SMART:Blox
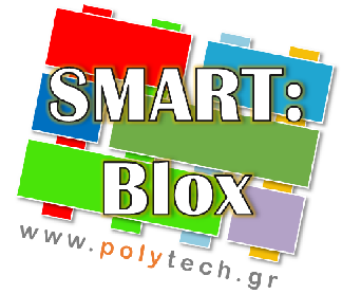
A **"STEP FORWARD"** in modern education offering Computer programming tools of integration in STEAM curriculum projects.

SMART:Blox

www.polytech.gr

SMART:Blox: POLYTECH's proposal for an upgrade of **STEAM educational methodology**, which **incorporates Computer coding knowledge** and **programming skills training** as the **integration** platform amongst and across all **STEAM** disciplines.

OVERVIEW

SMART:Blox is an intuitive play & train set that includes a code programming, icon driven application platform, an Arduino based controller and set of electronic input and output devices which allow the students to be trained in the basics of programming and computer science while in parallel educating and exploring important principles of STEAM - **Science, Technology, Engineering, Arts** and **Math** offering hundreds of projects.

All I/O devices for the circuit designs are built in a form of building blocks so they can be easily attached to any branded plastic building blocks of jigsaw toy set and kids can create quickly and easily intelligent designs.

All connections to the blocks are made with provided RJ 11 cable so no wiring is required to create the project structures.
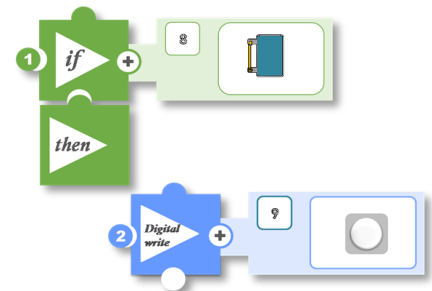
Simple - **Safe** - **Intuitive** and **Easy** training system for the young programmers of the future. No bread boards. No wiring schemes. No spaghetti boards of wires. A simple **Plug and Play** system.

The intuitive Graphics user interface, using block logic and icon libraries makes the programming task easy as a game for any age or students and with no prior programming knowledge, teaching in a step-by-step the process from Algorithmic thinking to actual programming and implementing any STEAM project.

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STEAM, acronym for Science, Technology, Engineering, Arts and Mathematics, is an approach to education that aims to introduce into the teaching of Mathematics, Natural Sciences (vital for the basic understanding of the world), Arts, Technology and Engineering Science a perspective in which every child develops personal skills in a favorable learning environment.
It is a new post-scientific discipline and is in constant development.
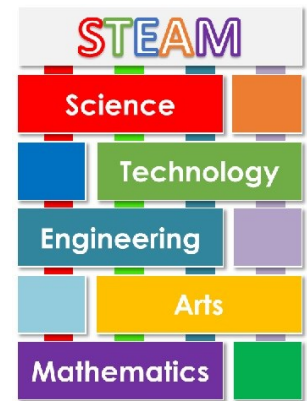
C-STEAM, acronym for Computed coding-Science, Technology, Engineering, Arts and Mathematics, is **POLYTECH**'s approach to the STEAM curriculum. Most technology applications and innovations are based on computer processing breakthroughs, so C-STEAM aims to make computing and programming the core of a STEM curriculum as this is evolving and becomes more and more of a necessity for students in global education and in real life.

STEAM training is becoming a requirement all over the world and societies are trying to integrate STEM into primary and secondary education.

STEAM attempts to transform the teaching methods from the level of traditional teacher-centered approach to problem solving teaching with discovery-exploratory learning projects which triggers the creative engagement of students.

STEAM aims to the skills development by encouraging children to respond and engage in playful activities on **Science**, **Technology, Engineering, Arts** and **Mathematics**. The involvement and interest shown by children with the STEM scientific fields is really impressive.

STEAM curriculum, provides the process of solving genuine problems and acquire skills that are relevant to critical thinking and group work collaboration.

C-STEAM, is the approach for the **upgrading of STEAM** educational curriculum by Polytech SA, which **incorporates computer knowledge** and **programming** as the **integration means** between the other STEM disciplines.

By teaching how to program, C - STEAM allows students to build and create tangible creations...
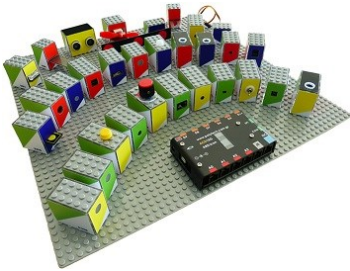
SMART:Blox

Are offered to implement C-STEAM training. This set is a **modular, low cost, intuitive** kit of **hardware** and **software** tools.
The kit includes an **icon** and **logic block** driven **programming application**, an **Arduino** ARM based **controller** and **electronic input output** devices which allow the students to be trained in the **basics of programming** and **computer science** while in parallel educating and exploring important principles of Sciences, Technology and Engineering Arts and Math.

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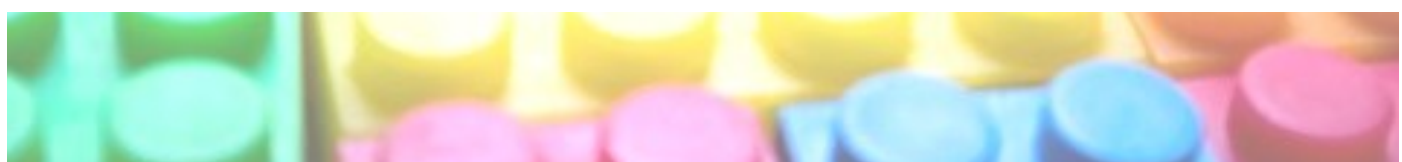
SCOPE OF SMART:BLOX

C-STEAM is the basic training methodology offered by **SMART:Blox** and is a great way to teach the basics of programming and computer science along with STEAM projects at literally any age or level of students.

When **SMART:Blox** sets are integrated to smart structures, built by using typical plastic building block modules, connected to the **ARC:icon** controller and combined with **ARDicon** application – the icon-based programming code environment- provide a powerful and intuitive way to make simple and realistic control logic circuits with all sorts of inputs.

The **S1 basic kit** of **SMART:Blox** introduces the young students to fundamental concepts such as iteration, conditional statements and variables while they use their skills in building simple pilot control projects.
Students focus primarily in exploring the control logic of Inputs and Outputs by applying them to simple STEAM projects.

Although, this is the basic and directly accessible way to create, program and observe a reaction to inputs, it offers many creative possibilities where students can enjoy the control of their logical, physical, tangible creations.

These structures are not complex or highly technical but for sure introduce students on HOW THINGS WORK in common life - commercial technology, basic science and engineering concepts and understand programming principles of and control process.

Imagination combined with logic creates art and technology and that is the aim of STEAM didactic program.

Additionally, SMART:Blox sets provide a vast number of input and output devices which can be incorporated easily into a physical design using simple **plastic building blocks**. Students can create and control various systems and simulate operations of numerous every day applications from refrigeration or air conditioning temperature control system to a security or alarm systems and from a garage or toll service control gate to a traffic light system. They can do math calculators, game, robotic moves, graphics and sounds...

C-STEAM TRAINING WITH SMART:BLOX

THE AIM OF C - STEAM TRAINING

- **Define problems, generate ideas,** build, **test,** and **improve solutions** to solve problems, both **independently** and **collaboratively.**
- **Define an algorithm** as a sequence of instructions that can be **processed by a computer.**
- Recognize that **computers** are devices that **execute programs.**
- **Identify** the **electronic devices** that contain **computational processors.**
- Demonstrate an understanding of the relationship between **hardware and software.**
- Compare various forms of inputs and outputs and do basic **I/O processing.**
- Understand and use the basic steps in **algorithmic problem-solving.**
- Develop a simple understanding of an **algorithm** using simply built **experiments** or **structures.**
- Construct a program as a set of **step-by-step instructions.**
- Create **variables** that represent different types of data and manipulate their values.
- Understand **condition commands** and **logic in programming,** using an **icon based** environment and **reverse engineering** to understand the coding they produce, including looping behavior, conditional statements logic, expressions, variables, and functions.
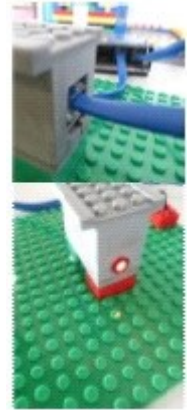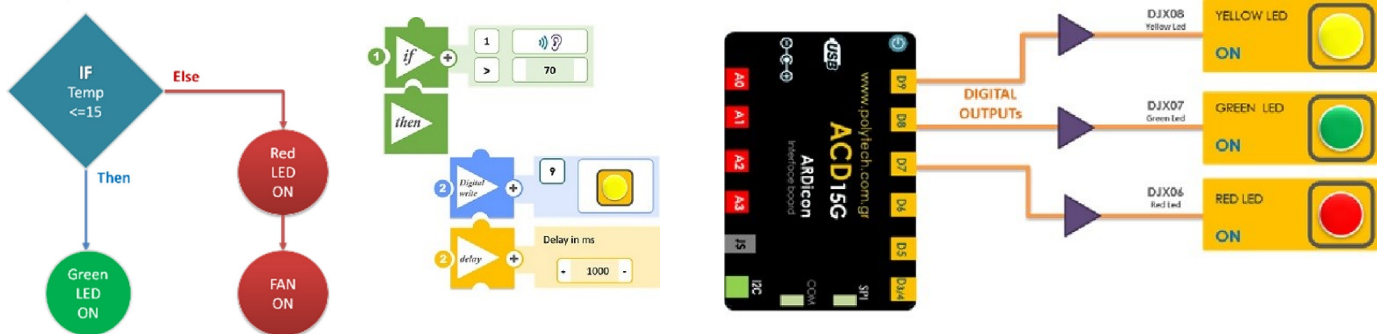

Students are able to:

- Apply all the above to **control their own structures** and perform measurements and observations in various science experiments, technology applications and engineering systems.
- **Manipulate or alternate designs** to duplicate various process.
- **Expand the given projects** to other variations or create their own unique ones.
- Combine efforts in a team or group project collaboration by interconnecting their controllers and **creating a networked operation and process.**
- **Explore more science experiments** or technology applications.
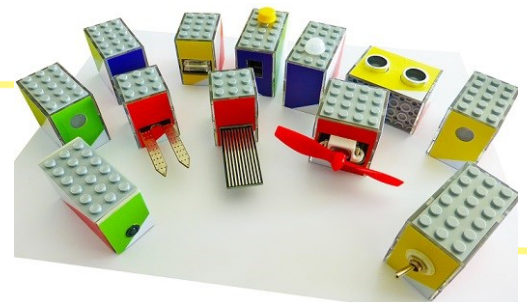
S1

SMART:Blox 's **S1** set is a **complete set of hardware, software components and didactic process**, customized for **young students**, with aim to teach the **basics of programming** and **computer science** while in parallel educating and exploring important principles of Science and Engineering. It is a **STEP UP on STEM** education including computer programming integration in STEAM.

The set is a complete, easily operated and versatile training system with didactic material, training projects categorized in disciplines as **Computer science, Electronics, Automation, Physics, Green energy, Ecology, Chemistry, Biology.**

Its category includes the following basic components:

1 The **ARDicon**-ACD15G controller, especially designed for **simple, plug and play** usage by the students.

Connections from the devices to the controller are made using **RJ12 cables**. It is an **Arduino controller** and includes **analogue** and **digital** ports, **power** connector, **reset** switch and a **USB port** for connecting to any PC or iOS/ Android Pad.

- USB cable and a set of RJ12 cables are included in the package.
- Wi-Fi or Bluetooth connection is *optional*.
- Battery back is *optional*.

2 The ARDicon SMART:Blox **program coding application** for **Arduino** controllers.

This is an intuitive **icon** and **command block** based **coding environment** that makes programming **as easy as a building blocks toy set** and playful for **young kids** to understand **computing logic easily** application.
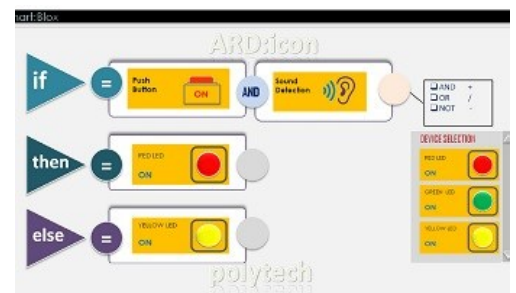
A library of **icon based input** and **output devices** (color LEDs, sensors, motors, many types of electronic switches, rheostats, etc.).

Its **function – logic block scheme** offers a unique, intuitive and simplified way of training in **programming** and **processing various inputs**, apply fundamental programming concepts such as **iteration, conditional statements**, and **variables** in order to create the desired **outputs**.

ARDicon SB is MS Windows and Android compatible.

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③ **The SMART: Blox sets of 40+ electronic devices including, sensors, switches, LEDs and other various Inputs and Output devices** which, in combination with the controller and the application, offer a vast range of experimentation and STEAM project development.

All devices are build as **construction blocks** (**smart bricks**) which are compatible in assembly with most of the branded building block toys that exist in the market. The students can combine the SMART: Blox' s 20 sets with constructions blocks and make a vast number of projects in STEAM. More than 500 projects are available in these, not including the variations of them and the team combined projects.
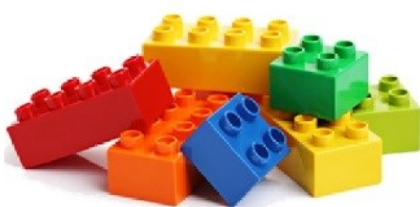
Sound Buzzer ON	Sound Detection	CONTACT SWITCH OPEN
Push Button ON	CAPACITANCE SWITCH CONTACT	Magnetic Switch OPEN
IR Detection ON	IR Receiver ON	IR Transmitter ON
Temp Humidity Sensor % °C	RED LED ON	GREEN LED ON
YELLOW LED ON	TOGGLE SWITCH ON	
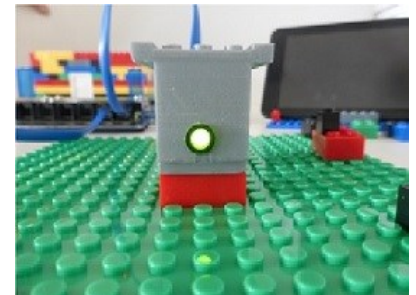
Angle Degrees 0	Magnetic Field Detection	IR Transmitter ON	Sound Detection
ON MOTOR	ON STEP MOTOR	IR Receiver ON	Vibration Sensor ON

# SMART:BLOX BASIC AND ADD-ON CONFIGURATION KITS

S1 A KIT

It is a **complete set** of devices that offers more Input and output devices for **more extensive programming**. It includes the S1 Basic kit and the devices of the **S1 A** add-on set. The devices are provided with their accessories.
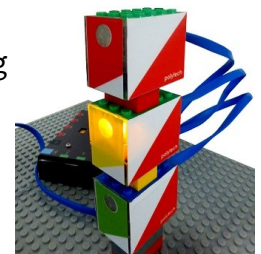
S1 ECO KIT

An **add-on** set of devices to the kits **S1 Basic** and **S1A** offering more Input and Output devices and more programming training in **Ecology** oriented projects. It offers the possibility to create more complex STEAM projects, typical of Ecology applications and enhance greater skills in algorithmic and programming logic. The devices are provided with their accessories.
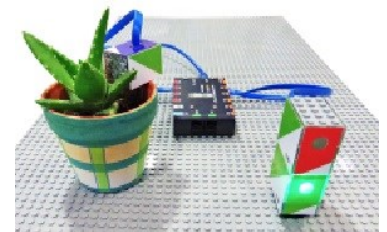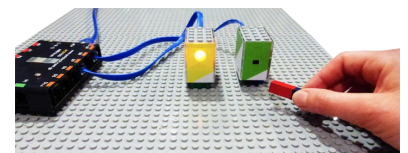
S2 AUTO KIT

An **add-on** set of devices to the kits **S1 Basic** and **S1A** offering more Input and Output devices and more programming training in **motion and automation technology** oriented projects. It offers the possibility to create more complex STEAM projects, typical of Automation field applications and enhance greater skills in algorithmic and programming logic.
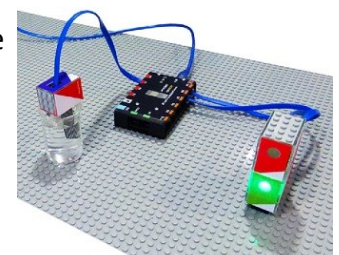
S3 PCB.P KIT

An **add-on** set of devices to the **S1 Basic** kit offering more Input and Output devices and more programming training in **Physics** oriented projects. It offers the possibility to create more complex STEAM projects and enhance greater skills in algorithmic and programming logic.
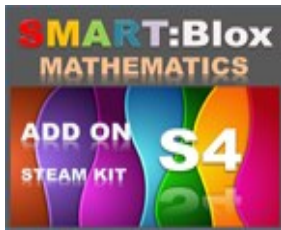
S3 PCB.CB KIT

An **add-on** set of devices to the **S1 Basic** kit offering more Input and Output devices and more programming training in **Chemistry and Biology** oriented projects. It offers the possibility to create more complex STEAM projects and enhance greater skills in algorithmic and programming logic.

SMART:BLOX BASIC AND ADD-ON CONFIGURATION KITS

S4 MATH KIT

An **add-on** set of devices to the **S1 Basic** kit offering more Input and Output devices and more programming training in **Mathematics** oriented projects. It offers the possibility to create more complex STEAM projects, typical of Mathematics field applications and enhance greater skills in algorithmic and programming logic.

S5 GREEN ENERGY KITS

The **S5 GE basic kit** is a set of Alternative Renewable energy practical training devices and instruments which enable the students to carry out a wide range of experiments and measurements. It aims to train students in the operating principles and performance of Solar, Wind, Hydrogen and Bio-Fuel Cells, Mechanical and Thermal energy transformations to Electrical energy. The S5 Green Energy set consists of the S5 GE kit and **5 individual subsets**, one for each of the forms of green energy under study:

S5 SL - Solar Energy

The Solar Energy training tasks using the SMART:Blox **S5-SL** set allow the students the correlation of school physics with practical usage of the photovoltaic cells and photovoltaic energy, combined with the other green energy forms as hydrogen fuel cells, make quantitative recording and analysis of the characteristics and performance of solar cells with the use of the components of the S5 GE kit.

S5 WD - Wind (Aeolic) Energy

The Wind Energy training tasks using the SMART:Blox **S5-WD** set allow the students the correlation of school physics with practical usage of the wind turbines, correlate the wind energy with the other forms as hydrogen fuel cells, make quantitative of the characteristics and performance of wind turbine with the use of the components of the S5 GE kit.

S5 FC - Fuel Cells Energy

The Fuel cell training tasks using the SMART:Blox **S5 FC** set allow the students the correlation of school physics with practical usage of the Fuel cells. The set includes 2 subsets to conduct experiments: the **S5 FH2** Hydrogen Fuel cell kit and the **S5 FBE** Bio-Fuel (Ethanol) cell kit.

S5 EM - Mechanical to electrical energy

The transformation of motion or mechanical power to electrical power is well known to everyone. Basically, we can say that wind power is a mechanical energy transformation. Hydropower is also a mechanical energy transformation. When mechanical forces, natural as air and hydro or steam or any input of mechanical energy, Dynamic or Kinetic, is applied and we get electrical energy as result, we can categorize it in mechanical power transformation. The bicycle dynamo that gives electricity to the bicycle light is a typical example.

S5 TE - Thermoelectric generator TEG

Thermo-electrical energy is the electrical energy produced by heat flux. Is the transformation of thermal energy to electrical energy. When 2 sides of a system have a great temperature difference they produce electrical current using a thermoelectric generator TEG.