A comparison of the adaptive behavior from kids to adults to learn Block programming *

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Abstract. Block programming presents an interactive and very simple way to learn to program, today block programming applications allow you to develop and program the electronic hardware components such as sensors and motors, whose relationship between hardware, software and mobile applications are fundamental in this technological age. In this article we present a study on how much the speed of learning differs and how much information retention capacity children, adolescents and adults have in the same conditions of learning, environment, tools and teaching system with the topic of creating robots through simulation of electronic circuits. In addition, the manipulation of electronic components such as sensors, motors and bluetooth is presented.

Keywords: Learning · Education · Robotics · Kids · Teenagers · Adults · Programing languages · Computer games · Hardware Simulator · Electronic components · Block programming · Bluetooth · Sensors · Motors

1 Introduction

In the context of Peru, the education methodology is not enough to a complete a certain level of knowledge. Our target study subjects are people between the ages of 9 and 45, because is the 57.232% of the total population (information was collected from [1]).

Kids (6-9 years old) have more easily way to learn and play with new tools [9], Teens (10-12 years old) and Juniors (13-17 years old) have the same capacity to learn, but they have another distractions that causes a little reduction in the learning curve for new things [10].

Adults (from 18 years old and on) have a different way to learn things about technology, some of them have experience working with computers but others do not use computers in daily life.

We have approximately 100 children, 100 teens, 100 junior and 100 adults, each group is divided into a group of 25 people with the same curriculum, the same materials, the same teachers and the same 16 lessons (each lasts 3 hours a day).

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2 Methodology

We started the classes with the empirical methodology based on Metaphors [3] because or students are novices in programing skills [5]. That means, we teach using example of different simple situations in the real life to explain what can we do to interact and which solutions we provide to solve daily problems.

Once finished this lesson and verify times (See Table 2 for times), we introduced the algorithm, programing language and block programming concept.

2.1 Learning Computer Science concepts

To introduce computer science concepts, we explain what is an algorithm based on common things like how to buy a soda or how to turn on a computer.

To explain block programing, programing language (Javascript) and algorithm concept, we use Blockly Game platform [7], E.g. guide an astronaut to the goal through a labyrinth (See Figure 1(a) and see Table 3 for times).

Table 1: Table of time average

Situations	time thinking
How to wash their hands	15-20 min
How to build a house	10-15 min
How to download games	10-15 min
How to develop a program	20-25 min

Table 2: Table of situations, they are different and depends of the age.

Category	Average time
Kids	50-55 min
Tween	45-52 min
Teen	30-41 min
Adults	25-37 min

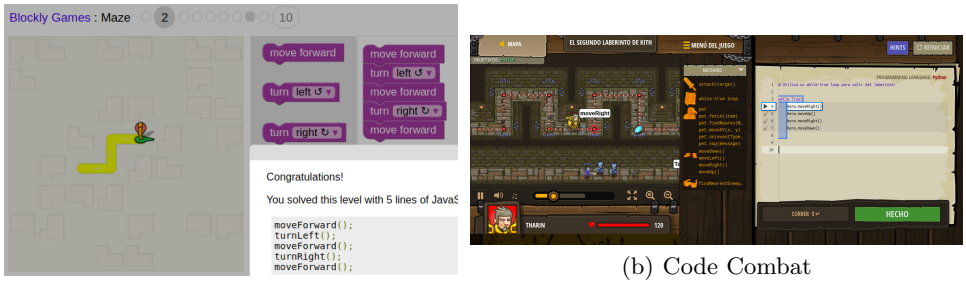
Table 3: Table of average range of time to explain, thinking and solve the Maze problem.

2.2 Improving Programming Skills

To introduce programming skills, we explain the codes generate by Blockly games and what impact have in the computer. Now, its time to improve the programming skills with CodeCombat [8] with python language to solve a Loop problem.

CodeCombat as Blockly games, uses methods to give direction to simulate movement of the character inside the maze level (See Figure 1(b) and see Table 5).

Programming code was more easy than blocks. That is because they use mind map technique [2]. With that knowledge students can apply in other situations or problems.



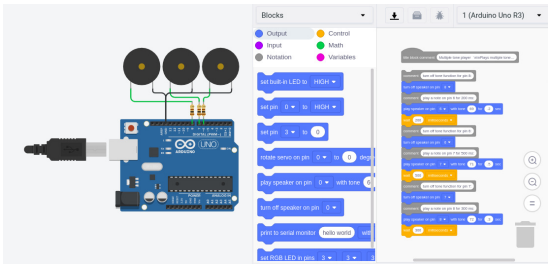
(a) Blockly Games

(b) Code Combat

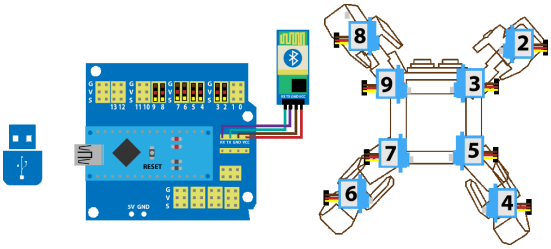
Fig. 1: Programing kyo with TinkerCad.

2.3 Implementing a robot with electronic components

To introduce how to manipulate electronic components and how to program it, we use TinkerCad [6] to simulate connections of sensors like buzzer, proximity or other components like bluetooth, leds and resistance with an Arduino board. TinkerCad also allow to program it with blocks (See Figure 2(a)) and the last part is the implement of Kyo and how time it take (See Figure 2(b)).



(a) Blocks Code



(b) Kyo Design

Fig. 2: Programing kyo with TinkerCad.

Table 4: Table of time average

Category	Time
Kids	20-25 min
Tween	11-19 min
Teen	12-16 min
Adults	10-15 min

Table 5: Table of average range of time to solve the loop problem of Maze.

Table 6: Table of average range of time to solve the tinkercad circuit.

Category	Time
Kids	14-20 min
Tween	8-15 min
Teen	5-9 min
Adults	9-12 min

Category	Time
Kids	54-80 min
Tween	48-55 min
Teen	42-49 min
Adults	30-36 min

Table 7: Table of average range of time to connect and program Kyo Robot.

3 Conclusions

This work introduces the different adaptive behavior with different methodologies in the learning speed of kids, tweens, teens and adults. We note that tweens and teens have more ability to understand new concepts with new tools using games as metaphors. For adults, games are not for them, but if we explain theory, they understand better.

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.

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