WHAT IS STEM

- The term STEM is an acronym used by those relevant to the educational method concerning the fields of **Science, Technology, Engineering** and **Mathematics.**

STEM is an educational approach designed to combine technology and engineering along with science and mathematics, which are vital in order to understand the laws of the universe.

The University of Colombia stated that the basic question to be answered is:

"How can we give such a meaning to education so that children would want to remain at school, improve their performance and graduate high school with the proper knowledge in order to start their academic education and enter working market?"

eTwinning

Hellenic Ministry
of Education and
Religious Affairs

CTI
"DIOPHANTUS"

Computer Technology
Institute & Press

Erasmus+

THE ANSWER TO THIS QUESTION IS SIMPLE:

- Students should have to be trained properly so that they can understand that their own prosperity depends on the quality of the whole world they live in, in other words they should be educated in matters like the **climatic change, renewable energy sources, natural environment** etc..

- A nation deeply educated is able to meet the everyday challenges and innovate. With the moto in US "*educate to innovate*" a grand campaign was initiated to offer children the opportunity to develop their capabilities in an ideal environment.

- **STEM** education is now an economic must in the country, as more than 30 prospering occupations will require STEM knowledge in the near future.

eTwinning

Hellenic Ministry of Education and Religious Affairs

CTI "DIOPHANTUS" Computer Technology Institute & Press

Erasmus+

IT IS NOW MORE THAN EVER ESSENTIAL FOR ALL COUNTRIES TO INVEST IN THIS PIONEERING INITIATIVE

- Throughout Europe, countries that aim to develop their industry, try to induct STEM in their education systems.

- To this direction, in 2009 began an effort in the European School Network, so that some of the schools would develop pilot activities and technologies in the classroom, exploring the use of educational material in teaching STEM.

- Stem education is an attempt to evolve from the tutor-centered approach into a teaching method that involves **problem solving, creative initiative, research** and **hands-on activities.**

eTwinning

Hellenic Ministry of Education and Religious Affairs

CTI "DIOPHANTUS"

Computer Technology Institute & Press

Erasmus+

IT IS NOW MORE THAN EVER ESSENTIAL FOR ALL COUNTRIES TO INVEST IN THIS PIONEERING INITIATIVE

- STEM offers a chance for children to develop their abilities encouraging then to answer questions and get involved with fun activities based on **science, mathematics, engineering and technology.**

- It is truly impressive how the children react to this method, as they seem to find it more interesting and appealing.

- By applying STEM through various projects, students learn to **process facts,** focus on **solving problems** and **gain abilities** fitting to global education, **develop critical thinking** and **work in a t**eam, while it has also been reported *that the knowledge gap between children from different countries has significantly been decreased.*

eTwinning

Hellenic Ministry of Education and Religious Affairs

CTI "DIOPHANTUS"

Computer Technology Institute & Press

Erasmus+

EDUCATIONAL ROBOTICS

- What is amazing is that robotics is not truly in the curriculum in plenty of countries.

- In Europe, we are faced with a disinterest of young students in taking up STEM studies and later on STEM jobs. It is a key problem for the Ministries, as well as the industry, to attract the STEM talents of tomorrow.

EDUCATIONAL ROBOTICS and STEM

- Educational robotics call upon an integrated approach, where *mathematics, mechanics, physics, electronics, computer science* and also *arts*, via design, are interrelated.

But what is a robot anyway?

- A **robot** is a machine - *especially one programmable by a computer* - capable of carrying out a complex series of actions automatically.

- Robots can be guided by an external control device or the control may be embedded within.

- Robots may be constructed on the lines of human form, but most robots are machines or constructions designed to perform a task with no regard to how they look.
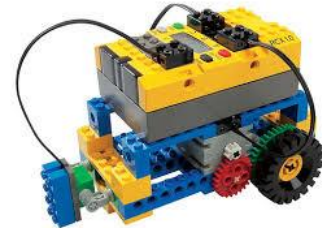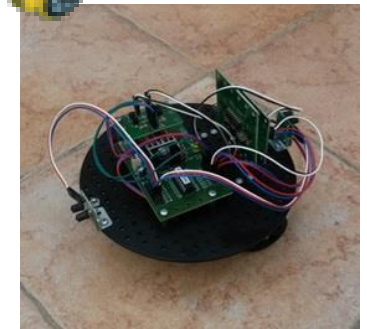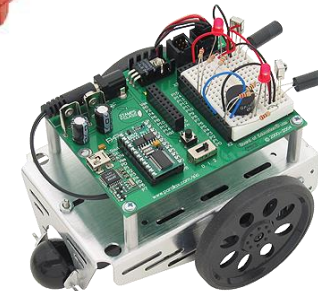
eTwinning   Hellenic Ministry of Education and Religious Affairs   CTI "DIOPHANTUS"   Computer Technology Institute & Press   Erasmus+

STEM MULTILATERAL SEMINAR

3-5 October 2019, Patra, Greece

Educational Robotics kits

- Bee-Bot – Blue-Bot
- Pro-Bot
- Lego WeDo
- Lego Mindstorms (RCX, NXT, EV3)
- Activity Bot
- Boe-Bot
- Scribbler Robot (S2, S3)
- Arduino
- H&S Electronic Systems platform

eTwinning

Hellenic Ministry of Education and Religious Affairs

CTI "DIOPHANTUS"

Computer Technology Institute & Press

Erasmus+

STEM MULTILATERAL SEMINAR

#eTwinPatras2019, #eTwinning

3-5 October 2019, Patra, Greece

Educational Robotics kits

They offer:

- **«Construction»** materials (*bricks, gears, wheels, pulleys,* etc.)
- **sensors** for transmitting data coming from the environment to the computer/processor – *input devices*
- **output devices (***motors, lamps,* etc.)
- **programmable units**

eTwinning

Hellenic Ministry of Education and Religious Affairs

CTI "DIOPHANTUS"

Computer Technology Institute & Press

Erasmus+

STEM MULTILATERAL SEMINAR #eTwinPatras2019, #eTwinning
3-5 October 2019, Patra, Greece

Educational Robotics kits

- They offer flexible tools for **design** and **construction** in a limited time and at a relatively low cost.

- They have a lot to teach in **science** and **programming**:

- not in the sense of **'calculation'** but in the sense of **'interaction'**,

where:

- **data** is not **'values'** but **'entities to be observed'**

- **results** are not **'new values'** but **'actions in a dynamic process'**.

eTwinning   Hellenic Ministry of Education and Religious Affairs   CTI "DIOPHANTUS"   Computer Technology Institute & Press   Erasmus+

STEM **MULTILATERAL SEMINAR** #eTwinPatras2019, #eTwinning
3-5 October 2019, Patra, Greece

Educational Robotics kits

- Students and Teachers work together in a *rich in materials environment*

- They work in an educational environment based on the *constructivist learning theories*

- Students don't just learn about *facts*, *equations* and *techniques* but they learn how to think **critically** and in a **systematic way to solve a problem**

- Students are driven to understand concepts and phenomena.

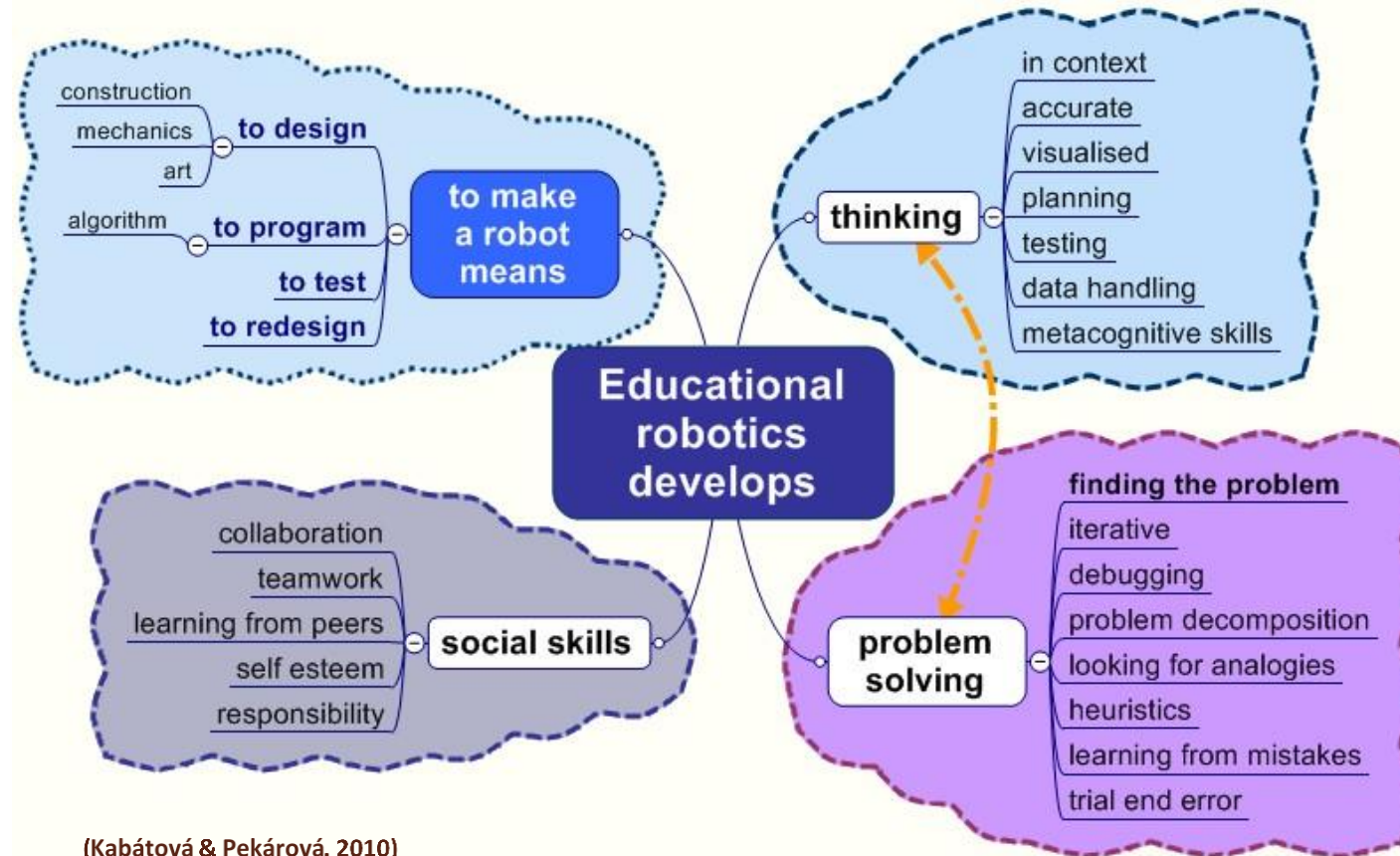eTwinning Hellenic Ministry of Education and Religious Affairs CTI "DIOPHANTUS" Computer Technology Institute & Press Erasmus+

Educational robotics: Competencies

Educational robotics develops

to make a robot means
- to design
  - construction
  - mechanics
  - art
- to program
  - algorithm
- to test
- to redesign

thinking
- in context
- accurate
- visualised
- planning
- testing
- data handling
- metacognitive skills

social skills
- collaboration
- teamwork
- learning from peers
- self esteem
- responsibility

problem solving
- finding the problem
- iterative
- debugging
- problem decomposition
- looking for analogies
- heuristics
- learning from mistakes
- trial end error

(Kabátová & Pekárová, 2010)

eTwinning · Hellenic Ministry of Education and Religious Affairs · CTI "DIOPHANTUS" Computer Technology Institute & Press · Erasmus+

Educational Robotics kits

❑ Bee-Bot - Blue-Bot (**3+**)

❑ Pro-Bot (**4+**)

Logo Programming

❑ Lego WeDo (**7+**)

Scratch, icon-based drag-and-drop programming environment, Tynker

❑ Lego Mindstorms (RCX, NXT, EV3) (**7+**)

Robolab, MicroWorlds Ex Robotics, Enchanting, NXT-G, leJOS NXJ, MATLAB and Simulink, RobotC, C/C++, Java, NXT-Python, EV3 Software, Ada

Educational Robotics kits

Activity Bot (**7+**)

Propeller c, BlocklyProp visual programming, Pbasic, Spin

☐ Boe-Bot (**7+**)

Propeller c, BlocklyProp visual programming, Pbasic, Spin

☐ Scribbler Robot (S2, S3) (**5+**)

BlocklyProp visual programming, Pbasic

P a r a l l a x

Educational Robotics kits

❑Arduino (**9+**)

Arduino IDE, wiring (C/C++), Scratch for Arduino (S4A), Ardublok, Modkit, Arduino Compiler for LabVIEW, Blocky, mniBlog

❑ H&S Electronic Systems platform (**9+**)

Picaxe Programming Editor

Educational Robotics – STEM - eTwinning

- Can **Educational Robotics in a STEM Education framework** be an effective learning and collaborative tool for **eTwinners** (Teachers and Students)?

- After all, the objective of education remains quite simple: *increasing the desire to learn for your students and rediscover the joy of teaching for you as teachers.*