RUNNYMEDE COLLEGE & TECHTALENTS

Why teach Scratch? The first programming language as a tool for writing programs.

The MIT Media Lab's amazing software for learning to program, Scratch is a visual, drag and drop programming environment that allows pupils to be creative without learning strong and strange syntax rules.

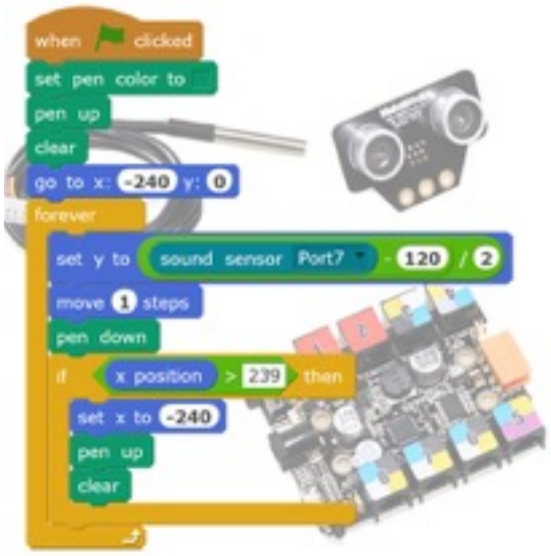
It’s the best way to introduce students into programming world. With a very simple tool, they will learn the concepts of coding quick and easily.

Why teach programming with robotics?

There is increasing need for people, other than professional programmers to have some programming ability, for example adding some code to an Excel spreadsheet or Access database. Knowledge of programming concepts can help people understand how software packages work and make effective use of software even when no actual programming is required.

The educational value of programming with robotics extends beyond providing an easy and interesting introduction to programming. Students learn about ICT, media and communication. Programming requires logical thinking, critical reasoning, problem identification and solving skills and persistence. This way of learning programming develops knowledge of systems concepts e.g. coordinating timing and interactions between “sprites”, sensing and feedback.

During two years, we will base this educational extracurricular activity not only in programming assessments. In so doing, we also introduce the students into robotics, engineering and mechanical concepts.



Scratch is fun!

There are many benefits to learning in a fun environment. Children are motivated and see learning as a satisfying enjoyable experience. Students engage with learning better when they are intrinsically motivated. Completing Scratch projects requires persistence but because students are working on projects that interest them, they are motivated to overcome challenges and frustrations.

Scratch is easy

The Scratch language and the development environment are designed to be intuitive and easily learned by children without previous programming experience. Frustration involved in getting started is minimal because writing a first animation is easy but the more advanced features offer scope for experienced users to write complex games and animations.

Scratch is based on sprites which can be moved and manipulated. Code fragments are represented by coloured blocks that are organized into 8 groups: movement, looks, sound, pen, control, sensing, numbers, and variables. The blocks are dragged into the scripts area to make scripts for each sprite. Syntax errors are avoided because the blocks are shaped to click together with appropriate blocks. When testing, variables can be displayed to assist in debugging and understanding how the scripts are working. Variables and blocks can be changed while the program is running.

Scratch is creative

Scratch encourages creativity, both thinking of ideas for projects and finding ways to overcome difficulties in implementing them. Many different types of projects can be done. Music can be added to Scratch or even written within Scratch. Photos and graphics can be imported and edited.

Scratch encourages sharing

Completed projects, including code, can be uploaded to the Scratch website where they can be viewed by anyone. Scratch users can download the code and modify or extend it to make their own project or to learn new techniques. There also forums and opportunities to add comments, etc.

What skills does Scratch teach?

Scratch works into three keys: Information and Communication Skills, Thinking and Problem Solving Skills and Interpersonal & Self-Directional Skills.

What programming concepts does Scratch teach?

Scratch supports these concepts: sequence, iteration (looping), conditional statements, variables, threads (parallel execution), synchronisation, real-time interaction, boolean logic, random numbers, event handling and user interface design.

First Step. Imagine, program and share.

Years 3 & 4

Learn Scratch

This course introduces the knowledge, skills and basic structure of programming understanding the concepts, working with the algorithm intellect, with an analytical mind and a logical approach to problem-solving.

- Creating your first Program. Pupils create their first Program in Scratch learning the concepts and previous tools.
- Working with costumes and the stage, understanding sprites and adding costumes.
- Learn the different blocks: Motion, Looks, Sound, Pen, Events, Control, Operator, and Sensing Blocks, adding multimedia to their projects at the end creating their own blocks.
- Learn how to build your own “videogame” with different animations and also simulations and fun to use.

“Scratch Tools for learning”: Lego WeDo and Makey-Makey.

- Lego WeDo & Scratch, the perfect combination for robotics understanding and the purpose of programming with different challenges. It allows users (Students from 7 to 10) to design their own interactive Lego machines, and then program them using drag-and-drop software like Scratch.

  The LEGO Education WeDo kit provides a fascinating opportunity in simple robotics and programming for young students. The kit has 12 activities that introduce valuable science and engineering concepts like pulley setups and gear trains and ratios, and makes them approachable and interactive with sensors, motors, and software. And with Scratch, the possibilities are endless.

- With Makey-Makey they will learn in an open way to work because this tool will allow them to turn everyday objects into touchpads combining them with the internet. It's a simple Invention Kit for Beginners and Experts doing art, engineering, and everything inbetween. It also will help us to move forward into new directions making progress.

And also, we will make a short introduction to the 3D printing teaching the students with simple programs trying to involve them with the tool of the near future.

Second Step. Be Genius

Years 5 & 6

Now that we know Scratch, and we feel comfortable, let's use it as a programming platform, create your projects with littleBits and Makeblock.

Create a Scratch Profile. Get involved into your own project. "Facts, actions and no words". Be able to manage with programming and create your own histories and games with multiple screens creating multistate buttons and wiring up them to your screens. Create complex projects.

Designers know that the best way to predict what's next is to invent it. So that, in this advanced staged, students will create their own projects, giving free rein to the imagination, being creative and techie. By adding all kinds of electronic script blocks, teachers can write scripts to control robots or interact with sensors and actuators, inspiring students' interests to learn by playing building their own robots or explore various sensors and actuators. Get to know all electronic modules: Main Control Panel, Drivers, Sensors, Communication, Display, Switches and Controllers and others.

And also they will understand hardware by making it—and without necessarily being an engineer, introducing littleBits.

Working inside the "do it yourself" community, we choose the best tool with Makeblock

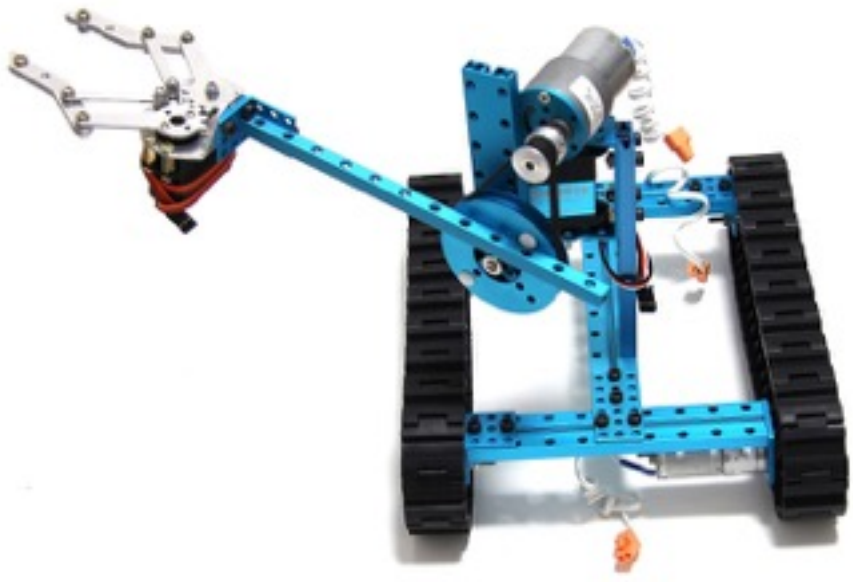
Why we choose these two kickstarters?

The clue for us is their perfect integration with Scratch. We trust in Littlebits and Makeblock because of their projection towards different and advanced programming languages.

Kickstarter is the world's largest funding platform for creative projects. It is a new way to help bring creative projects to life. And both of them are the most known and successful kickstarters of the moment.

LittleBits puts the power of electronics in the hands of everyone. With it, students can make their own electronic creations with no soldering, wiring, or programming required. As they describe themselves, littleBits™ is on a mission to Democratize Hardware by empowering everyone to Create Inventions, large and small, with a platform of easy-to-use Electronic Building Blocks -Funding: Angel, 9/2011 ($850K); Seed, 07/2012 ($3.65M); Series A Round, 11/2013 ($11.1M); Series B Round, 6/2015 ($44.2M)-.

Makeblock is the Next Generation of Construct Platform: an aluminum extrusion based construct platform that can be used to build robots, machines, toys or even art-ware ($185,576 helped to bring this project to life).



Constructionism

Constructivism is the widely accepted theory that learning occurs when individuals reflect on their experiences and construct a personal understanding. Knowledge cannot simply be transmitted by a teacher or absorbed by a student. Learning is a continual process of integrating new information with existing knowledge and reconstructing individual understandings.

Scratch is one of the many programming tools subsequently developed to support Constructionist learning.

Of course, the students will have to use the 3d printer for designing and prototyping tools, parts and components for their creations. Copy, paste, and adjust simple shapes to create variations of their models and combining different shapes.

Third Step. Maker: Coding for Seniors

Seniors

Pupils will become familiar whit “Maker Culture” in a great way, learning basic engineering via exploration and trial and error field testing, turning Leds on and off and programming them from the computer, exploring switches, knobs, and dials working also with sensors for light, touch, distance, vibration, and more. A Great Maker Workshop: Electronic, programming and 3D printing: in this course, students will get comfortable with the Arduino programming environment, learning basic functions of Arduino, and also electronics, mechanics, engineering principles, 3D modeling and design and, of course, programming concepts.

In this step, our students will realize dynamics in Robotics with Arduino and Bitbloq and also with Makeblock for beginners.

- We teach them how to build their own robot in line with the DIWO Project: Do it with others
- Assemble the different parts with the electronic components
- Download the program and the code and program the robot they will print by themselves.
- The students will create their own code and install it inside
- We make the activity more accessible because we show them the benefits of robotics with quick results
- We teach them also digital design with the 3D printer (printing specific pieces - wheels, gears, bolts, pins and nuts for robot prototyping). That way they combined robotics, mechanics, 3D printing design and engineering as well.

- App Inventor. Advanced level in App Inventor using the tablet resources such as Bluetooth connection to Arduino, e-mail sending, compass, accelerometer and GPS.

They will learn to use motors, gears, pulleys, wheels and axis, sensors and laptops.

Each student will be **responsible** for their own kit.

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