

An Experience Report on the Effectiveness of Five Themed Workshops at Inspiring High School Students to Learn Coding

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Outline

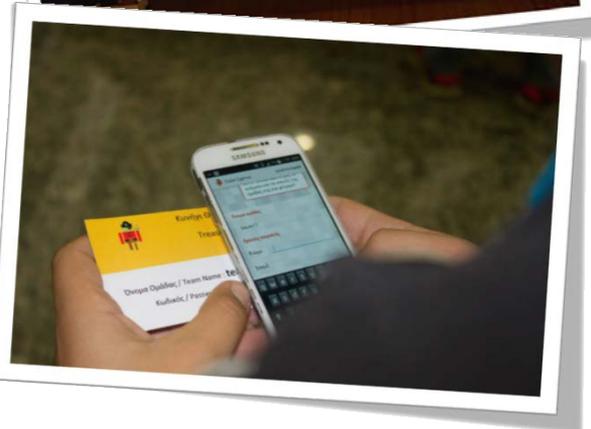
- Background and aim
- The five themed workshops
- Data collection & Questionnaire design
- Results & Lessons learned
- Conclusions

Background and aim

- Problem
 - Fewer students pick coding studies because of negative stereotypes
- A fun and educational event to
 - “Inspire teenagers in Cyprus to take an interest in coding”
- Kick-off funding
 - Cyprus Fulbright - Alumni Small Grants Scheme (2013)
- First Code Cyprus
 - First **Code Cyprus** on March 8th 2014
 - Since then, First Saturday of March every year

Approach

- A fun and educational event
- Plenary keynote on the “beauty and value of coding”
- Parallel hands-on workshops
 - More about these soon...
- Lunch
- Treasure hunt with prizes



Workshops

- Goal: Introduce three fundamental coding concepts
 - Variables, Conditionals, Loops
- Typically two hour-long
 - First part lecture/tutorial
 - Second part hands-on practical
- Workshops during data collection (March 2017):
 - *Beginners programming*
 - *Games challenge*
 - *Robotics challenge*
 - *Querying data with SQL*
 - *Programming microelectronics with Arduino*

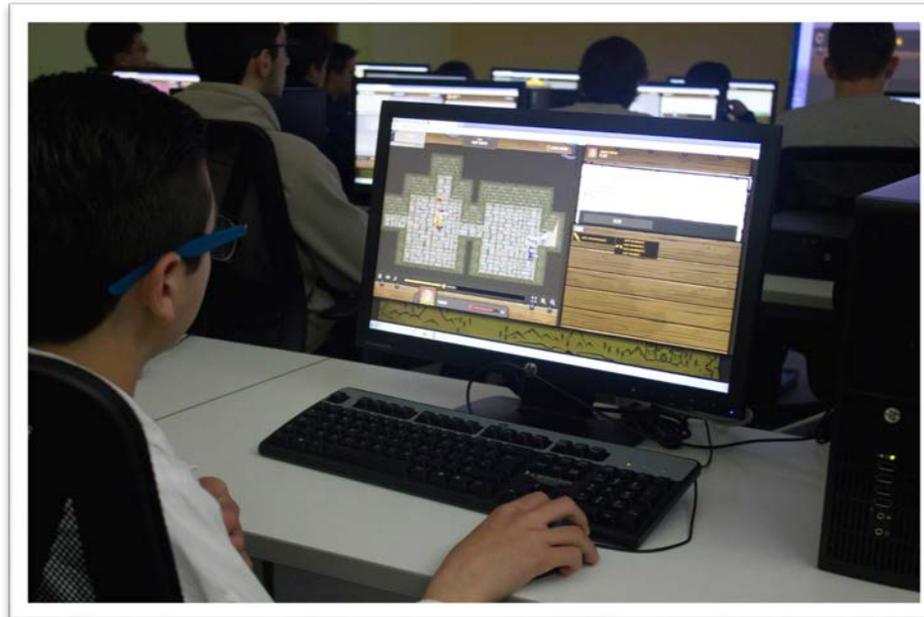
Workshop: Beginners programming

- Aimed at ‘newbies’
- Based on Python
- Designed to be interactive (i.e. use an online interpreter that presented the output immediately)



Workshop: Games challenge

- Aimed at 'intermediate' level participants
- Introduced concept of algorithms
 - Maze solving with left(or right)-wall-following algorithm
- Practical using Code Combat with Python



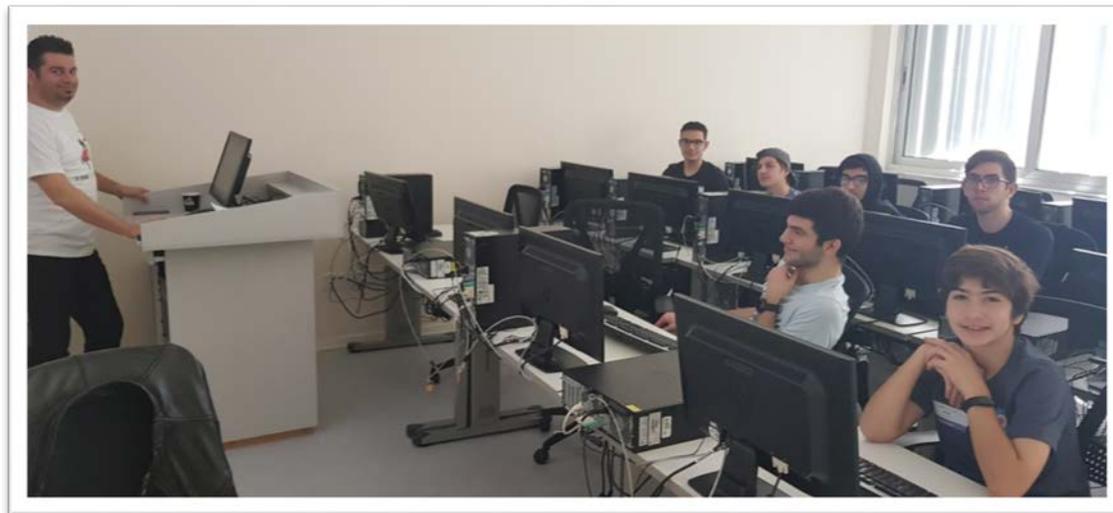
Workshop: Robotics challenge

- Aimed at ‘intermediate’ level participants
- Based on the Engino Robotic Platform (ERP)
- Practical included the programming of ERP to realize the ‘line following algorithm’



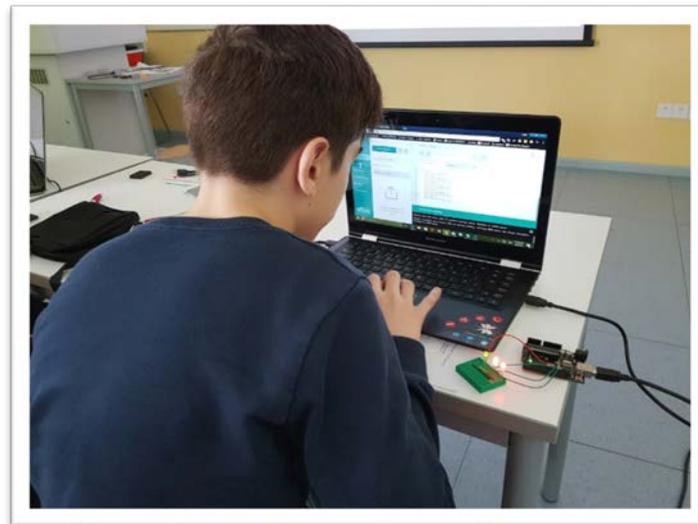
Workshop: Querying data with SQL

- Aimed at ‘advanced’ level participants
- Covered standard coding constructs (conditionals and loops) as well as SQL selection queries
- Practical using a custom-made interactive web application to form appropriate queries



Workshop: Programming micro-electronics with Arduino

- Aimed at 'advanced' level participants
- Using a standard Arduino micro circuit board
- Windows-based IDE and C++ based code
- Practical challenge was to develop a traffic lights prototype



Data collection

- Research question
 - “Are individual workshops/themes more *effective* in engaging participants to take an interest in coding?”
 - Effectiveness: understand more, appeal more
- Approach
 - Participants to fill in individual questionnaires during the workshops and compare the results
- Questionnaire consisted of 4 pages (parts A, B, C, D)
 - Parts A and B were filled before the workshop start
 - Parts C and D were filled after the workshop end

Questionnaire design

- Part A
 - Demographic data (age, gender) and self-assessment of math/programming skills
- Part B
 - Questions to identify participants' understanding of *variables*, *conditionals*, *loops* before the workshop
- Part C
 - Similar to Part B but aims to measure the participants' understanding after the workshop
- Part D
 - Self-assessment of their progress and personal impression on programming

Questionnaire design

- Part B excerpt

The completely anonymous questionnaire for students attending Code Cyprus 2017

Part B – What do you know

7. What do you think the following code will print? If you don't know programming yet, just try to answer anyway:

```
set anna to 8
set bill to 5
set z to anna + bill
print "Anna and Bill together have "
print z
print "euro "
```

Answer: _____

8. What do you think the following code will print? If you don't know programming yet, just try to answer anyway.

```
set Count to 1
repeat 4 times
do set Count to Count + 1
print Count
```

Answer: _____

9. What do you think the following code will print? If you don't know programming yet, just try to answer anyway.

```
set Temperature to 7
if Temperature < 15
do print "It's cold today "
else print "It's warm today "
```

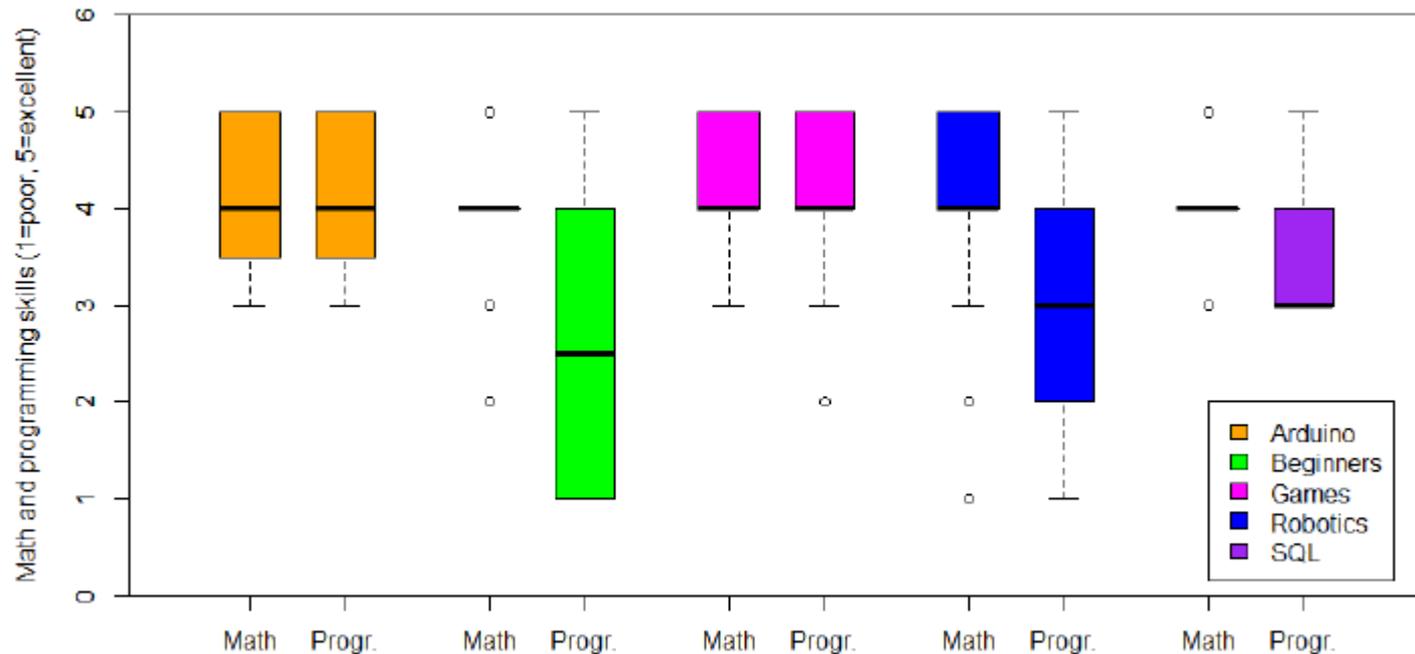
Answer: _____

Results & Lessons learned

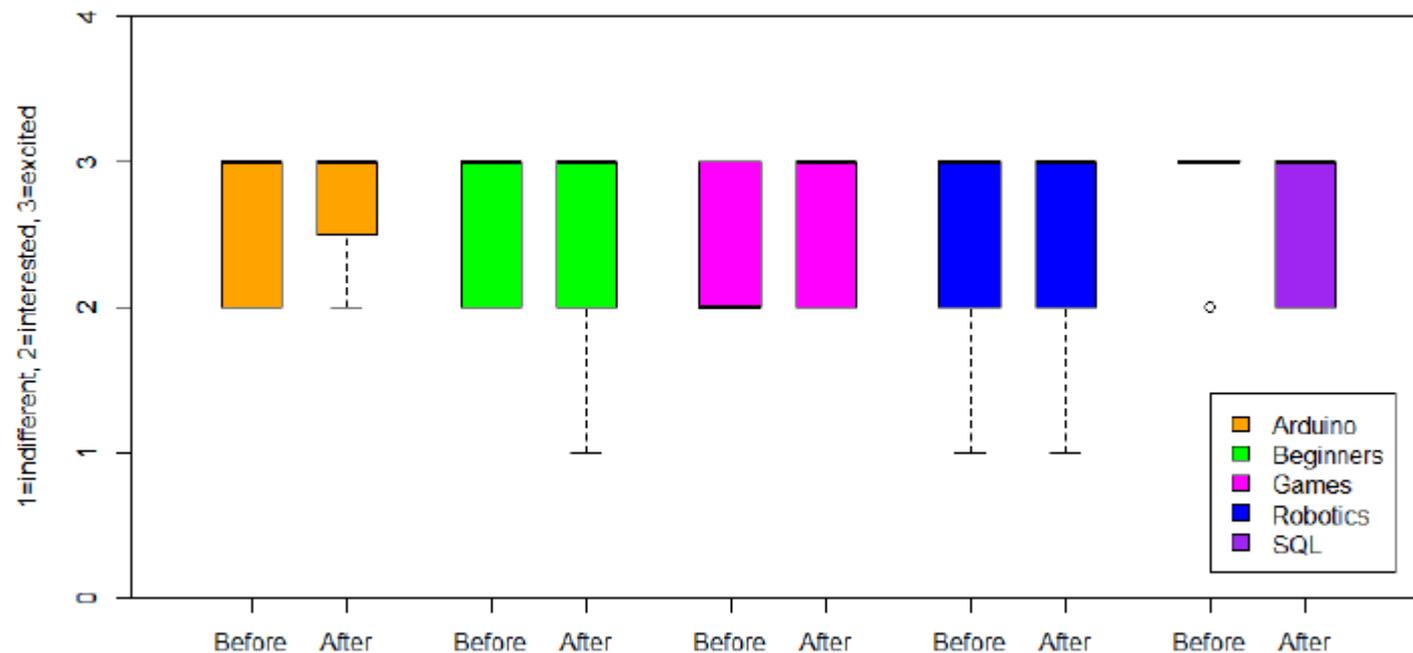
Table 1: Summary of participants - demographic data

Workshop	Ard.	Beg.	Gam.	Rob.	SQL	<i>Total</i>
Cohort	8	34	18	29	10	<i>99</i>
Gender						
Male	8	16	12	16	10	<i>62</i>
Female	0	18	5	13	0	<i>36</i>
Other	0	0	1	0	0	<i>1</i>
Age						
Min	14	10	11	12	15	<i>10</i>
Median	15	14	15	14	15	<i>14</i>
Max	17	16	18	18	21	<i>21</i>

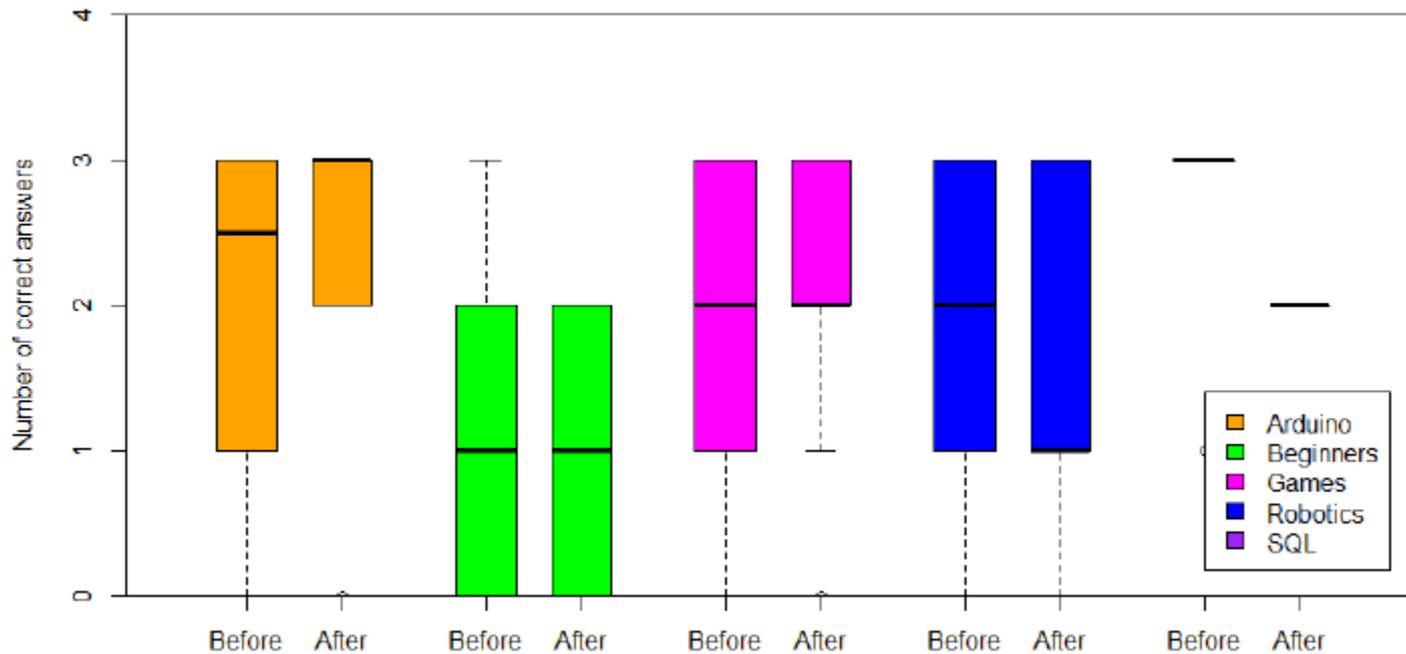
Participant self-rated math and coding skills, grouped by workshop



Participants' view of programming, grouped by workshop



Comparison of correct answers before and after the intervention, grouped by workshop



Conclusions

- Compared effectiveness of 5 themed workshops at “inspiring high school students to take an interest in coding”
 - Verified ‘gender gap’ engaging young persons to learn coding
 - Confirmed the value of ‘themed activities’, like the use of robotics
 - Identified challenge of attracting the ‘right audience’
- You might also want to look at:
 - Code Cyprus page, <http://about.codecyprus.org>
 - Treasure hunt app, <https://github.com/NPaspallis/CodeCyprusApp>
 - Backend, <https://github.com/nearchos/uclan-thc>

Questions?

- Thank you!