



# STEM Education Curriculum

**Lessons for educating students in STEM with a hands-on approach**

This modular STEM education curriculum has carefully been curated by STEM curriculum experts at STEMpedia and other educational institutes for introducing students to STEM disciplines with an interdisciplinary hands-on approach.

With experiential learning as its prime focus, curriculum consists of about 90 lessons and hands-on STEM activities that will help students develop important life skills such as creativity, critical thinking, problem-solving, teamwork, and attention to detail.

The curriculum is accompanied by detailed lesson plans, activity sheets, and teaching slides for assisting educators in making the most out of the lessons. The curriculum comprises of the following sub-curriculums:

<b>Grade 2+</b>	<b>Hands-On STEM for Elementary Kids</b>	<b>20 Lessons</b>
<b>Grade 5+</b>	<b>Electronics for Kids – Level 1</b>	<b>8 Lessons</b>
	<b>Introduction to Programming for Kids</b>	<b>7 Lessons</b>
	<b>Physical Computing for Kids – Level 1</b>	<b>13 Lessons</b>
	<b>Robotics for Kids – Level 1</b>	<b>9 Lessons</b>
<b>Grade 7+</b>	<b>Electronics for Kids – Level 2</b>	<b>7 Lessons</b>
	<b>Physical Computing for Kids – Level 2</b>	<b>14 Lessons</b>
	<b>Robotics for Kids – Level 2</b>	<b>11 Lessons</b>

**STEMpedia**

**contact@thestempedia.com, +91-8726 533 960, +91-8765 696 060**



# Hands-On STEM for Elementary Kids

## Introduction to STEM with exciting hands-on activities

Hands-On STEM for Elementary Kids has specially been designed for pre-teens to introduce them to the wonders of electronics, physical computing, and robotics through exciting hands-on STEM activities designed keeping in mind the fact that these years are when the skill development process in children is the most active.

With its clear explanations and an assortment of exciting STEM activities for kids, Hands-On STEM for Elementary Kids will have students building their own DIY projects with ease.

### Material Required

STEM Classroom Bundle, activity sheets, and creative cut-outs.

### Prerequisites

Enthusiasm for exploring the unexplored!

### Learning Outcomes

After completing this curriculum, students will have a basic understanding of electronics, physical computing, and robotics. The activities in this curriculum, focusing on experiential learning, will help them develop skills such as DIY-ing, problem-solving, critical thinking, creativity, and teamwork.

**20**  
Lessons

**20+**  
Learning Hours

**2+**  
Grade



[bit.ly/2IYdFfw](https://bit.ly/2IYdFfw)

## Module 1

## Plug and Play

Students will be introduced to the basic electronic components with the help of engaging hands-on STEM activities based on evive.

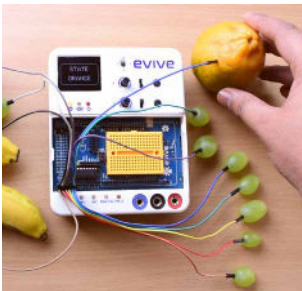


### Lesson 1.1 - Conductors and Insulators

What are conductors and insulators? How to categorise different things into conductors and insulators using evive's touch sensors?

#### Activity

Classifying different materials into conductors and insulators using evive capacitive touch sensors.

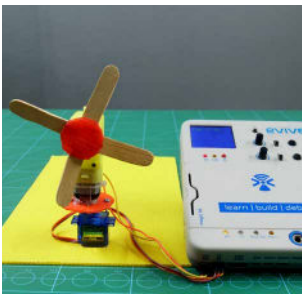


### Lesson 1.2 - Touch Piano

How to make a touch piano using evive and conductors?

#### Activity

Making a touch piano by attaching 6-8 conductors to evive capacitive touch channels.

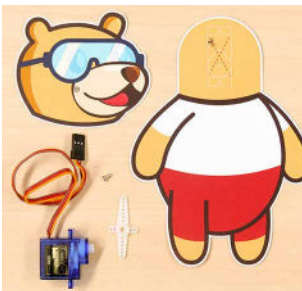


### Lesson 1.3 - Mini Windmill

What is a motor? How to control a motor's direction and speed of rotation using evive's menu?

#### Activity

Making a mini windmill using a motor and cardboard and controlling it with evive.



### Lesson 1.4 - Tobi's Head Moves

What is a servo motor? How to control the angle of a servo motor using evive's menu?

#### Activity

Moving the head of Tobi's cutout with the help of a servo motor and evive.

## Module 2

## Basics of Scratch Programming

Students will be introduced to the basics of programming and will learn how to create animations, stories, and their own games in PictoBlox, a Scratch blocks based graphical programming software.



### Lesson 2.1 - Animating a Sprite

What is Scratch programming? Exploring the different elements of Scratch in PictoBlox - sprite, backdrop, and blocks.

#### Activity

Adding a backdrop and a sprite on the Stage. Creating a small animation of Tobi moving around on the stage.

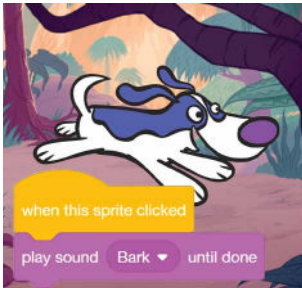


### Lesson 2.2 - Walking Animation

What are costumes? How to make an animation in PictoBlox by switching between the costumes?

#### Activity

Making Tobi walk by switching between his costumes.



### Lesson 2.3 - Playing Sounds

How to play sounds in PictoBlox using the Sound palette? How to sense when a sprite is clicked?

#### Activity

Making a barking dog animation where when the dog is clicked it barks and go to a random location on the stage.

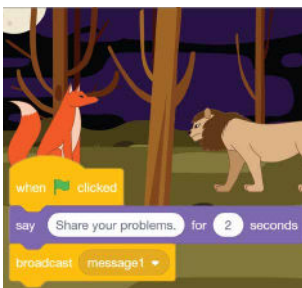


### Lesson 2.4 - Let's Chat!

How to make a sprite speak in PictoBlox? How to take user input by asking questions?

#### Activity

Creating a script where a friendly goblin chats with you.

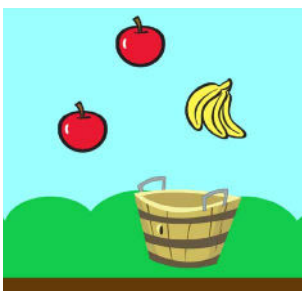


### Lesson 2.5 - Once Upon a Time

How to make two sprites communicate and turn it into a story in PictoBlox?

#### Activity

Creating a story in which a fox and lion talk about the problems they are facing in the forest.



### Lesson 2.6 - Let's Play!

How to make a sprite move with the keys of a keyboard? How to make a game in PictoBlox?

#### Activity

Creating a game to catch the falling fruits in the basket.

## Module 3

## Physical Computing for Pre-teens

Students will be introduced to physical computing with the help of several hands-on STEM activities based on evive.

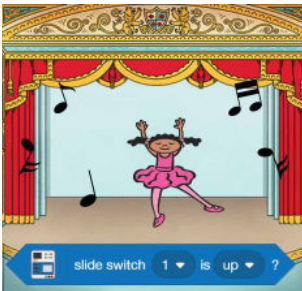


### Lesson 3.1 - Jumping Tobi

How to interface evive with PictoBlox? How to detect if evive's tactile switch is pressed or not?

#### Activity

Creating a script to make Tobi jump by pressing evive's tactile switch.

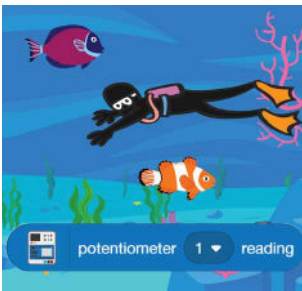


### Lesson 3.2 - Musical Party

What is a slide switch and how to read its state (up, down, or center) in PictoBlox?

#### Activity

Making a musical party in which sprites dance to the music that can be changed using evive's slide switch.

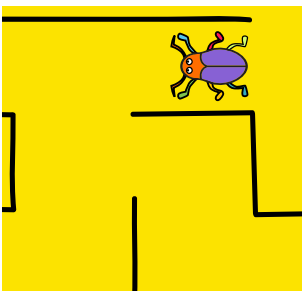


### Lesson 3.3 - Scuba Diving

What is a potentiometer and how to control a sprite using it?

#### Activity

Making an underwater animation in which a scuba diver swims among fish appearing at and moving to random positions on the Stage.



### Lesson 3.4 - Beetle in the Maze (2 lessons)

What is a navigation key? How to read the state of evive's navigation key in PictoBlox?

#### Activity

Creating a game whose aim is help to a beetle reach the end of the maze without touching the boundaries using evive's navigation key.

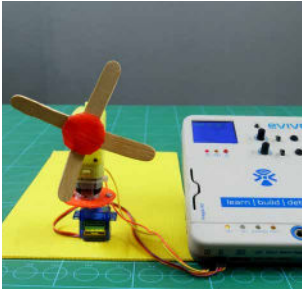


### Lesson 3.5 - Musical Drums using Touch Sensors

How to detect touch in PictoBlox?

#### Activity

Creating a script to make virtual musical drums that can be played by touching the objects connected to evive's touch sensors.



### Lesson 3.6 - Programmable Windmill

How to control a motor in PictoBlox and change its direction of rotation using evive's slide switch?

#### Activity

Creating a script to run a windmill and control the direction of its rotation using evive's slide switch.



### Lesson 3.7 - DIY Tollbooth

How to control the angle of a servo motor in PictoBlox?

#### Activity

Making a DIY tollbooth using cardboard and servo motor that can be controlled using evive's tactile switch.

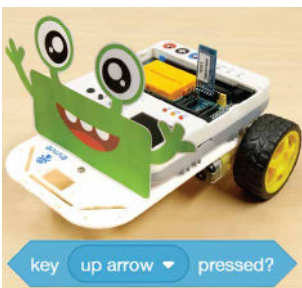


### Lesson 3.8 - Animating emojis on evive Display

How to display custom emojis on evive's display using PictoBlox?

#### Activity

Displaying emojis on evive's display that change every second.



### Lesson 3.9 - Programming a Robot

How to move a robot forward, backward, left and right?

#### Activity

Making scripts to run the robot forward, backward, left and right whenever the up, down, left and right key is pressed on the keyboard. Using the controls, the robot has to navigate through a path.

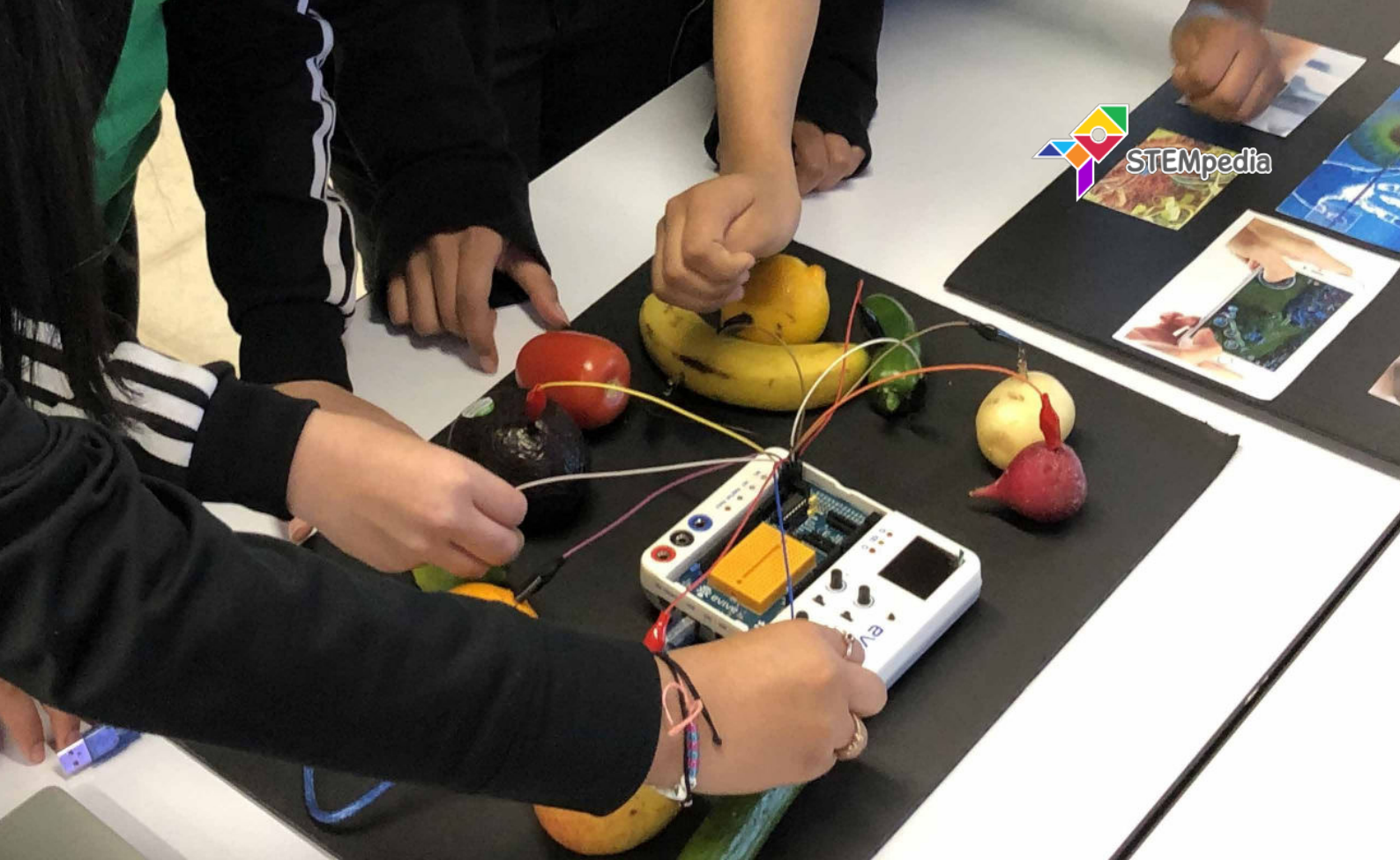


### Lesson 3.10 - Running a Robot Along a Square

How to ideate an algorithm to make a robot run along a predefined path?

#### Activity

Creating a code to run a robot along the edge of a square.



# Electronics for Kids – Level 1

## ABC of electronics with exciting hands-on STEM activities

Electronics for Kids - Level 1 is a specially-designed STEM middle school curriculum curated by STEM curriculum experts for teaching the basics of electronics to kids through STEM activities such as glowing an LED, making a DIY turntable, control DC and servo motors, using touch sensors to classify objects and conductors and insulators, etc.

With its clear explanations and an assortment of exciting STEM activities for kids, Electronics for Kids - Level 1 will have students building their own DIY electronics projects in no time.

### Material Required

STEM Classroom Bundle, activity sheets, and creative cut-outs.

### Prerequisites

None. Just enthusiasm.

### Learning Outcomes

After completing this curriculum, students will have a basic understanding of electronics, circuit design, actuators and sensors with the help of a wide variety of STEM activities.

The activities in this curriculum will help them develop skills such as problem-solving and debugging techniques, DIY-ing, teamwork, and creativity.

8

Lessons

8+

Learning Hours

5+

Grade

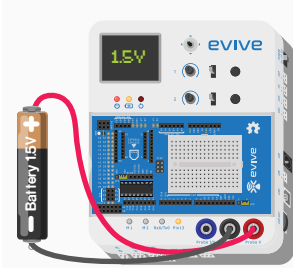


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## Module 1

## Basics of Electronics

Students will be introduced to the building blocks of electronics - voltage, current, resistance, Ohm's Law, how circuits work, and the basics of LEDs with the help of hands-on STEM activities based on evive.

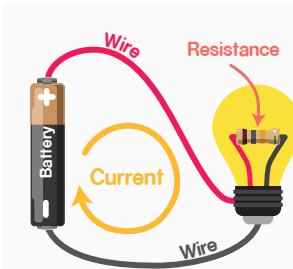


### Lesson 1.1 - Voltage

What is electronics? What is an electronic circuit? What is voltage and how to measure it using evive?

#### Activity

Measuring the voltage of a battery using evive.

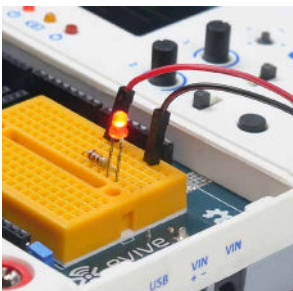


### Lesson 1.2 - Current and Resistors

What is current? What is resistance? How to calculate the resistance of a resistor using color code?

#### Activity

Calculating the resistance of 5 unknown resistors using color code.



### Lesson 1.3 - Ohm's Law and LED Basics

What is the relationship between voltage, current, and resistance and how to use it to light up an LED?

#### Activity

Glowing an LED using evive.

## Module 2

## Basics of Actuators

Students will learn how simple actuators like the DC motor and servo motor work with the help of hands-on STEM activities based on evive.



### Lesson 2.1 - Introduction to DC Motors

What are DC motors? What's inside a DC motor? How to control its direction and speed using evive?

#### Activity

Controlling the direction and speed of a DC motor using evive.



### Lesson 2.2 - DIY Turntable

How to make a DIY turntable using a DC motor?

#### Activity

Making a turntable to create beautiful patterns.





### Lesson 2.3 - Introduction to Servo Motors

What are servo motors and why are they important? How do they work?

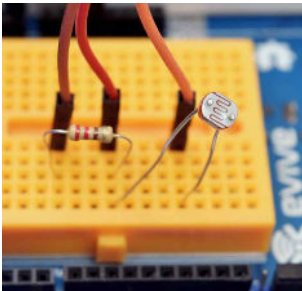
#### Activity

Moving the head of a cutout with the help of a servo motor and evive.

## Module 3

## Basics of Sensors

Students will learn how sensors work and how to visualize the output of different sensors with the help of hands-on STEM activities based on evive.

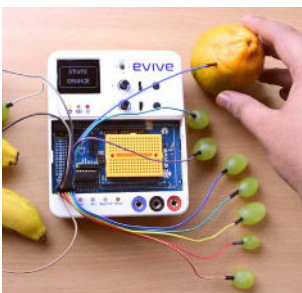


### Lesson 3.1 - Introduction to Sensors

What are sensors? How are they categorized based on the output they provide? How to read digital and analog sensor using evive?

#### Activity

1. Understanding the working of evive's Pin State Monitor.
2. Visualizing the light sensor using evive.



### Lesson 3.2 - Touch Sensors - Conductors or Insulators?

What is a conductor? What is an insulator? How does evive's touch sensor work?

#### Activity

Classifying objects as conductors and insulators using evive's capacitive touch sensor.

## Module 4

## Capstone Project

After learning the basics of electronics, students will make a capstone project like railway crossing barriers, car vipers, or a spinning mop. The project is not limited to these only and students can take any other projects as well if the project uses the learning from the curriculum.

The students will work on the project up to 3 sessions depending on the engagement. Craft material like cardboard, string, rubber bands and other should be provided to the student.

In the first session, students will be briefed about the capstone project. Then, they will get time to ideate on the project and make rough sketches of the model they want to make. They will also list down the material required to build the project.

In the second and the third session, students will make the project.



# Introduction to Programming for Kids

## Basic coding for kids with Scratch blocks-based graphical coding

Introduction to Programming for Kids is a creative computing curriculum designed by curriculum experts for teaching programming to kids through coding activities such as animating characters, drawing shapes, making an automatic grading system, etc.

With its clear explanations and a variety of exciting coding activities for kids, Introduction to Programming for Kids will help students develop basic coding skills and computational thinking.

### Material Required

Activity sheets, and computers.

### Prerequisites

None. Just enthusiasm.

### Learning Outcomes

After completing this curriculum, students will become familiar with programming basics, algorithms, logical reasoning, and conditional programming with the help of a variety of coding activities.

The activities in this curriculum will help them develop important skills such as problem-solving, critical thinking, and teamwork.

7  
Lessons

7+  
Learning Hours

5+  
Grade

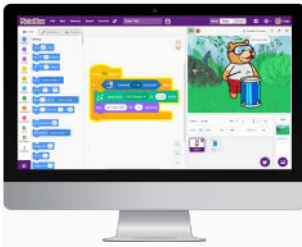


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## Module 1

## Getting Started with Programming

Students will be introduced to coding and its elements with a Scratch blocks-based graphical coding software - PictoBlox - and interesting hands-on coding activities.



## Lesson 1.1 - Introduction to Programming

What is a program? What are the different stages of writing a program? Introduction to PictoBlox software and its interface.

## Activity

Creating a script to make Tobi (a sprite) walk on the Stage.

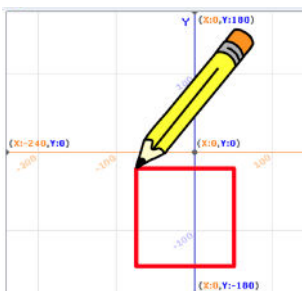


## Lesson 1.2 - Backdrop, Costume, and Animations

What is a backdrop and a costume in PictoBlox? How to add them to a project to make cool animations?

## Activity

Animating Tobi to make it walk by changing its costumes.



## Lesson 1.3 - Drawing Shapes in PictoBlox

How to draw lines in PictoBlox using the *Pen* extension? How to use the **repeat** block to make the script easy to debug?

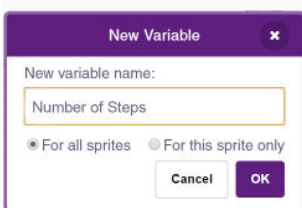
## Activity

Creating scripts to draw a rectangle, triangle, and circle on the Stage.

## Module 2

## Basic Coding Concepts - Algorithms

Students will be introduced to basic coding concepts such as variables, arithmetic operators, logical operators, and conditional statements.



## Lesson 2.1 - Variables

What is a variable and its purpose in a program? How to create a variable and manipulate its value in PictoBlox?

## Activity

1. Making Tobi move in different directions using keyboard keys and tracking its X and Y position using variables.
2. Creating a script to ask the user to enter input and store it in a variable.

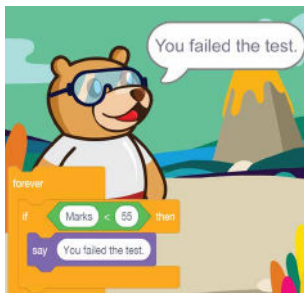


## Lesson 2.2 - Arithmetic Operators

What is an operator? What are the different kinds of operators in PictoBlox? What are arithmetic operators?

## Activity

1. Creating a script that ask users to input two numbers and gives the sum of the numbers as output - Addition Calculator.
2. Creating a script to draw the shape specified by the user in the input. like square.

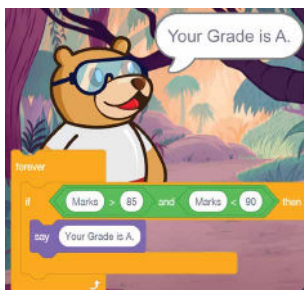


### Lesson 2.3 - Conditional Statements

How do the various conditional statements in PictoBlox - if, if-else, repeat, forever - function?

#### Activity

Creating different scripts to understand the flow of execution of a program when using conditional statements.



### Lesson 2.4 - Logical Operators

How do the various logical operators in PictoBlox - AND, OR and NOT - function? What are the different uses of logical operators?

#### Activity

Creating a script to make an Automatic Grading System that takes marks from the user and gives a grade based on the marks.

## Module 3

## Capstone Project

After learning the basics of programming, students will make a project in PictoBlox, which can be a game, a quiz or a story. Students will work on the project for 3 sessions. Students can be given themes on which they can make the project like:

- ▶ Clean Water and Sanitation
- ▶ Life Below Water
- ▶ Zero Hunger
- ▶ Agriculture
- ▶ Traffic System



# Physical Computing for Kids – Level 1

## Basics of physical computing with coding activities and games for kids

Physical Computing for Kids - Level 1 is a coding curriculum for middle school designed by computing curriculum experts for teaching physical computing through exciting activities such as controlling characters using evive, creating exciting games, making a smart LED street light, etc.

With its clear explanations and a variety of exciting coding activities and games, Physical Computing for Kids - Level 1 will help students develop basic physical computing skills in no time.

### Material Required

STEM Classroom Bundle, computers, activity sheets, and creative cut-outs.

### Prerequisites

Completed Electronics for Kids - Level 1 and Introduction to Programming for Kids or have worked on Scratch.

### Learning Outcomes

After completing Physical Computing for Kids - Level 1, students will become familiar with the basics of physical computing and gamification, algorithms, and logical reasoning with the help of a wide variety of coding activities.

Apart from the aforementioned learning outcomes, this STEM curriculum will also help them develop important skills such as problem-solving, attention to detail, and abstract thinking.

**13**  
Lessons

**13+**  
Learning Hours

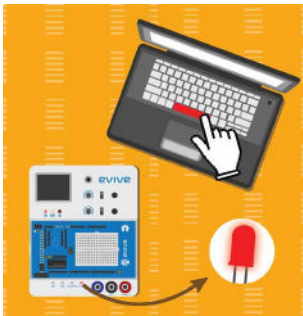
**5+**  
Grade



## Module 1

## ABC of Physical Computing

Students will be introduced to the basics of physical computing with the help of engaging coding activities based on evive.

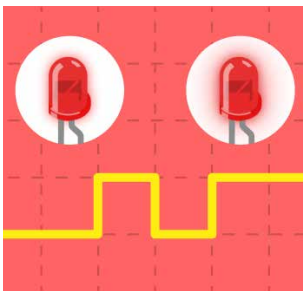


### Lesson 1.1 - Digital Output – LED State Control

What is physical computing? How to interface evive with PictoBlox in Stage mode? How to control the digital state of a pin to turn an LED ON and OFF?

#### Activity

1. Making an LED blink for 1 second.
2. Controlling the LED using a keyboard's space key as switch.



### Lesson 1.2 - Analog Output – LED Brightness Control

How to control the brightness of an LED in PictoBlox using analog output?

#### Activity

Creating a script to control an LED's brightness using the variable slider.

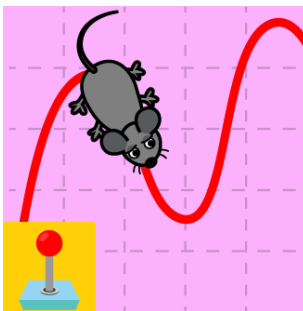


### Lesson 1.3 - Digital Input – Reading the State of Switches

What is digital input? How to read the state of a digital pin in PictoBlox? How to read the state (pressed or not) of evive tactile switch? How to read the state (up, down, or center) of evive's slide switch?

#### Activity

Making the sprite to rotate when the tactile switch is pressed.



### Lesson 1.4 - Analog Input – Reading Potentiometer

What is analog input? What is its range? How to read the analog state of pins in PictoBlox? How to read the state of evive's potentiometer?

#### Activity

1. Creating a script to control a sprite's direction using potentiometer to make it move across the Stage.
2. Creating a script to control an LED's brightness of using potentiometer.



### Lesson 1.5 - evive's Display – Hello World!

What are the specifications of evive's display? How to display and manipulate text on the display using the *evive Display* Extension?

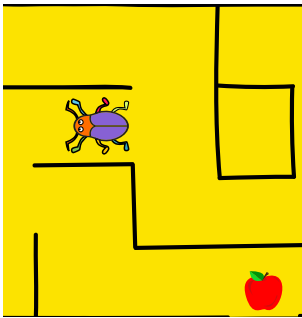
#### Activity

Creating a script to display potentiometer reading on evive's display.

## Module 2

## Ready. Set. Play!

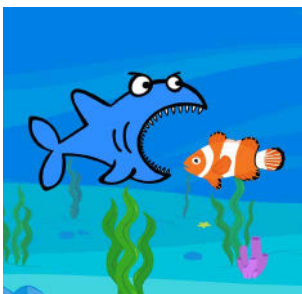
Students will learn the basic elements that make up a game and will code two simple games on their own in PictoBlox that can be played using evive.

**Lesson 2.1 - Beetle in the Maze**

How to make games and animations in PictoBlox? How to read the state of evive's navigation key?

**Activity**

Creating a game in PictoBlox whose aim is help a beetle reach the end of the maze without touching the boundaries. The beetle will navigate around using the navigation key of evive.

**Lesson 2.2 - The Hungry Shark**

How to create clones in PictoBlox? How to detect contact between two sprites and perform actions accordingly?

**Activity**

Creating a game in PictoBlox whose aim is to feed a super hungry shark as many fish as you can by controlling it using evive's potentiometer.

## Module 3

## Do It Yourself!

After gaining ample knowledge about physical computing, students will make various exciting DIY projects using PictoBlox and evive by implementing the knowledge.

**Lesson 3.1 - Displaying Patterns on RGB LED Strip**

What is an RGB LED strip? How to connect the RGB strip to evive and program it to display different patterns?

**Activity**

Creating scripts to play and understand the different pre-defined patterns on a RGB LED strip.

**Lesson 3.2 - Making Custom Patterns on RGB LED Strip**

How to program individual LEDs in an RGB LED strip to make custom patterns?

**Activity**

1. Creating a script to glow all the LEDs to different colors.
2. Creating a script to simulate the traffic signal rules using 3 LEDs.

**Lesson 3.3 - Controlling a DC Motor using PictoBlox**

How to program evive to control the direction and speed of a DC motor in PictoBlox?

**Activity**

Creating a script to control the speed and direction of a DC motor using evive's potentiometer slide switch respectively.

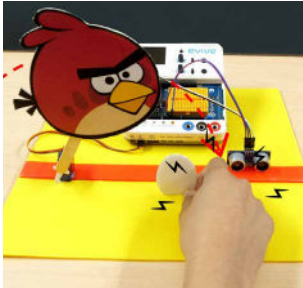


### Lesson 3.4 - Smart Hand Band for Blind People

What is an ultrasonic sensor? How does it work? How to connect it to evive? How to get the distance of an object using the sensor in PictoBlox?

#### Activity

Making a distance alarm system that will notify the user his/her distance from the object by changing the sound.



### Lesson 3.5 - Controlling a Servo Motor using PictoBlox

How to control the angle of a servo motor in PictoBlox?

#### Activity

Making a smart intrusion detection system that detects intrusion with the help of an ultrasonic sensor and prevents someone from stealing the egg by controlling the bird's movement using a servo motor.



### Lesson 3.6 - Smart LED Street Light

How to read the reading of analog sensors in PictoBlox? How to automate something based on a sensor's data?

#### Activity

Making a smart LED street light using an LED and a light sensor that turns ON when the sensor detects low light in the surrounding.

## Module 4

## Capstone Project

After learning the basics of physical computing, students will make a capstone project which should use their learning from the curriculum. Some example projects they can make are ultrasonic radar system, smart dustbin, smart toilet, etc.

The students will work on the project for 3-5 sessions depending on the engagement. Craft material like cardboard, string, rubber bands and other should be provided to the students.

In the first session, students will be briefed about the capstone project. Then, they will get time to ideate on the project and make rough sketches of the model they want to make. They will also list down the material required to build the project.

In the remaining sessions, students will make the project.





# Robotics for Kids – Level 1

Robotics basics with the help of fun robotics projects for kids

Robotics for Kids - Level 1 is a middle school STEM robotics curriculum designed by curriculum experts for teaching kids robotics with hands-on robotics activities such as assembling a basic mobile robot, building a Smartphone-controlled robot, a Follow Me robot, etc.

With its clear explanations and a variety of exciting simple yet exciting robotics projects for school students, Robotics for Kids - Level 1 is the perfect way to learn to build robots.

## Material Required

STEM Classroom Bundle, activity sheets, and creative cut-outs.

## Prerequisites

Completed Physical Computing for Kids - Level 1.

## Learning Outcomes

After completing this curriculum, students will be able to understand the basics of robotics, algorithms, etc with the help of a wide variety of hands-on activities.

The activities in this curriculum will help them develop important skills such as problem-solving, attention to detail, patience, and debugging.

9

Lessons

9+

Learning Hours

5+

Grade



## Module 1

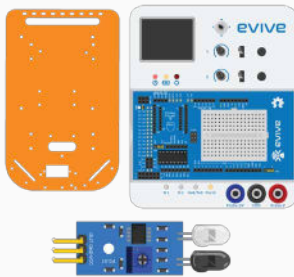
## Basics of Robotics

Students will first be introduced to robotics and then to the essentials of building a robot the DIY way as they learn how to build a Smartphone-controlled robot, a follow-me robot, and a gripper.



### Lesson 1.1 - Introduction to Robotics - Part 1

What are robots? What are their characteristics? Classification of robots. Applications of robots in different fields. Basic components of a mobile robot - gripper, wheels and actuators.

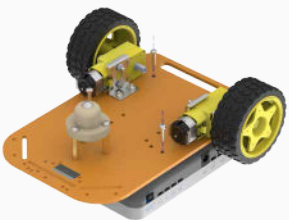


### Lesson 1.2 - Introduction to Robotics - Part 2

Basic components of a mobile robot - chassis, sensors, brain (evive). What is the importance of programming in robotics?

#### Activity

Demonstration of a Smartphone Controlled Robot, Follow Me Robot, and Obstacle Avoidance Robot.

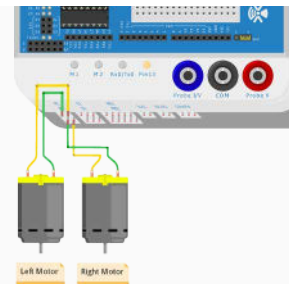


### Lesson 1.3 - Smartphone-Controlled Robot - Assembly

How to assemble the basic structure of a mobile robot?

#### Activity

Assembling a two wheel drive robot.



### Lesson 1.4 - Smartphone-Controlled Robot - Circuitry

How to control the movement of a two wheel mobile robot using evive?

#### Activity

Connecting the motors of the robot to evive. Making the robot move forward, backward, left, and right using evive's menu.



### Lesson 1.5 - Smartphone-Controlled Robot - Programming

How to make a custom block (function) in PictoBlox? How to control a robot using Dabble's Gamepad module?

#### Activity

Programming the robot to move forward, backward, left and right when pressing the up, down, left and right switch respectively on the Gamepad module.



### Lesson 1.6 - Follow Me Robot - Calibrating IR Sensors

What is an IR sensor? How does it work? How to connect it to evive and calibrate it to detect objects in close proximity?

#### Activity

Connecting two IR sensors in front of the robot chassis and calibrating them to detect objects at a distance of 5cm.



### Lesson 1.7 - Follow Me Robot - Programming

How to program the IR sensors of the robot to detect objects in front of it and follow them?

#### Activity

Programming the robot to follow the object according to the sensor readings.

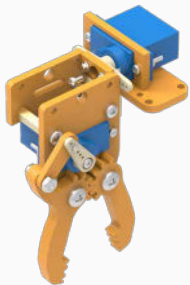


### Lesson 1.8 - Shy Robot - Programming Challenge

Students have to make a robot that runs away from the object in front of it - opposite to follow me robot.

#### Activity

Programming the Follow Me robot such that it runs away from the object in front of it. **No** assistance from the educator.



### Lesson 1.9 - Assembling a Gripper

What is a gripper? How to use a gripper to automate tasks such as picking and placing objects?

#### Activity

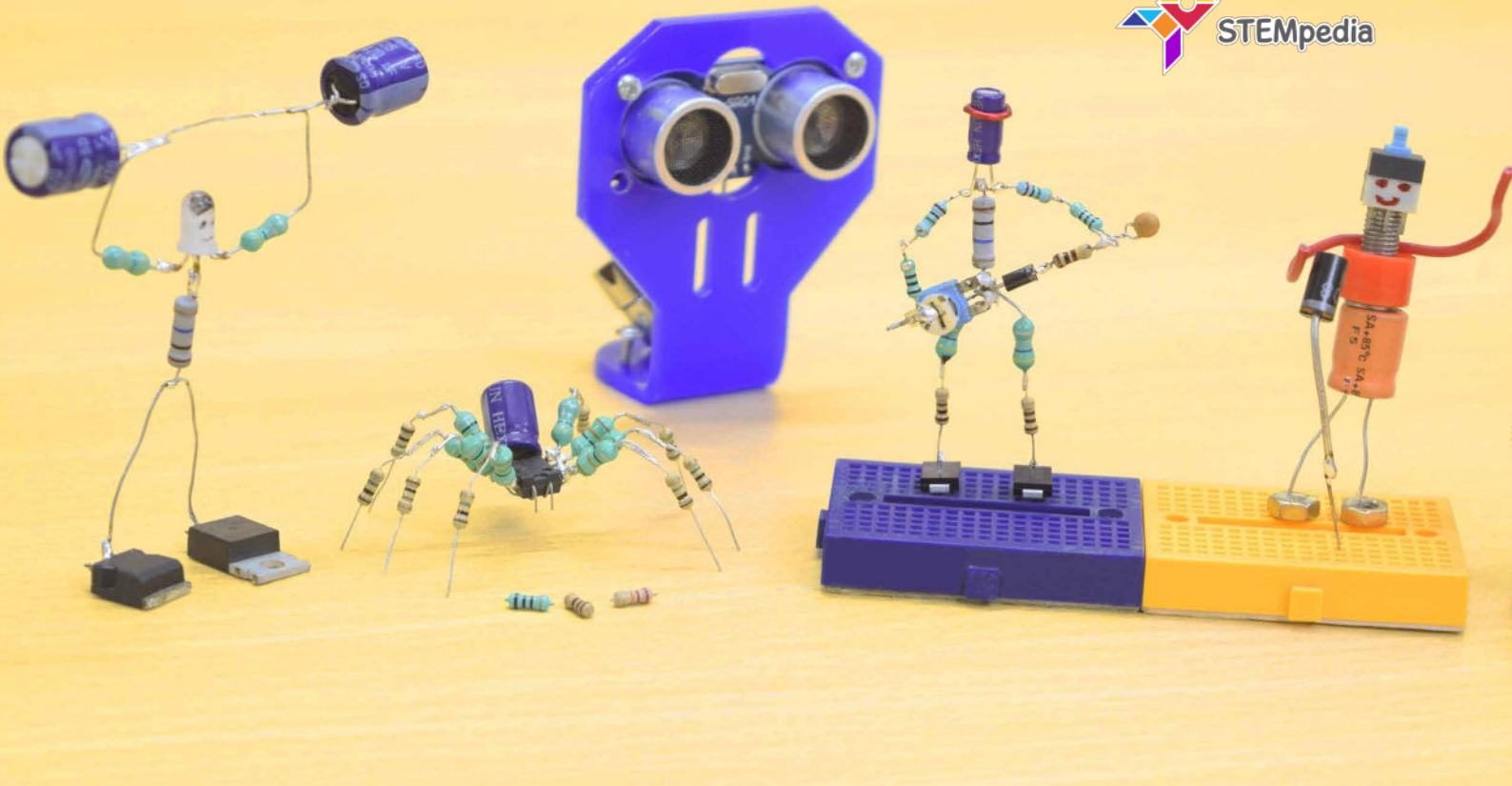
Making a gripper using acrylic parts, a servo motor, and evive, and programming it in PictoBlox.

## Module 2

## Capstone Project

After learning the basics of robotics, students will make a light following robot using light sensors. Student will use four light sensors attached to the body of the robot. Based on the reading of the sensors, robot will be programmed to move forward, backward, left and right.

The students will work on the project for 3 sessions.



# Electronics for Kids – Level 2

A step ahead into electronics with exciting hands-on STEM activities

Electronics for Kids - Level 2 is a specially-designed high school STEM curriculum curated by curriculum experts for kids to delve deeper into electronics through STEM projects such as understanding the effect of series and parallel connections in a circuit, visualizing analog and digital signals, visualizing an RC circuit, making DIY goggles, etc.

With its clear explanations and an assortment of exciting STEM projects, Electronics for Kids - Level 2 will have students building complex yet exciting DIY electronics projects in no time.

## Material Required

STEM Classroom Bundle, activity sheets, and creative cut-outs.

## Prerequisites

Completed Electronics for Kids - Level 1 or have a basic understanding of electronic circuits.

## Learning Outcomes

After completing this curriculum, students will have a basic understanding of analog and digital electronic circuits with the help of a wide variety of projects.

The projects in this curriculum will help them develop important skills such as problem-solving and debugging techniques, DIY-ing, teamwork, and creativity.

7

Lessons

7+

Learning Hours

7+

Grade



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## Module 1

## A Little More About Basics

This module begins with recapitulation of the basics from Electronics for Kids Level 1 after which students will be introduced to series and parallel connections and their effect on the circuit.



### Lesson 1.1 - Ohm's Law and LED Basics

What are voltage, current, and resistance? Find out the relationship between voltage, current, and resistance and use it to light up an LED.

#### Activity

Glowing a LED using evive.



### Lesson 1.2 - Series and Parallel Connection

What are resistor series and parallel connections? How do they affect the brightness of an LED in an electronic circuit?

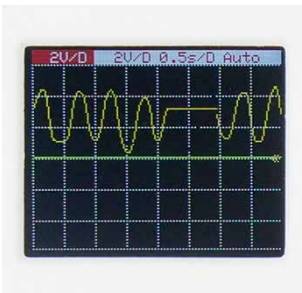
#### Activity

Making LED circuits with single, series, and parallel resistors. Reporting the circuit with maximum and minimum LED brightness.

## Module 2

## All About Signals

Students will be introduced to digital signals, analog signals, tactile switches, potentiometers, and capacitors with the help of hands-on STEM activities based on evive.

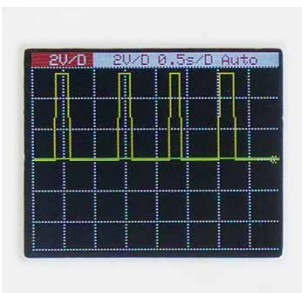


### Lesson 2.1 - ABC of Analog Signals

What is an electrical signal? What is an analog signal? What are its characteristics? What is a potentiometer? How to visualize a signal on evive's mini oscilloscope?

#### Activity

Visualizing the signal generated by evive's potentiometer on the mini oscilloscope.



### Lesson 2.2 - ABC of Digital Signals

What is a digital signal? What are its characteristics? What is a switch? What are its types? How does it behave?

#### Activity

Making a switch circuit and visualizing the signal generated by a switch on evive's mini oscilloscope.

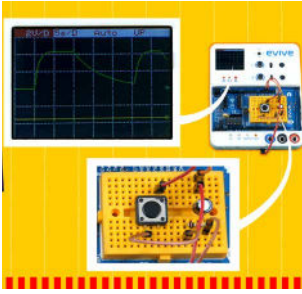


### Lesson 2.3 - LED Circuit with Switch and Potentiometer

How to control the brightness and the state of a LED using a potentiometer and a switch?

#### Activity

1. Making a circuit to control an LED's brightness using evive's potentiometer.
2. Making a circuit to control an LED's state - (ON/OFF) using a switch.



### Lesson 2.4 - Visualizing Resistor-Capacitor Circuits

What are capacitors and their effect on a circuit? Why does an LED's brightness vary slowly due to capacitor charging and discharging?

#### Activity

Making an RC circuit and visualizing the charging and discharging of a capacitor on evive's mini oscilloscope.

## Module 3

## Do It Yourself!

After gaining ample knowledge of the basics of electronics, students will make an exciting DIY electronics project using evive by implementing that knowledge.



### Lesson 3.1 - DIY Goggles

How to control a servo motor using evive?

#### Activity

Making a pair of goggles that open and close the protective shades with the help of servo motor.



# Physical Computing for Kids – Level 2

A step ahead into physical computing with engineering activities for kids

Physical Computing for Kids - Level 2 is a coding curriculum for high school students designed by curriculum experts for teaching physical computing activities such as making a DIY touch-based piano, controlling an LED with voice commands, etc.

With its clear explanations and a variety of exciting coding activities for high school students, Physical Computing for Kids - Level 2 will help them dive deep into physical computing.

## Material Required

STEM Classroom Bundle, computers, activity sheets, and creative cut-outs.

## Prerequisites

Completed Physical Computing for Kids - Level 1.

## Learning Outcomes

After completing this curriculum, students will get a better understanding of physical computing, gamification, algorithms, logical reasoning, and conditional programming with the help of a variety of coding activities.

The activities in this curriculum will help them develop important skills such as problem-solving, attention to detail, abstract thinking, communication, and empathy.

14  
Lessons

16+  
Learning Hours

7+  
Grade

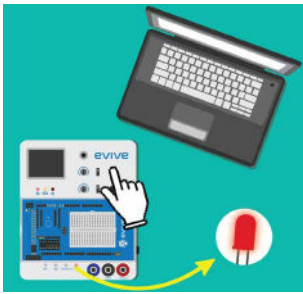


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## Module 1

## ABC of Physical Computing

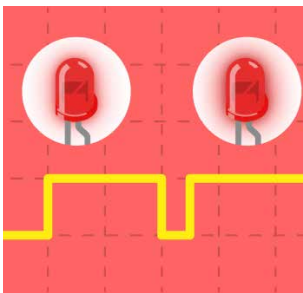
Students will be introduced to the basics of physical computing with the help of engaging coding activities based on evive.

**Lesson 1.1 - Digital Input/Output in PictoBlox**

How to implement the concept of digital input (reading the state of a pin) and digital output (setting the state to 0 or 5V) in PictoBlox?

**Activity**

1. Glowing an LED using evive.
2. Controlling the LED using evive's tactile switch.

**Lesson 1.2 - Analog Input/Output in PictoBlox**

How to implement the concept of analog input (reading the voltage at a pin) and analog output (setting the voltage between 0 to 5V) in PictoBlox?

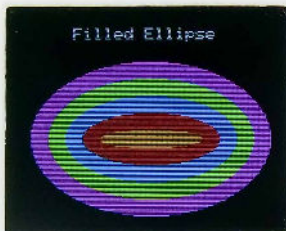
**Activity**

Controlling the brightness of an LED using evive's potentiometer.

## Module 2

## Do-It-Yourself!

Students will get to further explore evive's touch sensors and TFT screen by coding their own clock and a touch piano.

**Lesson 2.1 - Draw shapes on evive's Display**

How to draw different shapes on evive's display?

**Activity**

Creating a flag on evive display using different shapes.

**Lesson 2.2 - Animating Shapes on evive's Display**

How to draw characters of different size and color on evive's display and animating them to make a game?

**Activity**

Creating a script to draw a smiley face on evive display and make it go up, down, left, and right using keyboard keys.

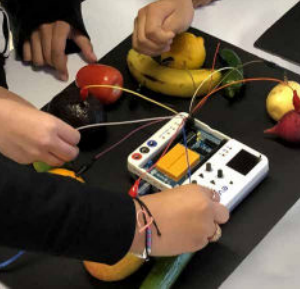
**Lesson 2.3 - Digital Clock using RTC**

What is a Real Time Clock? How to set the time and date in an RTC? How to retrieve the time and date from the RTC in PictoBlox?

**Activity**

Making a digital clock which displays the time on evive's display.





### Lesson 2.4 - Touch-Based Piano

How does evive's touch sensor work? How to program it in PictoBlox?

#### Activity

Making a touch-based piano using evive's capacitive touch channels and programming it in PictoBlox.

## Module 3

## Ready. Set. Play!

In this section, students will code three advanced games on their own in PictoBlox and play them based on evive.



### Lesson 3.1 - Shoot the Bat (2 Lectures)

Introduction to game theory and its concepts - animation, randomness, scoring and time constraints. How to interface a Joystick with evive?

#### Activity

Making a game whose aim is to eliminate the bats appearing randomly on the screen by aiming at them using a Joystick.

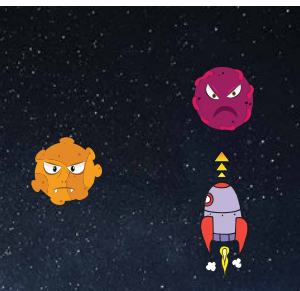


### Lesson 3.2 - Dodge (2 Lectures)

Application of the game theory concepts - animation, randomness, scoring and time constraints.

#### Activity

Making a game whose aim is to help the character dodge the obstacles coming its way jumping and sliding.



### Lesson 3.3 - Space Battle Game

How to play a game using Dabble's Gamepad module?

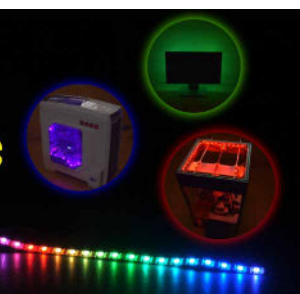
#### Activity

Making a game whose aim is to control shoot down the enemy by firing bullets and controlling the movement of the rocket ship using a Smartphone.

## Module 4

## Do It Yourself with a Smartphone!

Students will get to make an exciting Smartphone controlled project using Dabble.



### Lesson 4.1 - Music Reactive RGB LED Strip

How to read the sound sensor data from a Smartphone and control the color of an RGB LED strip according to the noise level?

#### Activity

Making a music reactive RGB LED strip box that changes color based on the sound sensor reading from Dabble.

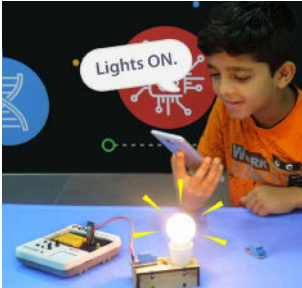


### Lesson 4.2 - Sound-Triggered Smartphone Camera

How to control the camera of a Smartphone using evive to take photos and videos?

#### Activity

Making a sound-triggered Smartphone camera that will click photos whenever the sound level goes beyond a certain limit.



### Lesson 4.3 - Controlling LED via Voice Commands

How to use Dabble's Terminal module to send and receive messages from a Smartphone in evive?

#### Activity

Making a wireless LED control project in which the state of an LED changes based on the voice commands sent from the Terminal module.

## Module 5

## Capstone Project

After learning physical computing, students will make a capstone project used for entertainment and should use the learning from the curriculum. The project can be a game in PictoBlox or an interactive hardware project.

The students will work on the project for 3-5 sessions depending on the engagement. Craft material like cardboard, string, rubber bands and other should be provided to the students.

In the first session, students will be briefed about the capstone project. Then, they will get time to ideate on the project and make rough sketches of the model they want to make. They will also list down the material required to build the project.

In the remaining sessions, students will make the project.



# Robotics for Kids – Level 2

**A step ahead into robotics with the help of fun robotics projects for kids**

Robotics for Kids - Level 2 is a high school STEM robotics curriculum designed by curriculum experts for teaching kids robotics with fun hands-on robotics projects such as building a gesture-controlled robot, obstacle avoiding robot, line following robot, etc.

With its clear explanations and a variety of simple robotics projects for school students, Robotics for Kids - Level 2 will have high school students building their own robots in no time.

## Material Required

STEM Classroom Bundle, activity sheets, and creative cut-outs.

## Prerequisites

Completed Robotics for Kids - Level 1 and Physical Computing for Kids - Level 2.

## Learning Outcomes

After completing this curriculum, students will have a better understanding of robotics, algorithms, etc with the help of a wide variety of hands-on activities.

The activities in this curriculum will help them develop important skills such as problem-solving, attention to detail, patience, and debugging.

11

Lessons

11+

Learning Hours

7+

Grade

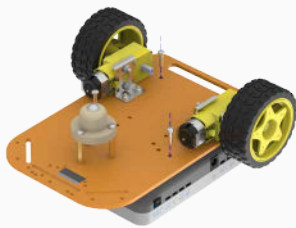


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## Module 1

## Robotics the DIY Way

Students will get to build 5-6 robots on their own right from the assembly to logic to writing the code to debugging the robot wherein they'll get learn several concepts that are widely used in the robotics industry.

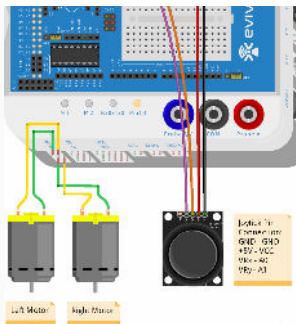


### Lesson 1.1 - Joystick-Controlled Robot - Assembly

How to assemble the basic structure of a mobile robot?

#### Activity

Assembling a two wheel drive robot.

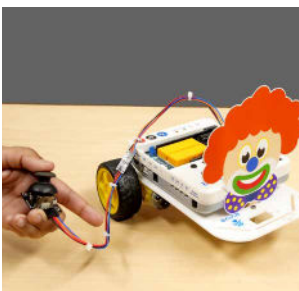


### Lesson 1.2 - Joystick-Controlled Robot - Circuitry

How to control movements of a two-wheel mobile robot? Visualizing Joystick on evive's Pin State Monitor.

#### Activity

Connecting the motors of the robot to evive. Making the robot move forward, backward, left, and right using evive's menu. Connecting the Joystick to evive and visualizing the reading on the Pin State Monitor.

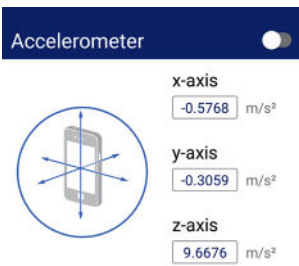


### Lesson 1.3 - Joystick-Controlled Robot - Programming

How to make a custom block (function) in PictoBlox?

#### Activity

Programming the robot to move forward, backward, left, and right according to the Joystick's movements.



### Lesson 1.4 - Gesture-Controlled Robot - Sensor

What is an accelerometer and how to read a Smartphone's accelerometer on evive using Dabble? How does a gesture-controlled robot work?

#### Activity

Creating a script to display the accelerometer data on evive display.



### Lesson 1.5 - Gesture-Controlled Robot - Programming

How to program a gesture-controlled robot that moves based on the movement of a Smartphone?

#### Activity

Programming the robot according to the logic.



### Lesson 1.6 - Obstacle Avoiding Robot - Part 1

How does an obstacle avoiding robot work?

#### Activity

Assembling the servo motor and ultrasonic sensor on the basic robot and understanding logic behind the working of the autonomous robot.



### Lesson 1.7 - Obstacle Avoiding Robot - Part 2

How to program and debug an autonomous robot?

#### Activity

Writing a program for the robot to detect objects in front of it and scan the area to find an obstacle-free path.

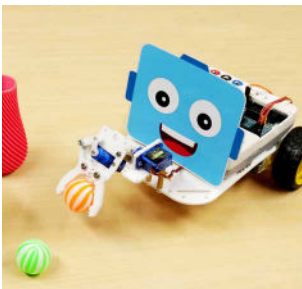


### Lesson 1.8 - Pick-and-Place Robot - Assembly

How does a pick-and-place robot work? How to calibrate a servo for optimal use?

#### Activity

Assembling a gripper using two servos and attaching it in the front of the robot. Calibrating the servo to define the exact range of operation.

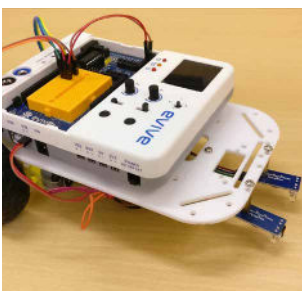


### Lesson 1.9 - Pick-and-Place Robot - Programming

How to program a Smartphone-controlled pick-and-place robot in PictoBlox?

#### Activity

Writing a program to run the robot and control gripper movements (open/close, up/down) using a Smartphone

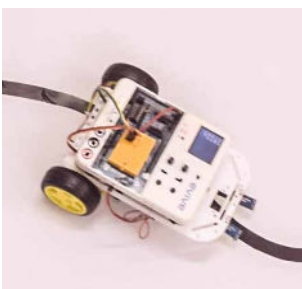


### Lesson 1.10 - Line-Following Robot - Circuitry

How to use IR sensors to detect a black line in a white region?

#### Activity

Completing the assembly and circuitry of IR sensors. Calibrating the sensors to detect black and white regions.



### Lesson 1.11 - Line-Following Robot - Programming

How to program and debug a line follower robot?

#### Activity

Writing a program to detect a black line a white region using IR sensors and follow it.

## Module 2

## Capstone Project

After learning robotics, students will make a cleaning robot which can be autonomous or a smartphone controlled robot. Students can make a variety of attachments which can be used for cleaning tasks like cleaning floor, or cleaning windows.

The students will work on the project for 3-5 sessions.

