



Guidelines for STEM clubs establishment and operation in educational settings

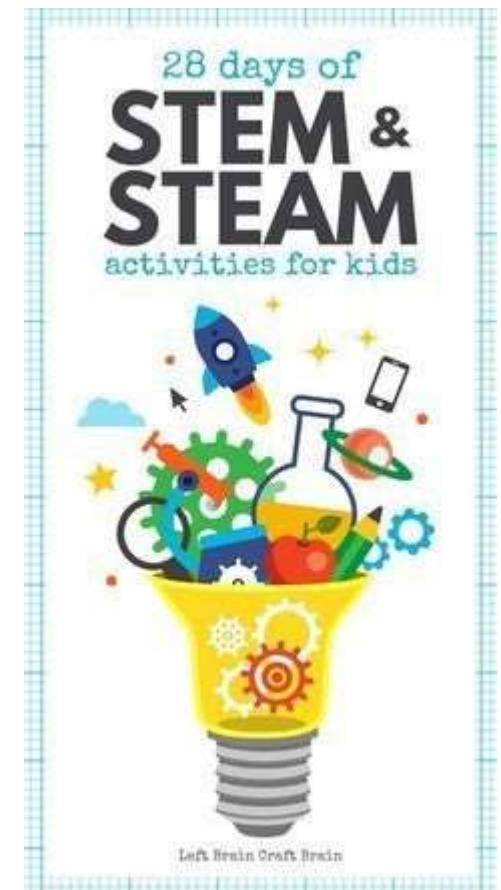
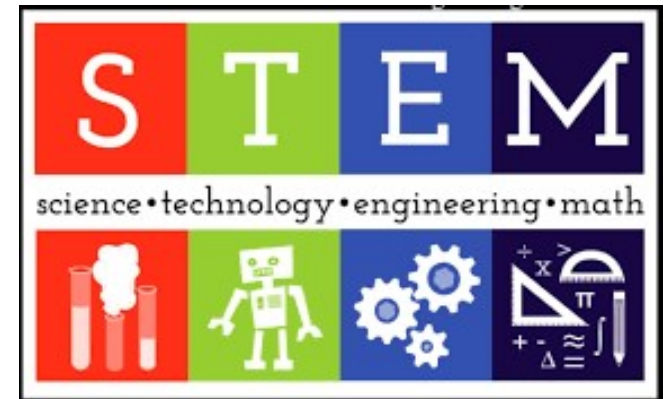
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Various definitions

What is a STEM club? (I)

A STEM Club is a gathering of students that meets regularly in an informal environment to work on inquiry-based Science, Technology, Engineering and Math (STEM) related activities.

A STEM Club might take the form of *an out of school club* or might *expand regular school activities* through activities *embedded as within the regular school day*.

STEM Clubs can meet the needs of students of all ages ranging, from pre-school through college.

STEM Clubs can vary in focus and activities, but the most successful STEM Clubs share common features, as outlined in this guide.

What is a STEM club? (II)

Clubs can be a powerful and enjoyable way to engage young people with STEM (science, technology, engineering and mathematics) subjects, and deliver a wide range of benefits.

They can ignite a new interest in STEM subjects for some and provide a platform for others to extend their learning.

They can give a deeper understanding, offer real-world experiences and suggest different ways to learn and engage in STEM subjects.

They are fun and exciting and allow all involved to explore STEM subjects in imaginative and inventive ways.

What is a STEM club? (III)

- Is a gathering of students that meets regularly in an informal environment to work on inquiry-based Science, Technology, Engineering and Math (STEM) activities.
- Can meet the needs of students ranging from Pre-K through college.
- Can vary in focus and activities.

What is a STEM club? (III)

“...In a STEM club you are seeing the students getting hands-on with stuff is so exciting. ... the activities actually help the students with their curriculum learning. ...

Involvement in a STEM Club can provide students with an opportunity to gain practical, teamwork and leadership skills and increase confidence in the STEM subjects, engaging them with further study of STEM subjects and the opportunity to discover STEM related careers.

The **aims** of **STEM Clubs** are: To enrich, enhance and extend the secondary school curriculum. Improve attainment in, interactions with, and experiences of, the **STEM** subjects among pupils. Improve collaboration between schools and also between schools and industry.

How to get started - STEPS

STEP 1: Build your Team

Core Team – the visioners Identify the Leadership team

Identify the Design team

Other Stakeholders to get involved (educators, parents, students, community members, other stakeholders)

Assign Roles and Duties/ Responsibilities (Logistics and Practicalities)

STEP 2: Define your vision & mission (I)

Mission and Vision

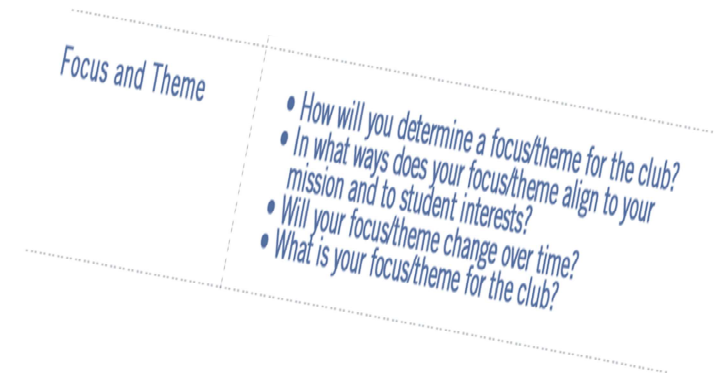
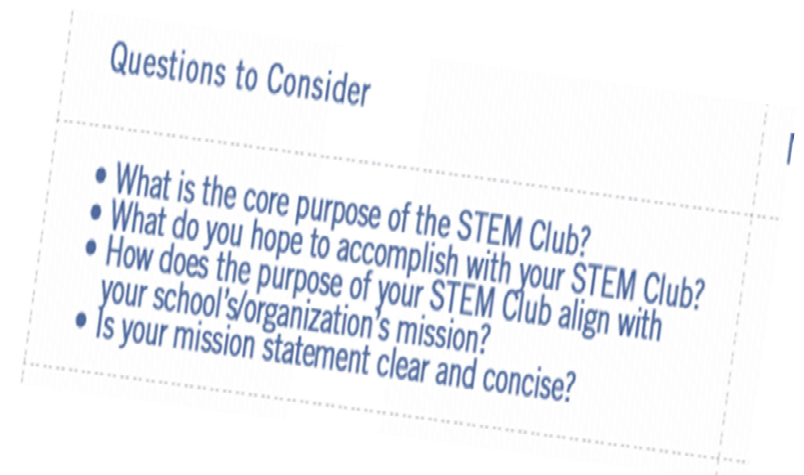
Goals, purpose and Objectives – Why are you planning to run a STEM club?

Clearly defined set of objectives

Name

Logo to communicate vision and mission/ goals and objectives

- Giving your club a name, making badges help to make students/ participants feel like they 'belong' to something special.



STEP 2: Define your vision & mission (II)

Possible Club objectives could be to:

- raise awareness of STEM subjects
- raise student attainment levels
- raise the profile of STEM subjects in the school and in the wider community
- enable the school (Club) to compete in STEM-related competitions and challenges
- enable students to better understand potential careers
- increase opportunities to liaise with industry

Sample

STEP 2: Define your vision & mission (III)

Some more possible objectives:

- To provide opportunities and facilities to support scientific interest
- To encourage a spirit of comradeship
- To liaise with other organizations who share these aims
- To search & promote the science talent and bring it to the limelight.
- Providing a platform for fun learning of scientific concepts by practical experiments related to their educational curriculum.
- To encourage interest in STEM Science, Technology, Engineering and math

Sample

STEP 3: The Design Process

Asking the right questions when designing a STEM Club

WHAT range of "subjects" will be taught in the space? What types of *activities* and *projects* could be done there?

WHICH tools are most needed?

WHO are the kids that will be using the space? Will others use the space as well? Who is staffing and managing the space?

WHEN will the space be used?

WHERE in the school or on the campus would be ideal? What considerations are important? (Location)

STEP 3: The Design Process

Designing a Makerspace (I)

STEM clubs provide hands-on, creative ways to encourage students to design, experiment, build and invent as they deeply engage in science, engineering and tinkering.

A STEM club is not solely a science lab, woodshop, computer lab or art room, but it may contain elements found in all of these familiar spaces.

Therefore, it must be designed to accommodate a wide range of activities, tools and materials.

Designing a space to accommodate such a wide range of activities is a challenging process.

STEP 3: The Design Process

Designing a Makerspace (II)

Some schools have chosen to incorporate STEM clubs within multiple classroom spaces.

This works well for many activities, particularly in elementary schools.

In Secondary Education: Better to have a separate room/ area

As STEM club activities expand to require more tools, it makes more sense to create a dedicated STEM clubs that includes appropriate tools, work areas and materials.

Answering these questions will allow schools to create a "design program" for their STEM club, defining the specific needs and requirements.

The design program is one of the most critical steps in ensuring the space will be functional and well used.

Top Design Considerations for a STEM club

Health and Safety

Durability

Practicality

Ergonomics

Flexibility

Step 4: Register Your Club With the School/ Community

Get the school approval - have the school authorities on board

Location/ Space/ Buildings

People to get involved

Launch the club

- Organize a 'Club Launch' session
- Introduce the club
- Give participants a taster of what they'll be doing during their time with you.
- It's a club not a just another lesson...



Step 5: Establish a Budget

How the STEM club will be funded?

You need money to start running (i.e. materials)

- Some schools will give club leaders a small budget to cover cost of materials, but this is not enough and not guaranteed.

Develop a Budget

Cost and Funding

- What will be the costs related to operating your club?
- How will these costs be covered?
- Is your school/organization providing any financial support for your club?
- How will you solicit additional financial resources, and if so how?
- How will you approach industry to support your club activities, and if so how?

Outside funding:

Grants for schools/ initiatives/ Participation in research projects/ fundraisers/ The Community / Donations / Membership fee / Trainings fee

Keep Track of the Budget/ To be assigned to a member

Step 6: Activities and Planning (Relate to Step 2- What?)

The Design team

Curriculum

Activities & Events

Training programs/ lessons

Potential ideas:

- guest speakers, special events, planning club outings, organizing fundraisers, parties, weekend trips, and hosting discussions or lectures.

Plan Ahead - Start Strong - Go online

Step 7: Spread the Word. ...

Develop a website

Social media accounts

Recruit members

Allow for partnerships

Develop a club network – membership fee

Engagement Plan

- What students will your club target?
- How will you recruit students?
- How will you ensure that your club appeals to a diverse membership?
- How will you connect your club to community, parents, and industry?

Mention your club to your friends and people you think will be interested.

Post flyers - Try to make these flyers eye-catching and interesting to look at.

STEM Ambassadors:

- STEM Ambassadors are volunteers who offer to give their time to go into schools to share their knowledge and expertise with teachers and students.

STEP 8: Sustainability

How to keep the STEM Club sustainable

It's important to make sure it lasts.

Keep your Club Going!

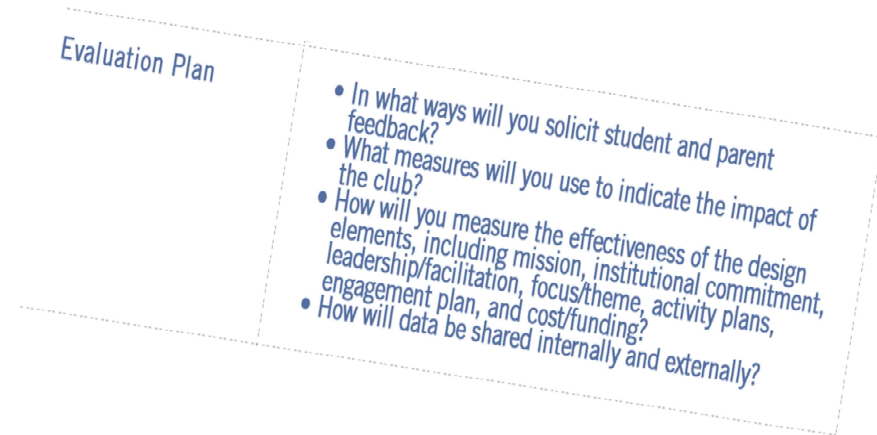
To keep the club around, students/ participant should enjoy it

Evaluation Plan

Ongoing process and attempts

Continue to:

- recruit new members,
- assign leadership roles,
- stick to a budget,
- plan activities and events to keep your club exciting.
- organize a special event each year/ in specific occasions



Materials & Equipment for STEM Club

(Relate to Step 2: Design - Which?)

Materials & Equipment

STEM clubs are equipped with a variety of tools that can be used for designing and creating things.

Some of these tools can include arts and crafts supplies like clay, pipe cleaners, paint, popsicle sticks, cardboard, paper, and glue.

Other times, they are more industrial, including nuts and bolts or supplies for mechanical or robotic work.

Some maker spaces are equipped with 3D printers and computers.

- On the computer, students are able to use software like Tinker CAD or other programs to design a three-dimensional object and print it from the bottom up in hard plastic

STEM Clubs are also committed to recycling and reusing as many materials as possible, so try to utilize donated items as often as you can.

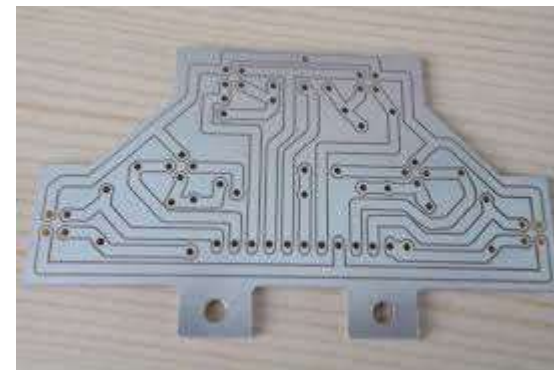
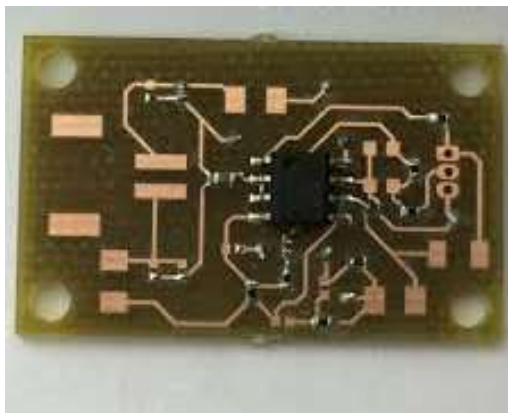
Computer Aided Design (CAD)/Computer Aided Manufacturing (CAM) software stations



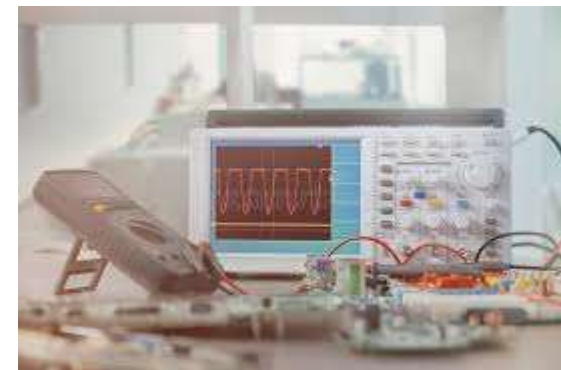
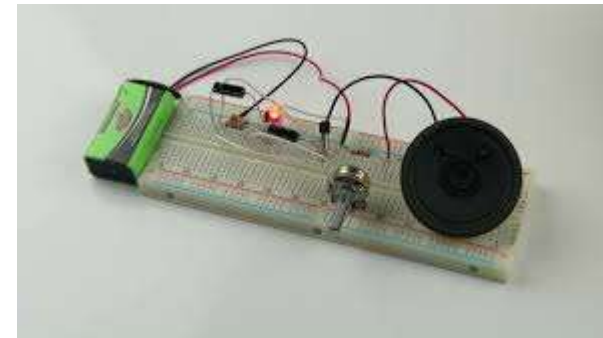
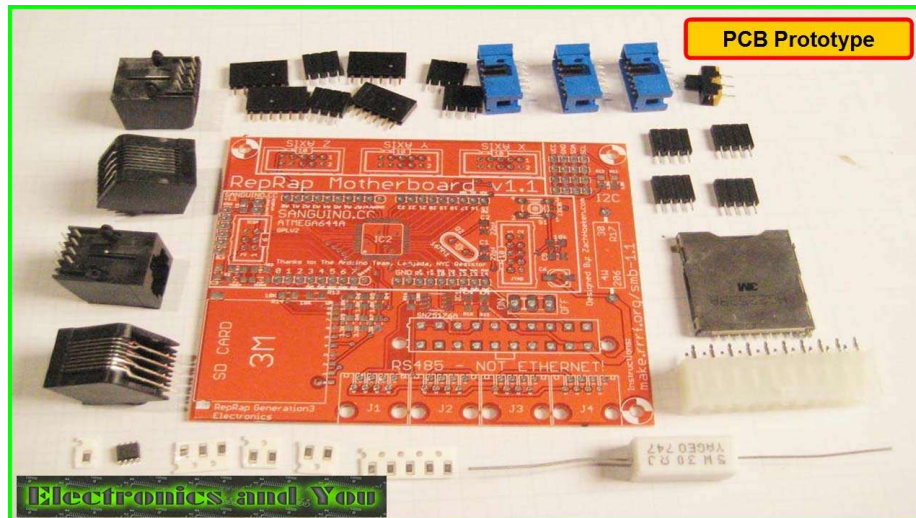
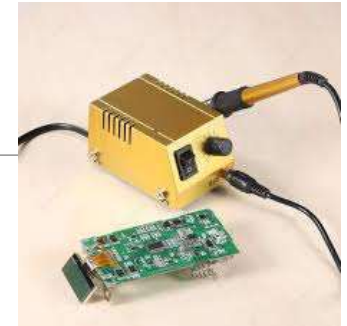
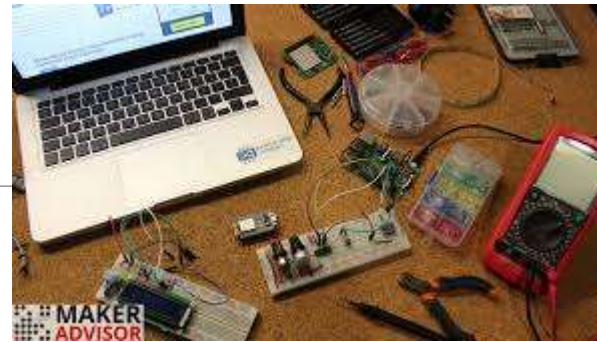
Computer Numerical Control (CNC) routers and mills



Printed Circuit Board (PCB) mills



Electronics prototyping and soldering equipment



Plasma cutters



Welding equipment and accessories





Arts and Crafts Supplies



Vinyl Cutters



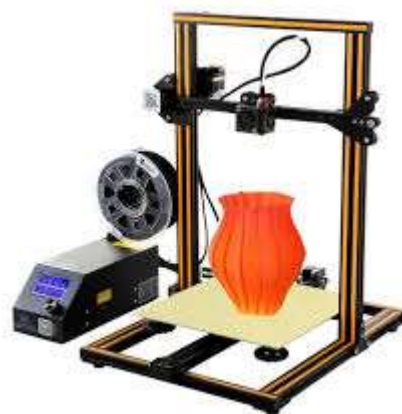
Other tools



Sewing Machines



3D Scanners



3D Printers

Virtual Reality (VR) equipment



Soldering Irons

Πακέτα Εκπαιδευτικής
Ρομποτικής



Botley



Blue Bot



Bee-Bot

**Robot
Mouse**



Engino

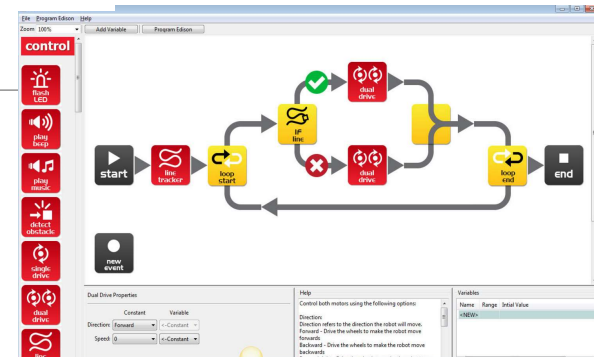
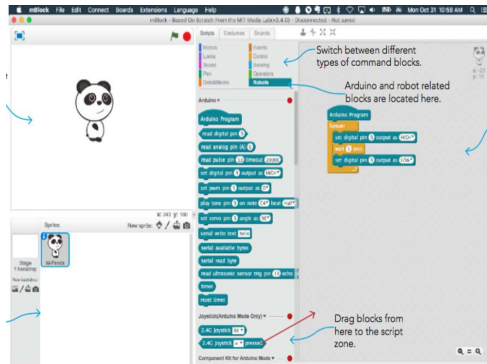
Lego WeDo 1





Meet Edison

mBot



Pro-Bot



Lego WeDo II



Kibo Robotics kit





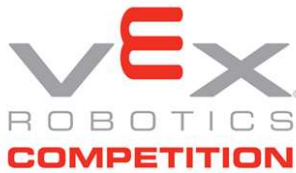
Raspberry Pi



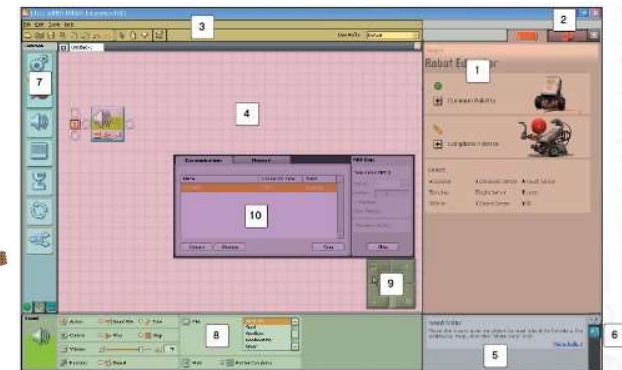
Lego Mindstorms Ev3



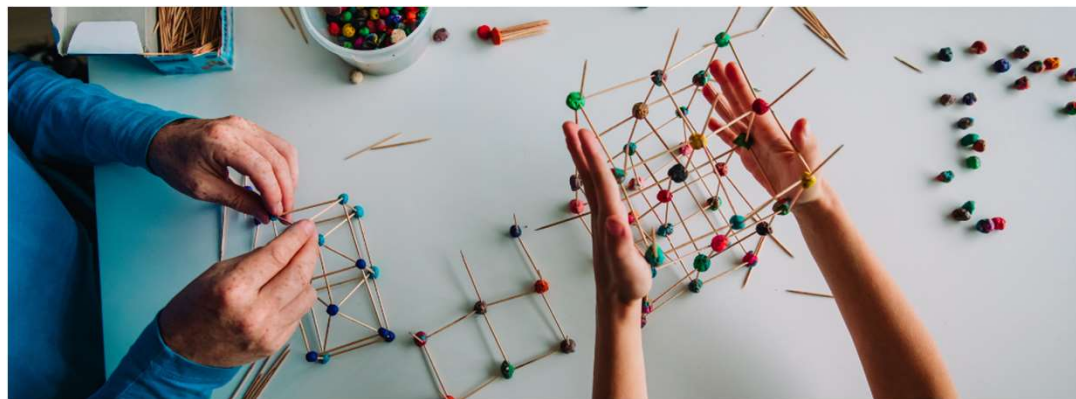
VEX



Lego Mindstorms NXT



Possible Activities





10 free STEM ideas to Jump-start your Makerspace

Maker STEM: Wind-powered www.sciencebuddies.org		Maker STEM: Junkbot Robots www.sciencebuddies.org	
Maker STEM: Pantograph www.sciencebuddies.org		Maker STEM: Roller Coaster www.sciencebuddies.org	
Maker STEM: Robot Hand www.sciencebuddies.org		Maker STEM: Cotton Ball Launcher www.sciencebuddies.org	
Maker STEM: Make a Harmonica www.sciencebuddies.org		Maker STEM: Night Light www.sciencebuddies.org	
Maker STEM: Paper Circuits www.sciencebuddies.org		Maker STEM: Paper Speakers www.sciencebuddies.org	

www.sciencebuddies.org



march
STEM

Teach OUTS OF The Box

Rainbow Bridge

Wind-powered Maze

Leprechaun Trap

Teach OUTS OF The Box



SPRING STEM

DESIGN A
BIRD'S NEST



STEM for all seasons



MARCH STEM
LEPRECHAUN TRAP



Click on the link below

STEM projects

Every STEM club is **unique** and the projects that are worked on inside of them are also very diverse.

Consider also the following:

- to be used for various courses within the school activities
- for afternoon activities
- Participate in competitions

There are lots of STEM clubs and there is no fixed formula for running one.

Teaching methods & Approaches

Problem – Based Learning

Project – Based Learning

Interest – Based Learning

Maker – Based Learning

Design Thinking and Design Thinking Process

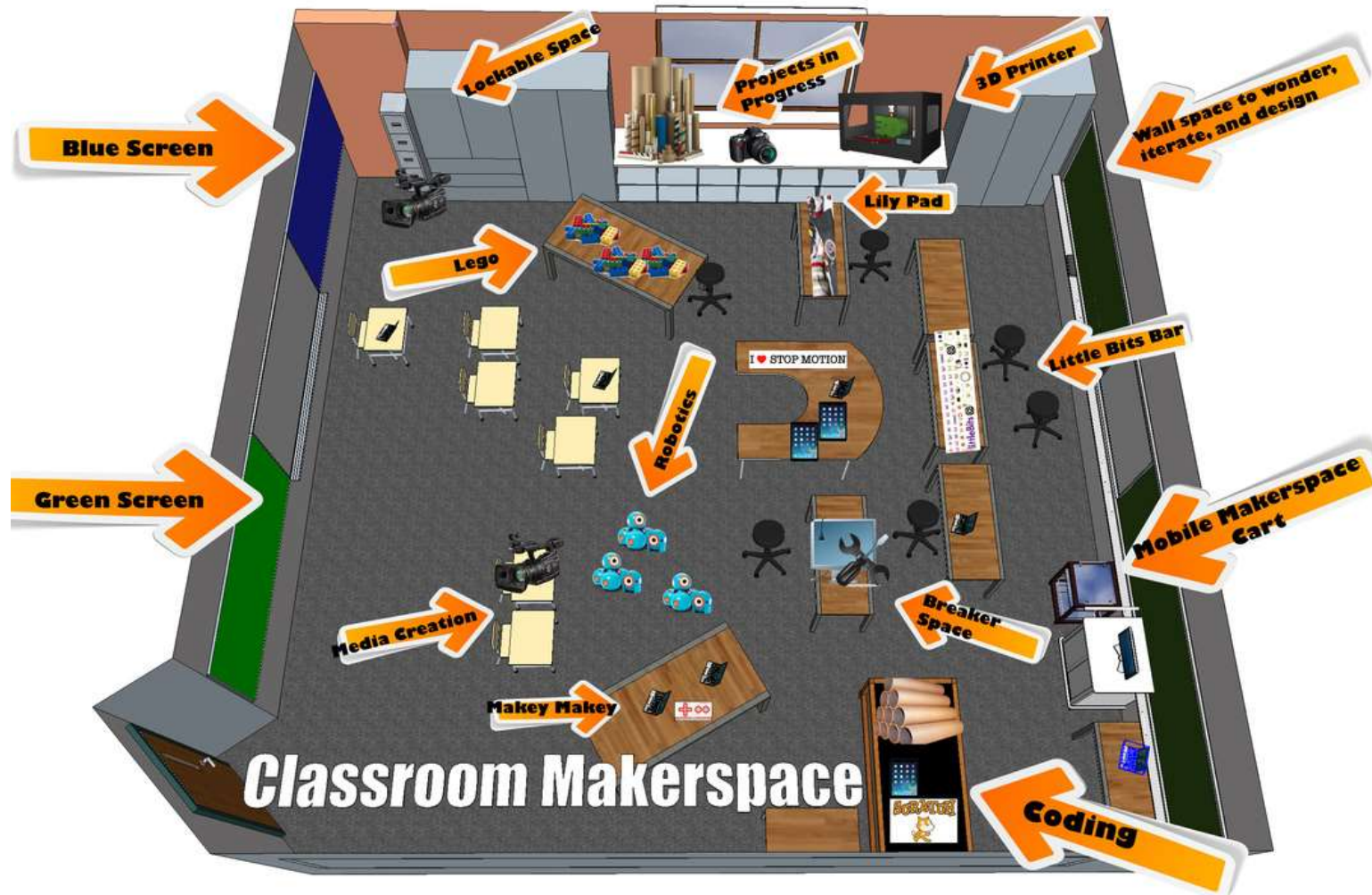
The **five** stages of Design Thinking, are as follows:
Empathise, **Define** (the **problem**), **Ideate**, **Prototype**, and **Test**.

Design Thinking Process



STEM Club Spaces/ Rooms





Benefits of a STEM club (I)

- Providing opportunity for meaningful STEM learning and for students to engage in science, technology, engineering and math in multiple ways and in a supportive and fun environment.
- Building their knowledge and application (i.e., behavior change) of STEM content and processes.
- Honing their ability to collaborate with and learn from other students and from STEM professionals.
- Building their interest in academic success and higher education.
- Foster their interest in additional STEM learning opportunities and careers.

Benefits of a STEM club (II)

- Related activities to the national curriculum develop understanding and conceptual learning regarding subject of Science and its topics.
- Hands-on skills development.
- Enhancement of practical approach and problem solving attitude.
- Team working.
- Leadership skills.
- Presentation skills.

10 tips for running a successful STEM club

Be clear about the focus of the club

Think about the students / participants

Be realistic

Long term projects vs. one off activities

Plan ahead

Collaborate – don't go it alone!

Don't reinvent the wheel!

Take part in competitions

Think about funding

Raise the profile

Link up with industry

STEM Ambassadors

Make it student led

STEM Club Check List

Think about your objectives – and how you will measure impact

Collaborate: teachers, technicians, helpers, volunteers and supporters – individuals and from organizations

Reflect on other Club models

Think about how to get the right members involved

Think about logistics – from exciting locations to resourcing and health and safety

Plan an exciting program of activities

Enhance Club leader skills – think about CPD

Raise your Club's profile

Organize trips and competitions

Link up with others

Get parents involved

Spread the word

Seven key attributes of a GREAT STEM Club

- A great STEM Club has seven key attributes:
 - It is personalized,
 - deep (allowing deeper learning),
 - empowering,
 - equitable,
 - differentiated,
 - intentional and
 - inspiring.
- Also...:
 - To keep up the good work
 - Have it for the future
 - Sustainability
 - Reevaluation



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ROBOSCIENTISTS PROJECT

Motivating secondary school students towards STEM careers through robotic artefact making

Erasmus+ KA2 2018-1PL01-KA201-051129

Creators

Nikleia Eteokleous (Frederick University)

Declaration

This report has been prepared in the context of the ROBOSCIENTISTS project. Where other published and unpublished source materials have been used, these have been acknowledged.

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