

## 1.1 ACTIVITY PLAN TEMPLATE

Engaging with robots in a fun way

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### Short description of the activity (Summary)

These were workshops run with students whose age was between 11 - 13 years, and, at secondary level. The robots used were Dash and Dot although the practical aspects were explored with Dash. Dash is a pre-constructed robot and activities focused around programming Dash through commands and loop statements. Another objective was explaining to students that when searching for a solution programming gives you the advantage of finding multiple answers to activities, and, that some solutions are simpler and more straightforward than others.

These sessions were run between March and May 2017 and during each workshop the tutors reflected with the students about group work and collaboration; a worksheet (Annex 2 ) was also assigned to students to gather feedback about this. STEM careers and gender in science were topics discussed during workshops.

Another topic discussed with students was about success, failure and resilience. These factors were presented to students in an employment context where perseverance, personal initiative and drive are key factors. The students recounted their experience of how successful/unsuccessful they were during the workshop activities by describing this in a diary post (Annex 3).

### Focus, Set up and Requirements of the activity

CURRICULUM

Select NO if the scenario is not aligned with the curriculum of your country and YES if it is. Please mention the relevant subject matter.

NO X YES  Subject: .....

CONTENT

Choose categories and give a rating of the level of emphasis on concepts from each of the following domains

<input type="checkbox"/> Science	<input checked="" type="checkbox"/> Technology	<input type="checkbox"/> Business	<input type="checkbox"/> Engineering	<input type="checkbox"/> Arts	<input checked="" type="checkbox"/> Mathematics
(0-10)	(0-10)	(0-10)	(0-10)	(0-10)	(0-10)



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**OBJECTIVES**

<i>Subject related</i>	Specific tasks according to set instructions related to, technology, programming and mathematical concepts including probability and random numbers.
<i>Technology use related</i>	Drag and drop visuals
<i>Social and action related</i>	Allowed students to collaborate and share ideas with each other, and, to learn that decision making processes are enhanced when being teams/groups.
<i>Argumentation and fostering of maker culture:</i>	Finding multiple solutions to activities, allowing the robot to respond to external stimuli/obstacles

**TIME****Duration:** 2 days**Schedule:** 4 hours per day**MATERIALS AND ARTIFACTS**

<i>Digital artifact</i>	Drag and Drop visuals
<i>Robotic artifact</i>	Not applicable
<i>Student's workbook and manual</i>	Using worksheets containing graded activities whose difficulty increased from one task to another
<i>Teacher's instruction book and manual:</i>	Power point presentation, and, hard copy of programme for time management

**Students and space****STUDENTS (TARGET AUDIENCE)**

<i>Sex and Age:</i>	boys & girls, 11 - 13 years old. Some classes were same gender, girls only.
<i>Prior knowledge:</i>	Knowledge of Scratch language for a few of the students which helped with programming of Dash; very few others had attended Lego Mindstorm classes. Other students had no previous knowledge in programming or robotics.
<i>Nationality and cultural background</i>	The majority Maltese; around 10% came from European or non-European countries
<i>Social status and social environment</i>	Church schools and private schools. In church schools the population is of a diverse social status. In private schools the majority come



	from a high social background and there are more foreigners attending versus church schools.
<i>Special needs and abilities</i>	Some degree of autism, dyslexia, dyscalculia, Down's syndrome

#### SPACE INFO

**Organizational and cultural context:** computer lab or school hall or school gymnasium

**Physical characteristics:** indoors

## Social Orchestration

#### POPULATION

**Students:** e.g. groups ranged between 15 and 26

**Tutors:** e.g. 2

#### GROUPING:

<i>Grouping criteria</i>	e.g. mixed ability, mixed gender or single gender
<i>Setting:</i>	e.g. Students seated on the floor, indoors, in groups of 2 or 3 sharing a tablet and a robot per group.

#### INTERACTION DURING THE ACTIVITY (EMPHASIS)

<i>Actions</i>	e.g. Exchange ideas and dialogue
<i>Relationships</i>	e.g. Collaborative and competitive (during races)
<i>Roles in the group</i>	e.g. role exchange in the group
<i>Support by the tutor(s)</i>	e.g. Intervene, monitor, facilitate

## Learning Procedures

#### EXPECTED STUDENT ACTIVITY

Students during the activity are expected to engage in the following actions: construct, observe, communicate, create, present their work in a blog, exchange ideas, etc.

#### STUDENT LEARNING PROCESSES

<i>Designed Conflicts and misconceptions</i>	Not applicable to activities prepared
<i>Learning processes emphasized:</i>	1. multiple programming solutions to the activities 2. communicate and discuss tasks set and decide on the way forward 3. write up about your experience, learn about collaborative issues).



Expected relevance of alternative knowledge	None
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## “How to” in the classroom

In this section of the activity plan we describe how we expect the teaching and the learning process to evolve. We might use phases or activities for this description. The phases or activities should support the objectives stated and make use of the materials, tools and teaching and learning processes mentioned earlier in the activity plan. Next we provide an example of phase description

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### PHASE 1: INTRODUCTION AND EXPERIMENTATION

**Duration:** 2 hours

**Orchestration:** Presentation, experimentation and group work.

**Description:** The pre-questionnaire was first carried out. This was followed by an introduction to what are robots and what isn't a robot. Advantages and disadvantages of robots in everyday life, and, how or why humans use them.

Collaboration, communication and teamwork are discussed and students are asked to talk about the requisites for good teamwork (Annex 2). Examples of science careers and employments were presented to them to sustain the applicability of STEM subjects and nurture STEM in their thinking and possibly future choice of subjects. Gender in career uptake and employment is discussed to explain that any STEM career can be equally taken up by males or females and hence to break down any stereotype images that the students might have had.

A demonstration of Dash and its functions, sensors and actions was explained to the children. The robot was then handed out and they were allowed firstly to experiment and explore freely.

Indicate which of the stated objectives are supported by this phase: Subject related, Technology use and action related

Expected student constructions: Not applicable

Expected forms of student dialogue: communication and taking turns

Teaching method: Instruction, demonstration by example, discussion with the students and experimentation by the students themselves.

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### PHASE 2: SEQUENTIAL PROGRAMMING AND LOOPS

**Duration:** 2 hours

**Orchestration:** Group work (groups of 2 or 3) and individual

**Description:** Students implement their first programs as per the puzzle sheet (Annex 1). Loops, If-else, repeat-until were included in the programs constructed by the students. A key factor in



these puzzles was to make students aware that a number of options and answers are possible in programming which range from a simple to a more complex solution.

Puzzle 5, as shown in Annex 1 allowed the students to come up with an activity themselves for a peer. We emphasized on creativity and to come up with an exciting task; this task was based on bringing in knowledge from the previous activities of the day but it had to be different.

At the end of this workshop, students were given a worksheet to point out characteristics relating to collaboration and group work.

Indicate which of the stated objectives are supported by this phase: Subject related, Technology use and action related

Expected student constructions: Not applicable

Expected forms of student dialogue: discussion, communication, taking turns, taking decisions

Teaching method: Instruction, demonstration by example, discussion, experimentation

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### PHASE 3: USING LOOPS AND ANALYSIS

**Duration:** 3 hours

**Orchestration:** group work

**Description:** Two scenarios are presented to students where the robot assumes two personalities: as a security guard (puzzle 6) and a lottery drawer (puzzle 7). In the former situation the robot must realise where its boundaries are and walk accordingly from one end to another. As a lottery drawer the robot presents a fair and transparent scenario by drawing random numbers. In both instances there are multiple ways how to arrive to your answer and the loops came into the picture again.

Two commonly used mathematical and analytical topics were part of these activities and explained. These are the use of graphs to interpret data collected (Puzzle 6) and hence the importance of statistics, and, probability (Puzzle 7). With regards to probability students recorded the number generated by their robot. The tutors generated a random number and then listed all the numbers on the board. Later the tutor revealed the number the robot generated. The question “What is the probability that your robot generates the same number as mine?” was asked to the students.

Indicate which of the stated objectives are supported by this phase

Expected student constructions - not applicable

Expected forms of student dialogue: brainstorming, interpretation

Teaching method: instruction, demonstration by example, discussion, experimentation

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### PHASE 4: REFLECTION AND POST FEEDBACK



**Duration:** 1 hour

**Orchestration:** Individual work

**Description:** These 2 day workshops focused on the students' abilities to come up with more than one answer to a task, and, therefore their resilience to achieve or give up. They were asked to describe and talk about their experience with being successful, unsuccessful and resilient in a diary post.

At the end of this exercise, the students were asked to give their feedback about the two day workshops which they had participated to.

An interview was carried out to 2 - 3 students who had acted as the focus group to get deeper insight of their experiences.

Indicate which of the stated objectives are supported by this phase

Expected student constructions: not applicable

Expected forms of student dialogue: personal reflection, evaluation

Teaching method: Explanation

## Assessment Procedures

Suggestions for procedures, methods and tools that can facilitate the achievement of the teaching objectives stated at the beginning of the activity plan. (e.g. post activity tests, reflective videos etc)



**Annex 1**

**Puzzle 1**

Make Dash drive in a square.

*There are 2 correct answers for this puzzle, can you find them both?*

**Puzzle 2**

Make Dash look left and right for 5 times.

*There are 2 correct answers for this puzzle, can you find them both?*

**Puzzle 3**

Make Dash work like a traffic light. Each colour should be active for 10 seconds. Once the light turns green, Dash should move forward 1 meter.

*There are 2 correct answers for this puzzle, can you find them both?*

**Puzzle 4**

Make dash drive forward until he finds an obstacle.

*There are 2 (or more) correct answers for this puzzle, can you find them?*



### Puzzle 5

Based on what you have learned in Puzzles 1 to 4 above, use this knowledge to come up with a puzzle for a friend your age in another class. Try it out to find out whether it works; ensure that your puzzle is solvable. Provide the answer as though you will act yourselves as the tutor.

### Turn Dash into a Security Guard

#### Puzzle 6

##### Part A

Your robot has a task. He is a soldier in a war zone and everyday and at all times he has to patrol a marked territory walking from end to another without stopping and without walking into the set boundaries marked by sacks.

Make Dash walk from one end to the other of the marked territory without bumping into the sacks.

Use cardboard boxes as sacks.

***There are over 4 correct answers, how many can you find?*** (Use your tablet to keep a record of your results and ask the tutors to check these).

##### Part B

After a month, the rebels lost some of their territory. This meant that Dash had less area to patrol and the sacks were brought closer. The new distance Dash walks from one side to another has decreased. Dash's task remained the same: the robot had to persist on a daily basis to patrol the boundaries and walk from one end to another.

**Think: a)** The distance has changed; does your programme from Part A to Part B change too?

b) The tutors will inform you of the different solutions obtained within the class; interpret this information and present it as a bar graph



## Grand Lottery

### Puzzle 7

Dash is able to generate random numbers. He finds himself at the Lottery Department and Dash is involved in the draw so that it is fair. His role is to generate 5 numbers to create a 5-digit number. This 5-digit number is the winning ticket and its owner is the winner of EUR 1,000,000!!

Get Dash to make this draw of five numbers; as a team you have to give the tutors your 5-digit number.

### Annex 2

**In a list share with us 3 top tips about collaboration and working with each other. The first tip must be the one which is most important to you.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**Write one more tip about collaboration and working with each other which you know from your personal experience. (If possible this should be a tip which hasn't been mentioned in today's session).**

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**Annex 3**

You were asked to find solutions to make Dash behave as a soldier and as a Lottery drawer. In arriving to these solutions you may have been successful or you may have failed (completely or partially) and we wish you to write about how this went by creating a diary post. Imagine you own a diary and you are going to share your feelings with it. Fill in the below as best as you can.

Dear Diary,

Today, at school, I was involved in workshops using Dash. This robot played two roles: being a soldier in a war zone and a Lottery Drawer at the Lottery Department.

I worked in a team. The most challenging moment in working as a team was \_\_\_\_\_  
\_\_\_\_\_

I learned from my team members that:  
\_\_\_\_\_  
\_\_\_\_\_

An idea I hesitated to share with my team was \_\_\_\_\_  
\_\_\_\_\_.

This idea could be useful:  
\_\_\_\_\_  
\_\_\_\_\_

I (succeeded/failed) \_\_\_\_\_  
to solve (one/both/none) \_\_\_\_\_ of these puzzles. \_\_\_\_\_  
\_\_\_\_\_ (Mention the names of the puzzles if any).

When I (failed/succeeded) to find an answer or answers I felt: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

As the friend with whom I share all my secrets, I wish to tell you that my feelings and attitude today following this workshop are:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



And, (write anything else which you wish to tell your diary):

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Thanks for taking care of my feelings and secrets,

Your dearest friend,

\_\_\_\_\_ (write your code number here)