

# A training Framework for ROBO21C

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Intellectual Output by the University of Malta

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## INTRODUCTION:

*A guide that implements a constructionist approach to introducing technology, in particular robotics, in the early childhood classroom is being employed. This approach is based on four basic tenets of constructionism*

- (a) Learning by designing meaningful projects to share in the community,*
- (b) Using concrete objects to build and explore the world,*
- (c) The identification of powerful ideas that are both personally and epistemologically significant*
- (d) The importance of self-reflection as part of the learning process.*

*In this case a methodological framework that can be used to integrate in, the classroom, is presented. Specifically it has the scope of engaging young students in exploring and learning new concepts and ways of thinking, combining robotics to what they are already familiar with and creating another dimension for learning and discovering without neglecting what they already do.*

## Prerequisites for trainer

- a. Familiar with hardware*
- b. Knows simple coding*
- c. Pedagogically sound and working knowledge of Technology Enhanced Learning and Digitally Mediated Education*
- d. Familiar with Project Based Learning activities.*

## FOCUS:

**A robot is a mechanical device that can be programmed to follow a sequence of events.**

## Things to take in consideration before implementing robotics tools.

a. Robotics can give rise to multimedia activities and are therefore multisensory. *Robots may speak, make sounds, or flash with lights and colours in response to the environment as per instructions.*

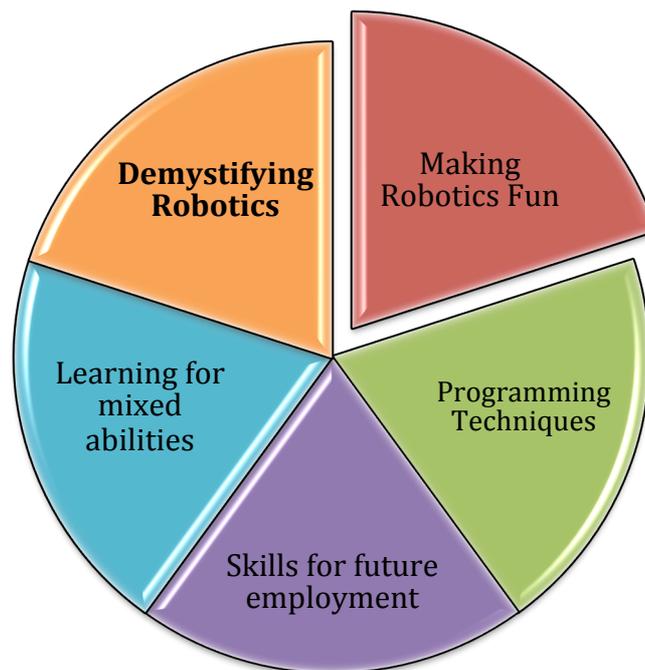
b. Robots lend themselves to do-it-yourself activities: *Enhancement of creative thinking, reflection and decision making skills.*

Robots need the ability to follow programmed instructions and not just be controlled

remotely and interactively even through the Internet, a computer or handheld device such as a smartphone or tablet PC.

*Making best use of hardware that pupils may already be familiar with. Giving an extra dimension of learning to already familiar devices.*

**Aims of Proposed Framework: 5 interrelated dimensions.**



THUS:

1. Elucidation of ways of making learning robotics fun
2. Search effective way of introducing programming to students
3. Provision of skills related to future employment.
4. Suitable exercises for mixed ability classrooms.
5. The demystification of a complex technology through principles that employ scaffolding methodologies.

### 1. Children find it fun

There are several competitions for a range of age groups that can channel competitive instincts in a positive way. For example, asking children to build a robot from a Lego WeDo set and then running a race to see which robot goes fastest works well.

| AIMS  | LEARNING OUTCOMES   | EQUIPMENT and METHODOLOGIES  |
|---|---|--|
| <p style="text-align: center;"><b>A.</b><br/><b>Game Based learning and Gamification</b></p>  | <ul style="list-style-type: none"> <li>a. Ability to work in groups.</li> <li>b. Adaptability skills.</li> <li>c. Experiential learning through winning losing and collaboration.</li> <li>d. Development of originality.</li> <li>e. Developing public speaking skills and self-presentation.</li> </ul> | <p style="text-align: center;">Blue/Beebots</p> <p style="text-align: center;">Bot races<br/>Bots and Board games</p> <p style="text-align: center;">LEGO WeDo</p> |
| <p><b>B. 21<sup>st</sup> century skills</b></p> <p>Communication<br/>Collaborate<br/>Connectedness<br/>Communities of Learners<br/>Convergence<br/>Contextualisation<br/>Create</p> | <ul style="list-style-type: none"> <li>a. Ability of working in a group.</li> <li>b. Multimodal communication</li> <li>c. Recognition of converging digital tools.</li> <li>d. Working and networking in a community of practice.</li> <li>e. Naturalisation to a device.</li> </ul>                      | <p>Sequential storytelling<br/>Building robots with a cause.<br/>Embedding robotics in cross-thematic and curricular approaches.</p>                               |

## 2. Effective way of introducing programming to students

Programming can be too abstract. By having to control a physical robot and seeing what goes wrong, students learn what robots can and can't do. They also learn the need for precise instructions.

| <b>AIMS</b>                         | <b>LEARNING OUTCOMES</b>  | <b>INDICATIVE EQUIPMENT/METHODOLOGIES</b>  |
|-------------------------------------|---|--|
| <b>A. Enhancing Rationality</b>     | <ul style="list-style-type: none"> <li>a. Knowing directions</li> <li>b. Cartesian Convention: Up and right are Positive, Down and Left are Negative</li> <li>c. Creation and or following a sequence of events.</li> <li>d. Development of foresight, learning through hindsight.</li> <li>e. Development of higher thinking skills, analysis, evaluation decision-making</li> </ul> | Sphero<br>Bluebot<br>Bee Bots<br>Handheld devices<br>BYOD  |
| <b>B. Encourage Problem Solving</b> | <ul style="list-style-type: none"> <li>a. Personalized problem solving</li> <li>b. Enhancing the use of schema and the zones of proximal developments.</li> </ul>   | Blue and Bee Bots<br>Scaffolding Activities and Modelling <ul style="list-style-type: none"> <li>i. Lego Learn to Learn</li> <li>ii. Lego Simple Machines</li> <li>iii. Lego WeDo</li> </ul> |
| <b>C. Coding</b>                    | <ul style="list-style-type: none"> <li>a. Coding using Scratch, LOGO, Daisy the Dinosaur (iPad only)</li> </ul>   | LEGO WeDo<br>LEGO Mindstorms<br><br>Learning through Gamification  |

**3. Provides skills useful in future employment**

Special reference is made to 21<sup>st</sup> century skills

| AIMS   | LEARNING OUTCOMES  | INDICATIVE EQUIPMENT/ METHODOLOGIES  |
|--|--|--|
| <p><b>A. Emphasising Key Competencies</b></p> <p>Communication<br/>Collaborate<br/>Connectedness<br/>Communities of Learners<br/>Convergence<br/>Contextualisation<br/>Creativity<br/>Entrepreneurship</p> | <p>a. Ability to work in groups.<br/>b. Adaptability skills.<br/>c. Experiential learning through winning losing and collaboration.<br/>d. Development of originality.<br/>e. Developing public speaking skills and self-presentation.</p> | <p>Lego Learn to Learn<br/>Lego simple machines<br/>Lego WeDo<br/>Lego Mindstorms</p> <p>Scaffolding methodologies</p> |

**4. Suitability for different mental abilities.**

**One size does not fit all thus applying scaffolding and differentiating approaches**

Scaffolding a lesson: breaking up the learning into chunks and then providing a tool, or structure, with each chunk.

Differentiation: the same chunks may be changed differently according to aptitudes

| AIMS   | LEARNING OUTCOMES   | INDICATIVE EQUIPMENT/ METHODOLOGIES                                       |
|--|---|---|
| <p><b>A. Contextualising Robotics</b></p> <p><b>B. Learning task orientations.</b></p> | <ul style="list-style-type: none"> <li>a. Development of leadership skills.</li> <li>b. Manage group dynamics.</li> <li>c. Develop group and personalised ownerships.</li> <li>d. Personalised Learning</li> <li>e. Simple programming</li> </ul> | <p>Bee/Bluebots</p> <p>BYOD methodologies.</p> <p>PC</p> <p>LEGO WeDo</p> |

Example:

The Head Programmer plans the next move.

The Code Writer puts the command cards in order.

The Command Keyer keys in the commands.

The Debugger tracks where in the program the robot currently is and fixes any problems that arise.

**5. Demystifying complex technologies**

Connect content with robots.

THUS:

***Learning by doing***

| AIMS   | LEARNING OUTCOMES  | EQUIPMENT/<br>METHODOLOGIES                      |
|--|--|--|
| <p><b>A. Contextual robotics use.</b></p> <p><b>B. Accessible through contextualization</b></p> <p>Thus: Thematic cross-disciplinary approaches through project based learning</p> | <p>a. I build robots</p> <p>b. Program robots for specific tasks.</p> <p>c. Learn to build test evaluate and refine and artifact</p> | <p>LEGO WeDo<br/>LEGO Mindstorms</p> <p>BYOD</p> |

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