Comparison of the learning curve and adaptive behavior from kids to adults using computational thinking with Block-Programming to Technology Enhanced Learning

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CTIC

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Introduction

Motivation

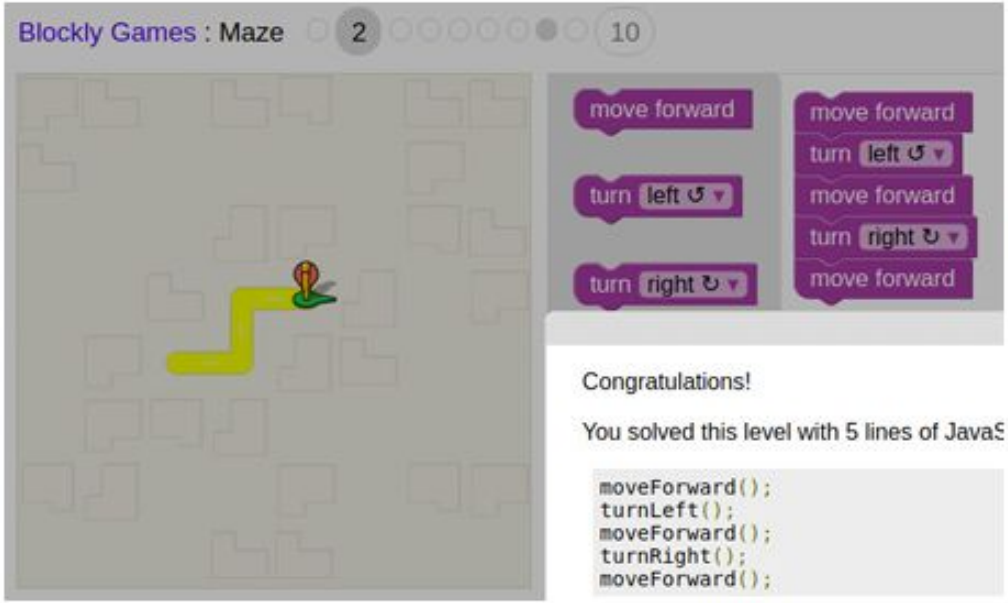
Enhance the speed learning using block programming and websites

Context

We identify the necessity of implement a program to easy use and fast learning for kids and adults

Methodology

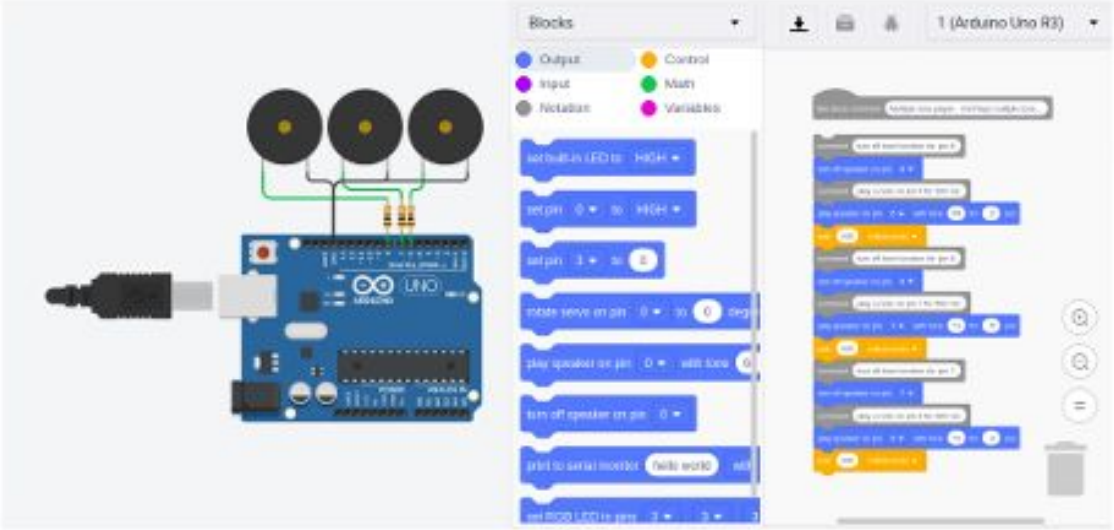
Block Programing



Code Combat


MAPA
EL SEGUNDO LABERINTO DE KITH
MENÚ DEL JUEGO
moveRight
THARIN
120
HINTS
REINICIAR
CORRER
HECHO

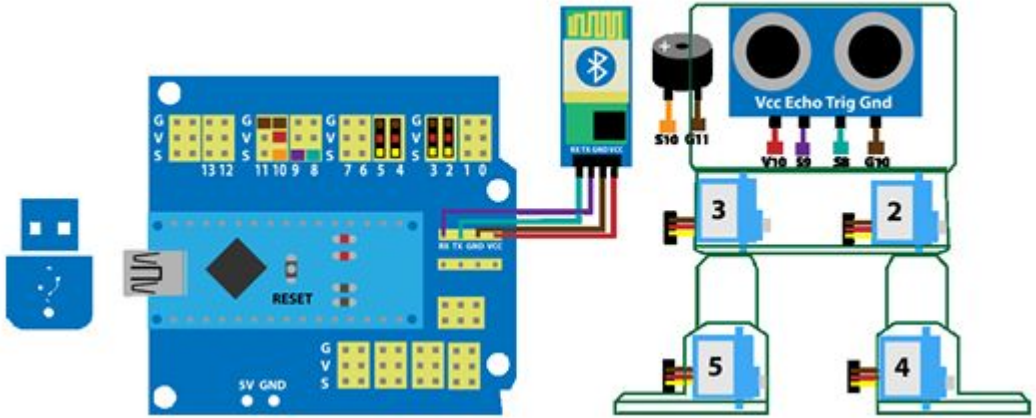
Block vs Code Programming

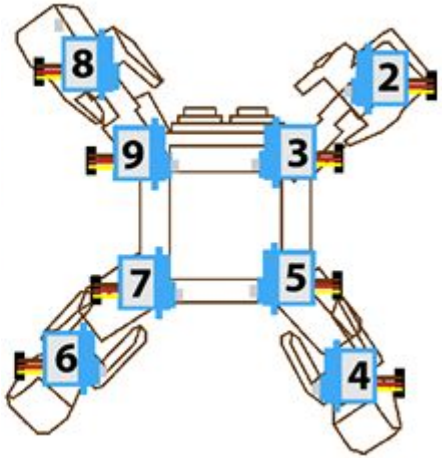


Text | 1 (Arduino Uno R3)

```
*/

int pos = 0;

void setup()
{
  pinMode(8, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(7, OUTPUT);
}

void loop()
{
  // turn off tone function for pin 8:
  noTone(8);
  // play a note on pin 6 for 200 ms:
  tone(6, 880, 200); // play tone 69 (A5 = 880 Hz)
  delay(200); // Wait for 200 millisecond(s)
  // turn off tone function for pin 6:
  noTone(6);
  // play a note on pin 7 for 500 ms:
  tone(7, 988, 500); // play tone 71 (B5 = 988 Hz)
  delay(500); // Wait for 500 millisecond(s)
  // turn off tone function for pin 7:
  noTone(7);
  // play a note on pin 8 for 300 ms:
  tone(8, 1047, 300); // play tone 72 (C6 = 1047 Hz)
  delay(300); // Wait for 300 millisecond(s)
}
```

Kyo vs Otto





Experimental results

Solution Proposal Average Time

TABLE I

TABLE OF AVERAGE TIME TO THINK ABOUT THE SITUATION AND SOLVE.

Category	Situations	time thinking range
Kids	How to go to the bathroom	18-34 min
Tween	How turn on a computer	17-25 min
Teen	How to use pythagoras theorem	15-20 min
Adults	how to develop a software project	10-15 min

Loop problem Average Time

TABLE II

TABLE OF AVERAGE TIME TO DESCRIBE AND SOLVE THE LOOP PROBLEM.

Category	time thinking the problem	time to solve the problem
Kids	20-30 min	20-30 min
Tween	14-21 min	15-20 min
Teen	11-16 min	10-15 min
Adults	6-12 min	9-17 min

Mini-Robot Average Time

TABLE III
TABLE OF AVERAGE TIME TO DESCRIBE THE MINI ROBOT IMPLEMENTATION.

Category	Time to describe the problem	Average Time to Solution
Kids	14-20 min	15 min
Tween	8-15 min	11 min
Teen	5-9 min	8 min
Adults	9-12 min	13.5 min

Describe Problem Average Time

TABLE IV
TABLE OF AVERAGE TIME TO DESCRIBE AND SOLVE.

How many time takes to learn a new concept with examples?			
Category	Real Time	Calculate time	Previous works Time
Kids	55-65 min	66.486 min	68.64 min
Tween	52-56 min	57.365 min	56.49 min
Teen	42-52 min	50.934	51.32 min
Adults	25-41 min	42.163	40.89 min

Preference about Computer Science

TABLE V
TABLE OF PREFERENCES FOR COMPUTER SCIENCE

What do you thing about computer science?		
Category	Before	After
Kids	Don't know what it is	Want play with robots in schools
Tween	Just movies	Want to design and learn programming in schools
Teen	Just for game develop	Want to study informatic or game develop
Adults	Just Excel and Word	Want to develop informatic projects Using new software tools

Best Methodology

TABLE VI
TABLE OF BEST METHODOLOGY PER AGE.

Which is the best methodology per age?			
Category	Age range	methodology	Occupation
Kids	6-9	mind maps	primary school
Tween	10-12	script language	primary-secondary school
Teen	13-17	metaphors	secondary school
Adults	18 and so on	real life examples	academies, institutes universities, workers

Code vs Block Preference

TABLE VII
TABLE OF PREFERENCES BETWEEN CODE VS BLOCKS.

Which do you prefer between code/blocks and Otto/Kyo robot?				
Category	Preference %	Type	Preference %	robot
Kids	92 %	Blocks	87%	Otto
Tween	50 %	Blocks/Code	60%	Otto
Teen	76 %	Code	55%	Kyo
Adults	80 %	Code	100%	Kyo

Conclusions

Conclusions

- This work introduces the different adaptive behavior with different methodologies in the learning speed of students divided in 100 kids, 100 tweens, 100 teens, and 100 adults.

- We note that tweens and teens have more ability to understand new concepts using games as metaphors.

- We note that Adults have a strong learning speed to understand new concepts based on past experience.

- From kids to juniors, they present a fast learning speed, but they forget concepts in a little period of time.

THANKS!

Any Questions?