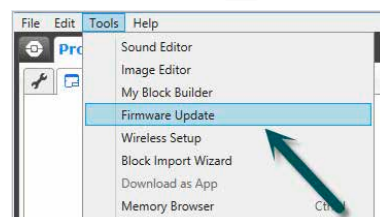
1. Take a look at the Quick Start videos. **Programming** and **Programming Overview** are recommended for most users, but we suggest watching all Quick Start videos to gain a good understanding of the capabilities of the LEGO® MINDSTORMS® Education software.
2. Complete the **Configuring Blocks** tutorial in the Basics category. This tutorial explains how to configure programming blocks – a fundamental concept used throughout the other tutorials.
3. Choose a route that suits your needs and select the tutorials that you wish students to start with (see 'Suggested Lesson Planning Routes' later in this introduction). Try out some of these tutorials to familiarise yourself with this approach.
4. Ensure each student computer has a pre-installed student version of the LEGO MINDSTORMS Education EV3 software. Refer to the readme.txt file for installation instructions. You can see which version is installed in the top bar of the software.
5. Ensure that each EV3 Brick has the latest firmware and is fully charged.
6. It is very important for students to understand the relevance of the elements in the brick set. Discuss the naming and basic functionality of the key hardware components, and establish a set of brick management rules.

The User Guide is your source for everything relating to the LEGO MINDSTORMS EV3 hardware.

Help text links are provided for students within each tutorial.



Firmware Update



Classroom Management Tips

How much time do I need?

Tutorials

The time taken to complete each of the tutorials depends on a number of factors. This includes the level of complexity, the age of the student, as well as the student's experience with LEGO® MINDSTORMS® and the concepts covered in the relevant tutorial. The following estimates are therefore based on the time it would take an average student, with no prior experience with LEGO MINDSTORMS, to complete a tutorial in each of the following categories:

Category	Estimated completion time* (minutes)
Basics	20
Beyond Basics	35
Hardware	20
Data Logging	20
Tools	15

*These times do not include building the model, which is required to complete a tutorial. Add approximately 20 minutes for tutorials requiring the Driving Base and approximately 10 minutes for those requiring the EV3 Brick.

Based on the timings listed above, it should be possible for your students to complete the first Driving Base tutorial within a 45-minute class period.



Classroom Management Tips

Content Editor

Customised Tutorials

The integrated Content Editor gives you the ability to customise the tutorials supplied with the Robot Educator in order to create your own set of differentiated lessons. Here are a few ways that you could customise the tutorials:

- Rephrase the text to better match the reading ability of your students
- Add images that are more relevant to your students
- Add additional tasks to challenge groups that complete the tutorials quickly

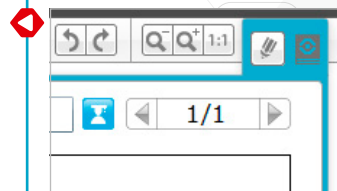
To ensure that you do not overwrite the tutorials supplied with the LEGO® MINDSTORMS® Education software, any changes you make will be saved as a new tutorial. All the files included with the original tutorial will also be included in the new project file, which you are then free to share with your students (for example on a network shared drive).

Student Documentation Tool

The Content Editor also allows students to document their progress and findings as they work through each tutorial. The Content Editor allows them to:

- Write full descriptions of their working processes
- Insert their own pages
- Add images and videos of their robot in action
- Share their unique project with other students

For more information on the Content Editor, watch the **Content Editor** Quick Start videos.



Suggested Lesson Planning Routes

There are many ways to utilise the Robot Educator to reach your specific teaching goals. In the following pages we have provided you with five lesson planning routes that allow you to tailor your coursework to suit different student audiences.

Basics of Robotics

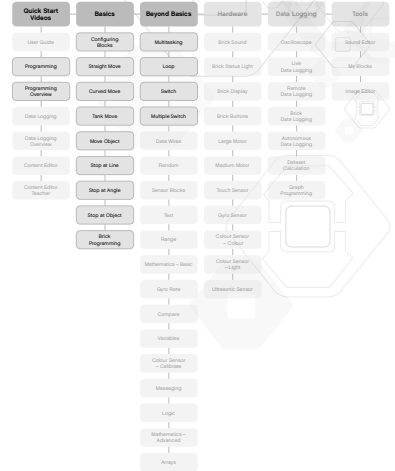
The aim of this route is to give students the knowledge they need to manipulate the hardware and software components that make up the LEGO® MINDSTORMS® Education EV3 software and Robot Educator Content Pack.

First, have the students watch the programming related Quick Start videos to familiarise themselves with the software interface. Next, lead them through the **Configuring Blocks** tutorial in the Basics category of the Robot Educator Content Pack. Then, improve your students' driving skills and make them familiar with the various sensors by having them complete the remaining eight tutorials in the Basics category.

To allow the students to create more complex programs, have them complete the **Multitasking, Loop, Switch** and **Multiple Switch** tutorials in the Beyond Basics category.

Basics of Robotics

Please see next page.



Basics of Robotics



Computer Science

This route teaches pre-computer science students the fundamentals of programming using the Robot Educator and Gyro Sensor hardware. The LEGO® MINDSTORMS® EV3 software is based on LabVIEW, the industry-leading graphical programming environment used by scientists and engineers worldwide. This graphical programming approach has proven to provide a solid foundation for students learning textual programming.

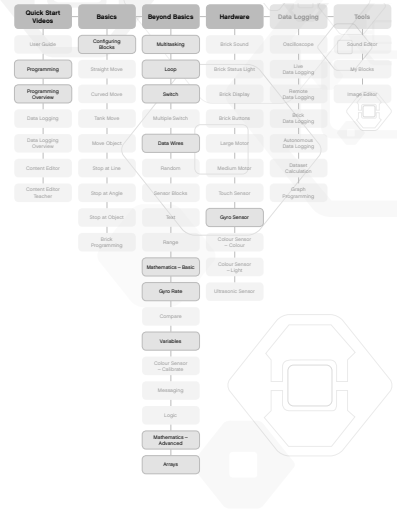
First, give the students a grounding in the interface by having them watch the programming-related Quick Start videos. Then, walk them through the **Configuring Blocks** tutorial in the Basics category.

Next, introduce the students to the sensor's Angle and Rate modes by having them complete the **Gyro Sensor** and **Gyro Rate** tutorials in the Hardware and Beyond Basics categories.

To teach the students the fundamentals of graphical programming, have them complete the following Beyond Basics tutorials: **Multitasking, Loop, Switch, Data Wires, Variables, Arrays, Mathematics - Basic** and **Mathematics - Advanced**.

Computer Science

Please see next page.



Computer Science



Middle School Science

As the name suggests, this route is aimed at middle school science students. It gives students a basic understanding of some of the hardware sensors included with the LEGO® MINDSTORMS® Education Base Set. It also teaches them about collecting and analysing data logged by the sensors.

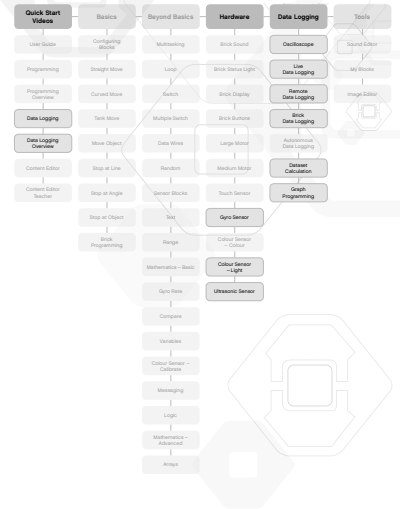
First, have the students complete the **Gyro Sensor**, **Colour Sensor - Light** and **Ultrasonic Sensor** tutorials in the Hardware category.

Next, teach the students the fundamentals of logging data via the Intelligent EV3 Brick by completing the **Brick Data Logging** tutorial in the Data Logging category. Have them also watch the Quick Start videos that introduce the Data Logging application.

The next step is to give the students more hands-on experience with the software. Have them complete the **Oscilloscope**, **Live Data Logging** and **Remote Data Logging** tutorials in the Data Logging category.

For students wishing to go further, the **Dataset Calculation** and **Graph Programming** tutorials demonstrate the real power of the Data Logging application.

Middle School Science
Please see next page.



Middle School Science



Mathematics

This route provides students with a selection of tutorials that touches on the basic use of mathematics. This includes randomising, defining a range, angles and rotational angle, as well as basic mathematics operations that calculate speed and trigonometry to navigate the Driving Base.

First, have them watch the Quick Start video, **Programming Overview**, which introduces the software.

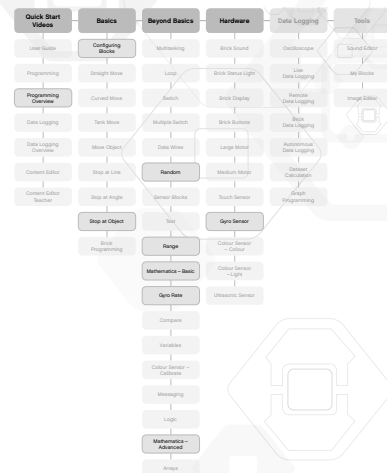
Next, have the students complete the **Configuring Blocks** tutorial in the Basics category, the **Gyro Sensor** tutorial in the Hardware category, as well as the **Stop at Object** tutorial in the Basics category, to ensure they know how the Gyro and Ultrasonic Sensors function.

The next step is to have the students complete more mathematics-oriented tutorials, such as **Random**, **Range**, **Gyro Rate** and **Mathematics - Basic** in the Beyond Basics category.

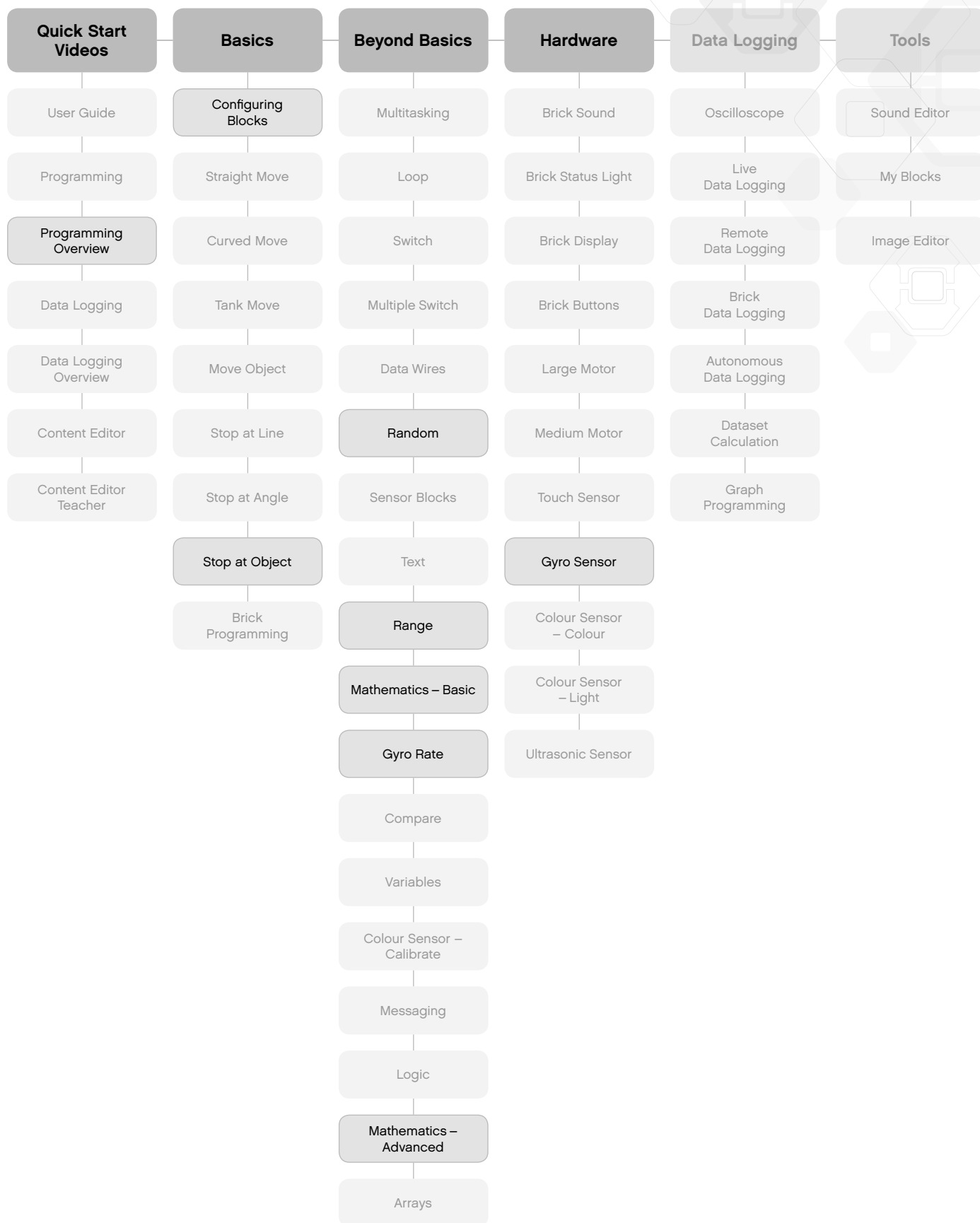
For students wishing to go further, the **Mathematics - Advanced** tutorial demonstrates the real power of the programming software.

Mathematics

Please see next page.



Mathematics



Technology / Engineering

This final route gives your students a series of tutorials that applies the LEGO® MINDSTORMS® concept to technology and engineering classes. The focus is on getting to know the hardware and its basic operation by carrying out simple programming tutorials.

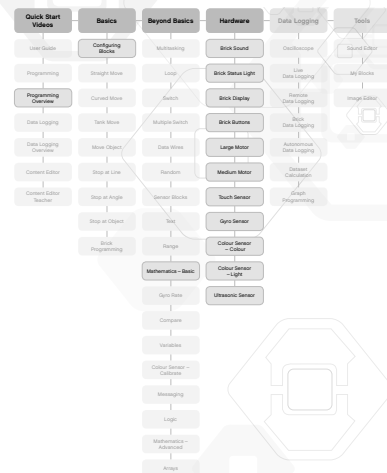
First, have the students watch the Quick Start video, **Programming Overview**, which introduces the software.

Next, have them complete the **Configuring Blocks** tutorial in the Basics category and the tutorials in the Hardware category to ensure that they know how the hardware functions and how to program it at a basic level.

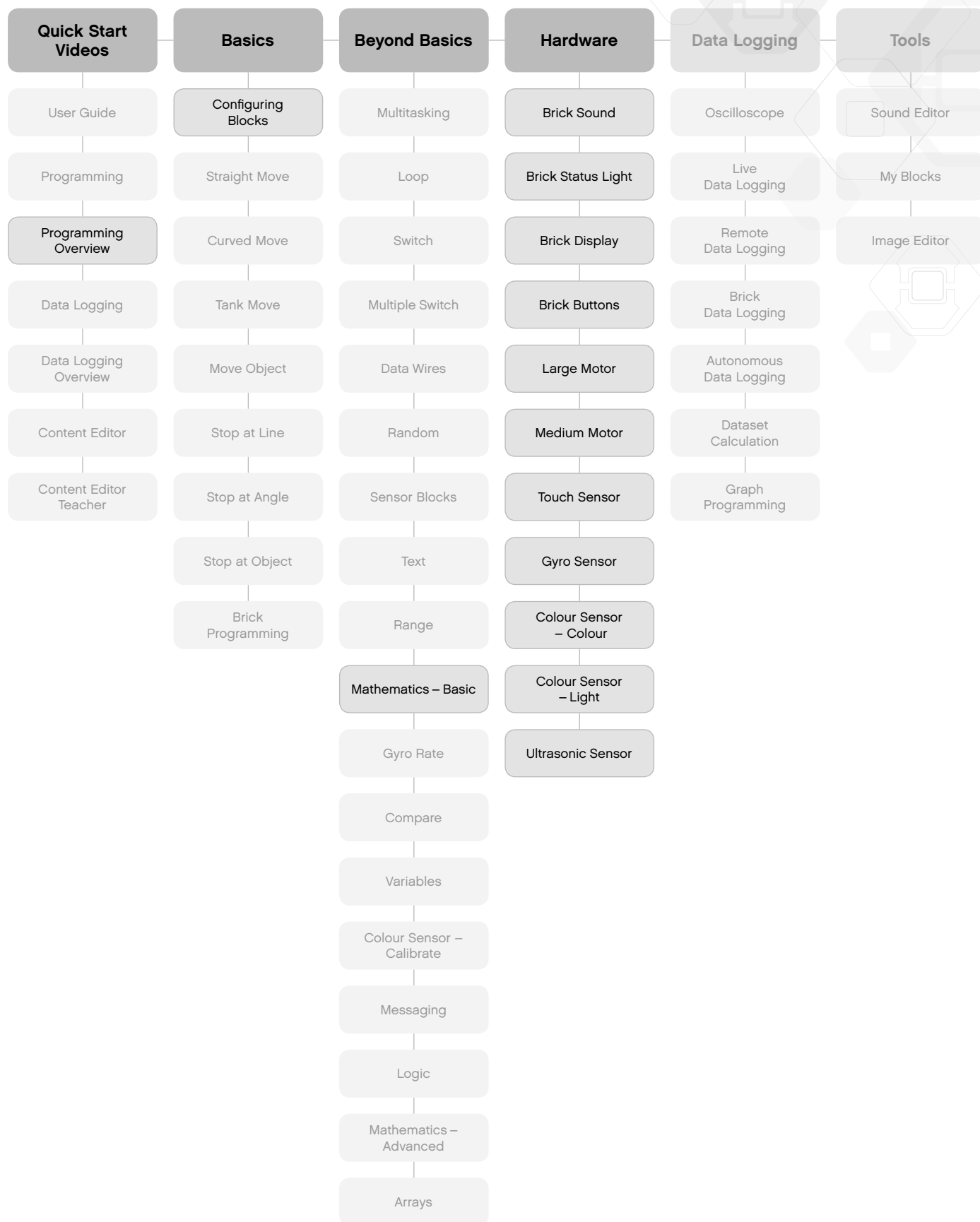
The next step could be to challenge them to build the slowest-moving two-motor vehicle and use the **Mathematics - Basic** tutorial to measure the speed.

Technology / Engineering

Please see next page.



Technology/ Engineering



Robot Educator Overview

