

# HSCI2020

**Viana do Castelo**  
Portugal  
13-17 July 2020



# MAKER EDUCATION

**DuinoGraph Platform  
applied to a Track with Sensors  
in the Mousetrap Car Project**







# OUR SCHOOL

RIO DE JANEIRO - BRAZIL



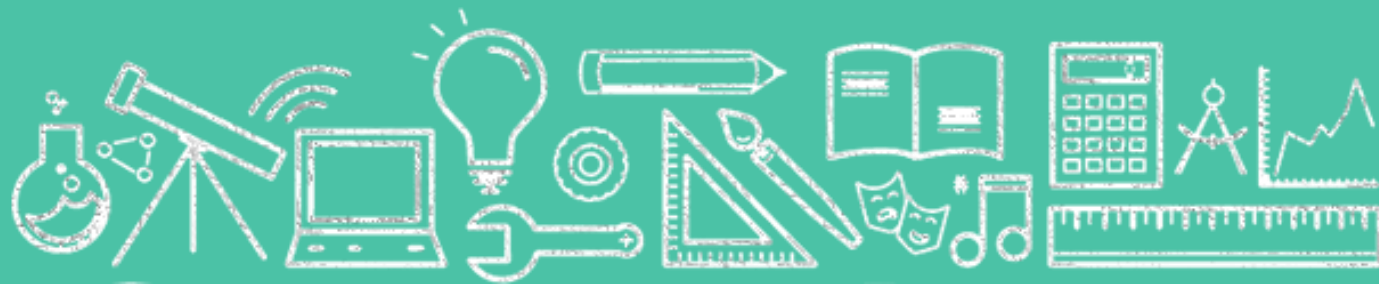
ESCOLA SESC  
DE ENSINO MÉDIO

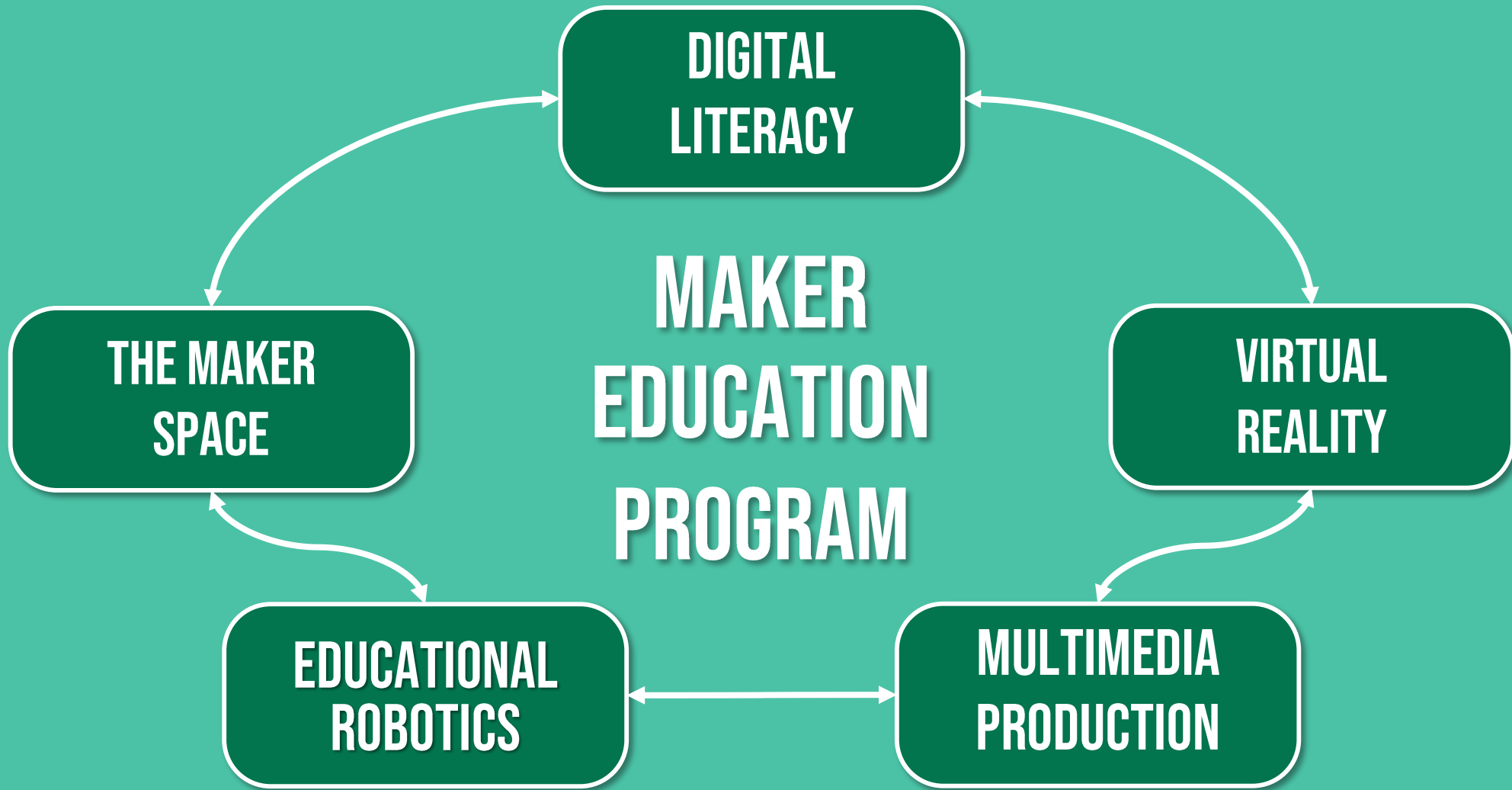


## **Our Mission:**

To educate young Brazilians for intellectual autonomy, creativity and social commitment.

# SESC HIGH SCHOOL MAKER EDUCATION PROGRAM





# MAKER EDUCATION BENEFITS



# MAKER EDUCATION

- Presents new approaches to the challenges in the “teaching-learning process” of exact science;
- Offers a potential way to motivate and involve students in the study of Mathematics and Sciences concepts;
- Enables a multidisciplinary experience and creates new ways of interacting with the environment.



ROBOTICS LAB



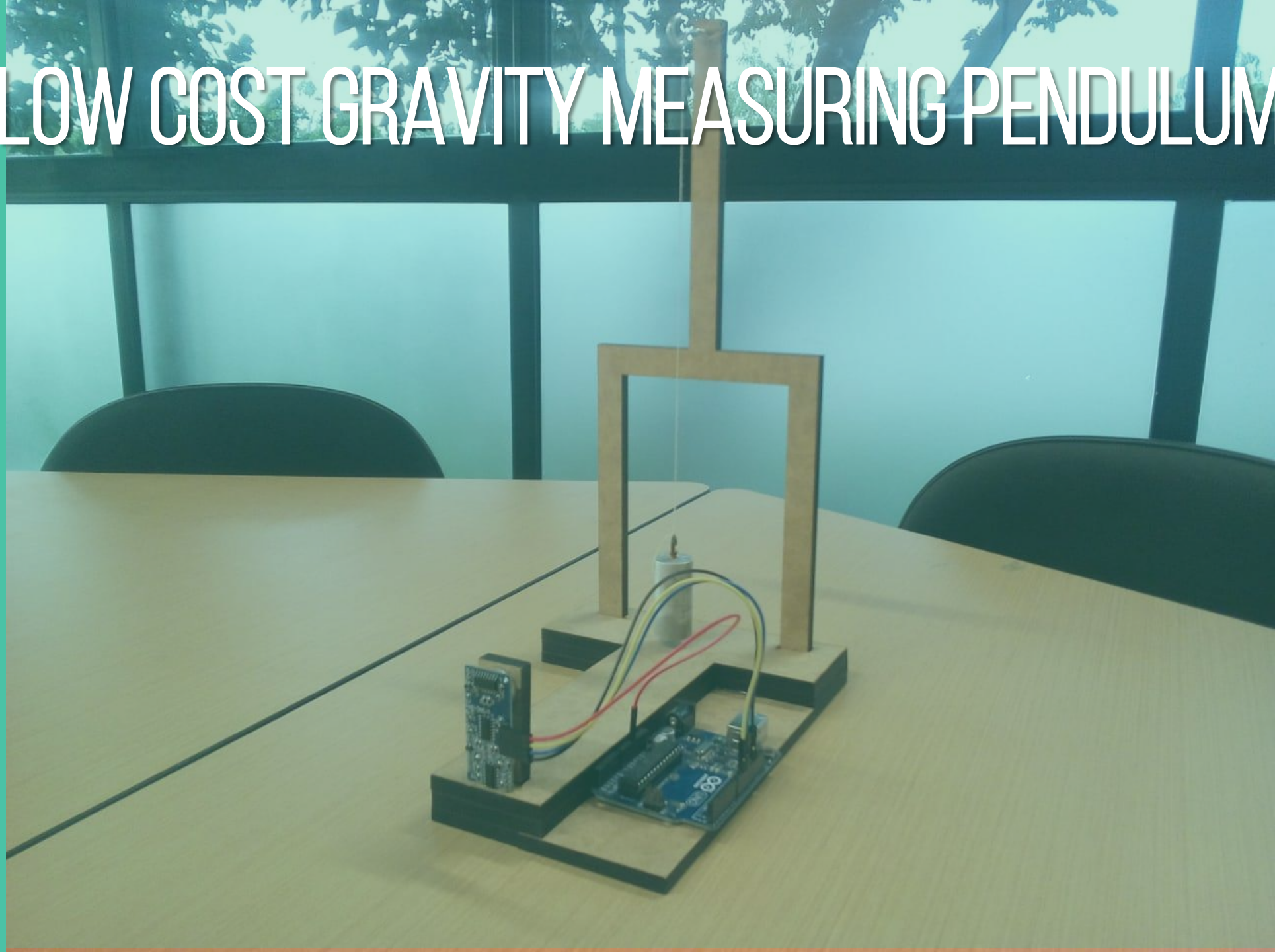
MAKER SPACE

ONE OF OURS INITIATIVES  
IS THE DEVELOPMENT  
OF LEARNING OBJECTS  
IN PARTNERSHIP WITH OUR STUDENTS



# LOW COST GRAVITY MEASURING PENDULUM

FOR EXAMPLE

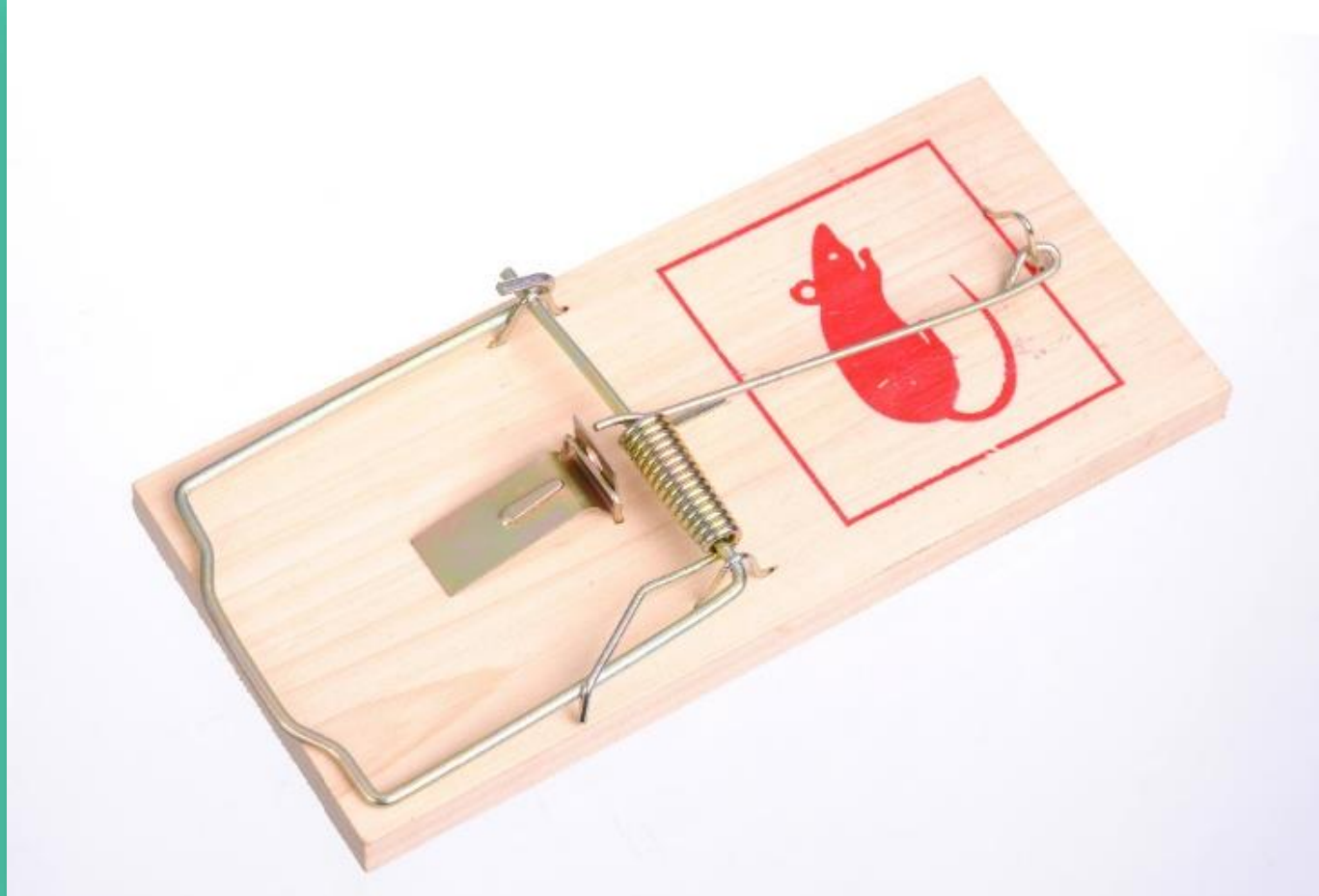




DUINOGRAPH PLATFORM APPLIED TO  
A TRACK WITH SENSORS  
IN A MOUSETRAP CAR PROJECT.

WHAT DOES IT MEAN ?

# MOUSETRAP CAR PROTOTYPE



US\$ 2,00



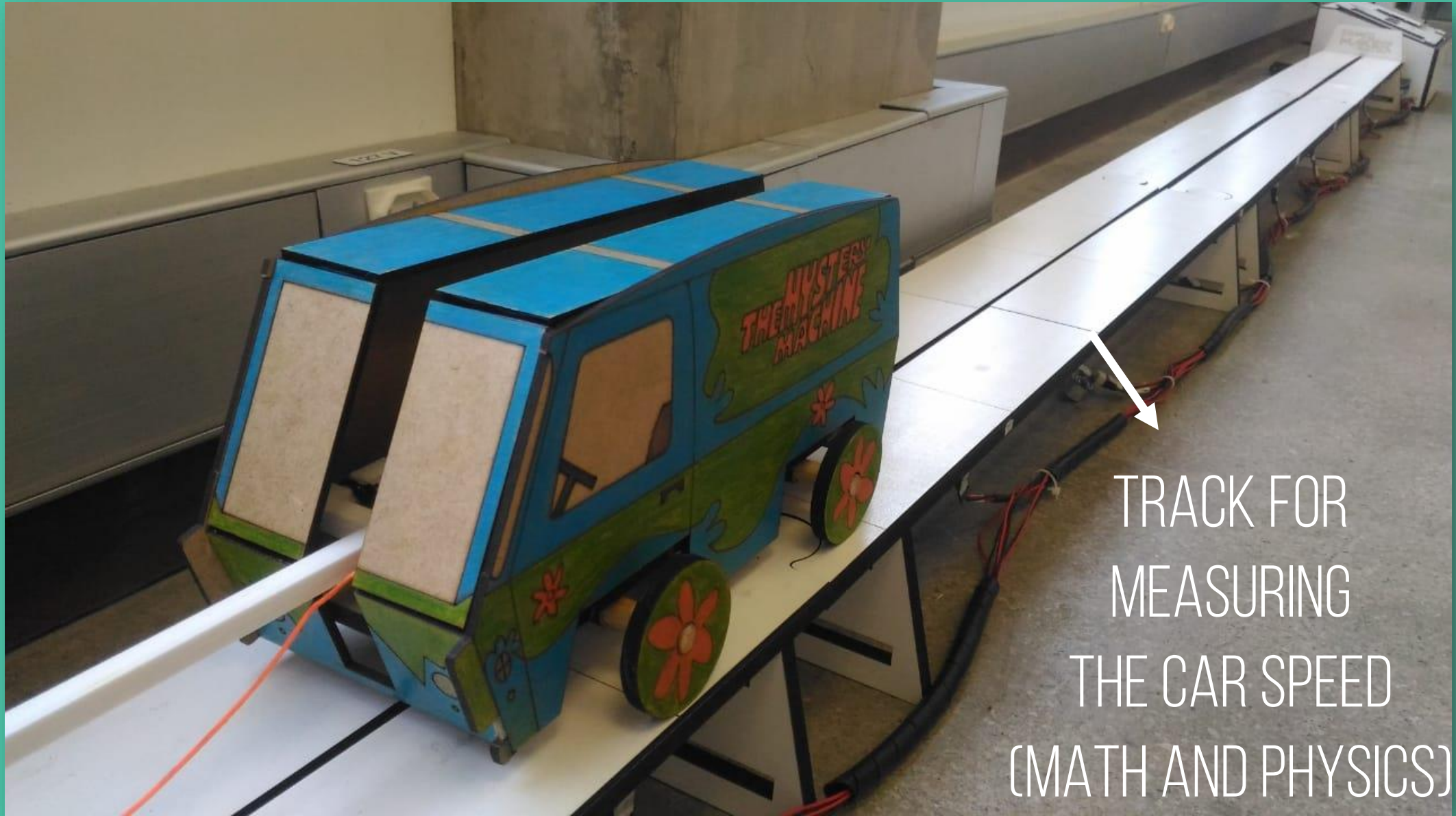
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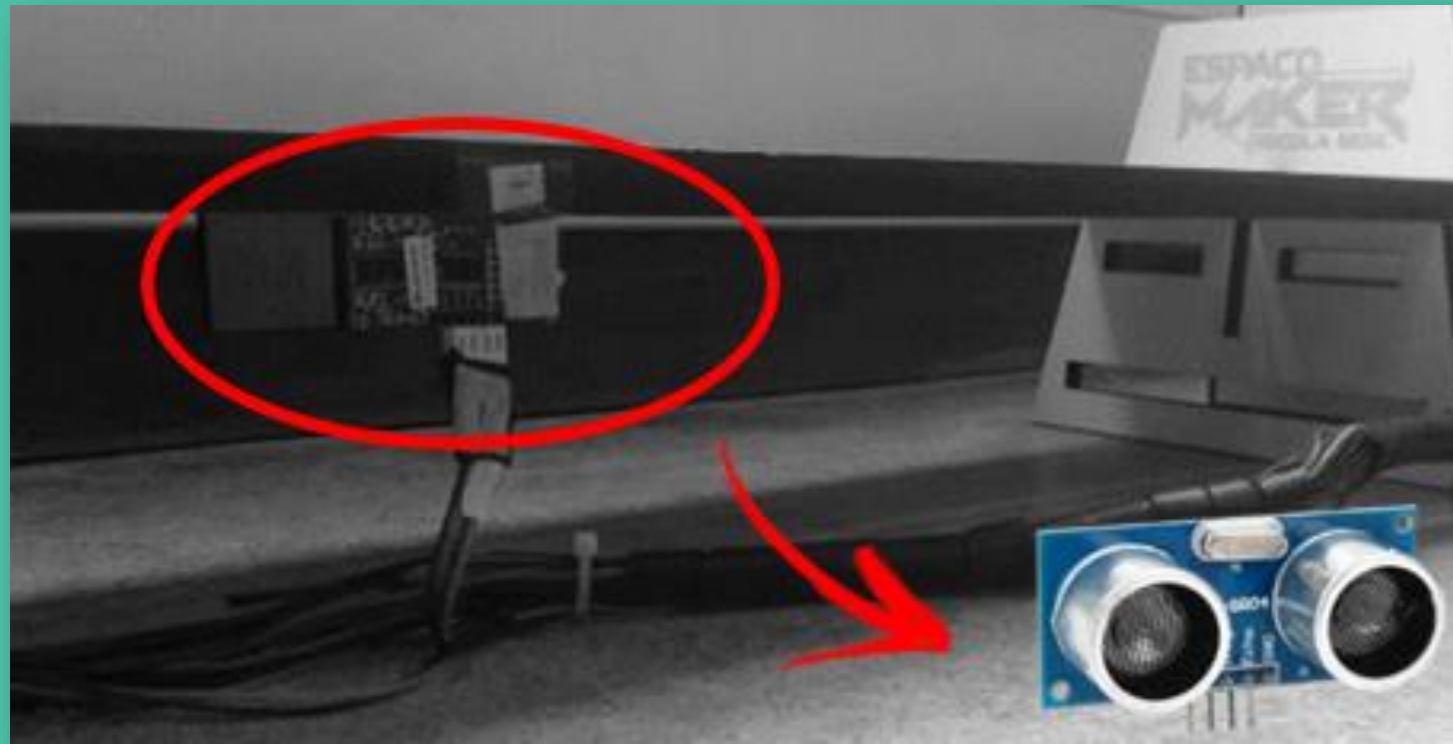
# Video



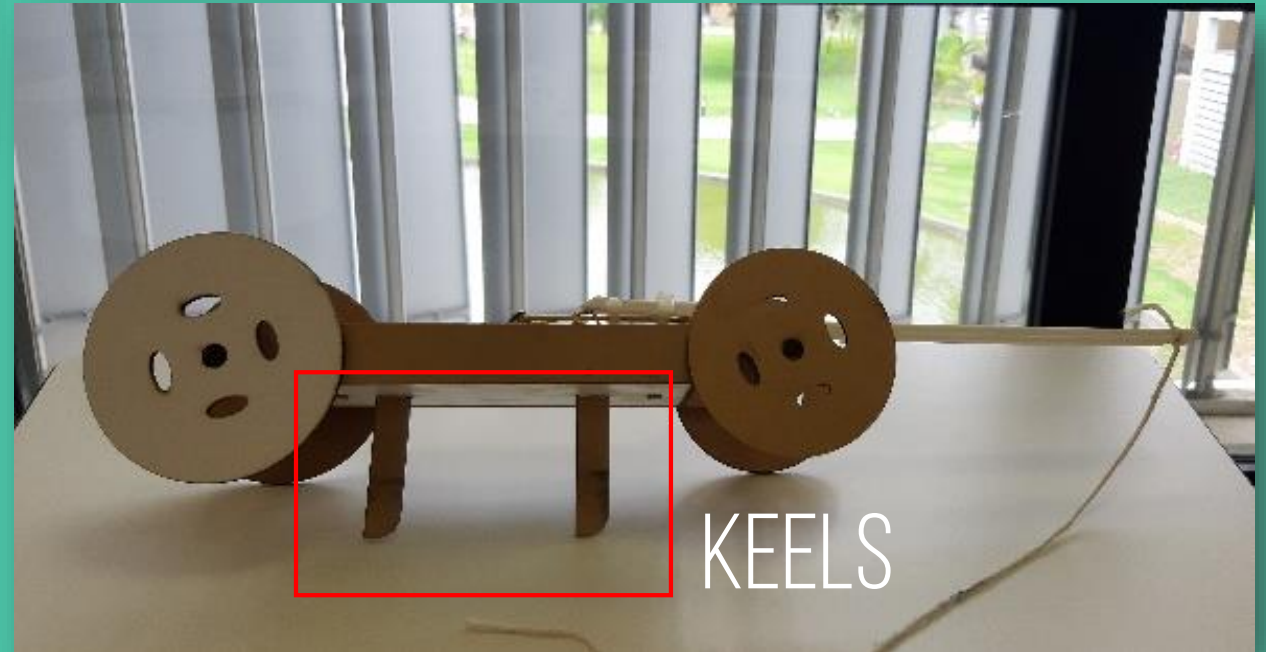
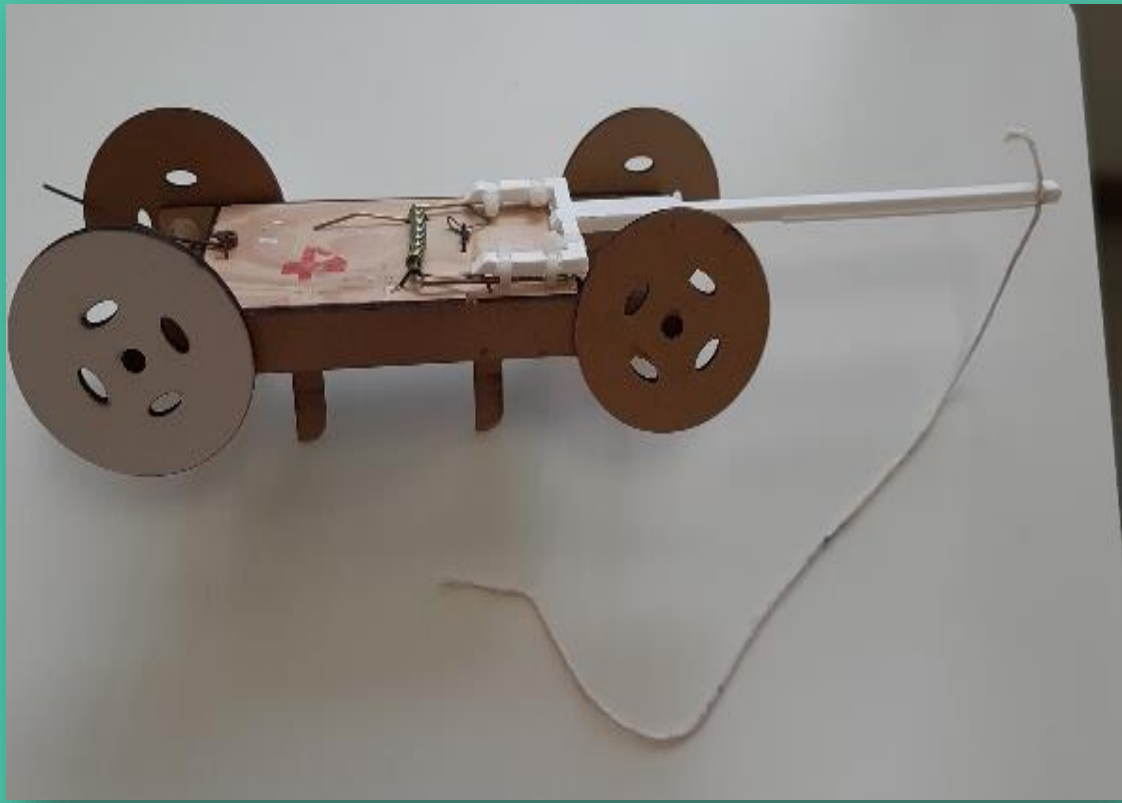
# THE TRACK WITH SENSORS

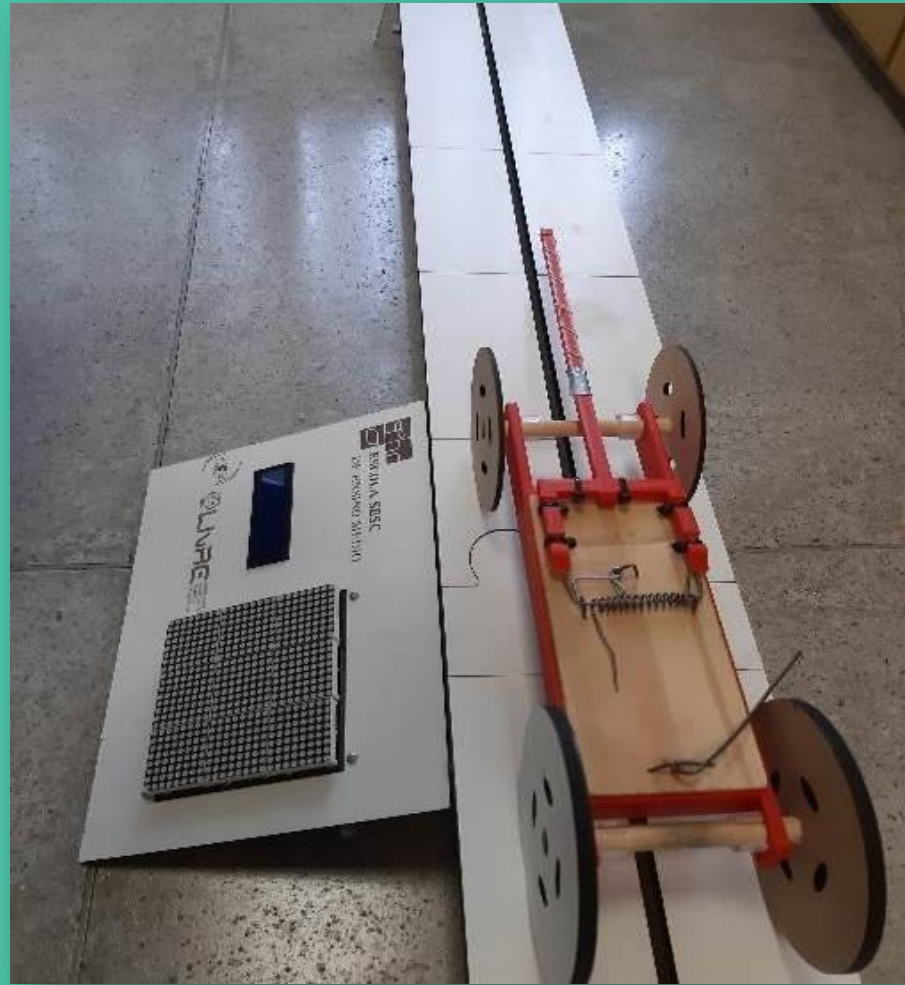


TRACK FOR  
MEASURING  
THE CAR SPEED  
(MATH AND PHYSICS)



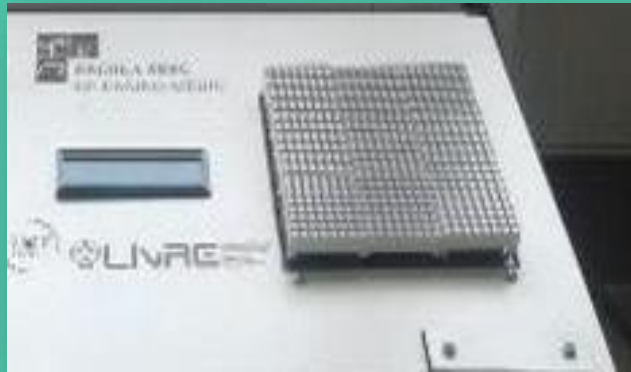






Track with longitudinal section

WHAT IS A DUINOGRAPH?

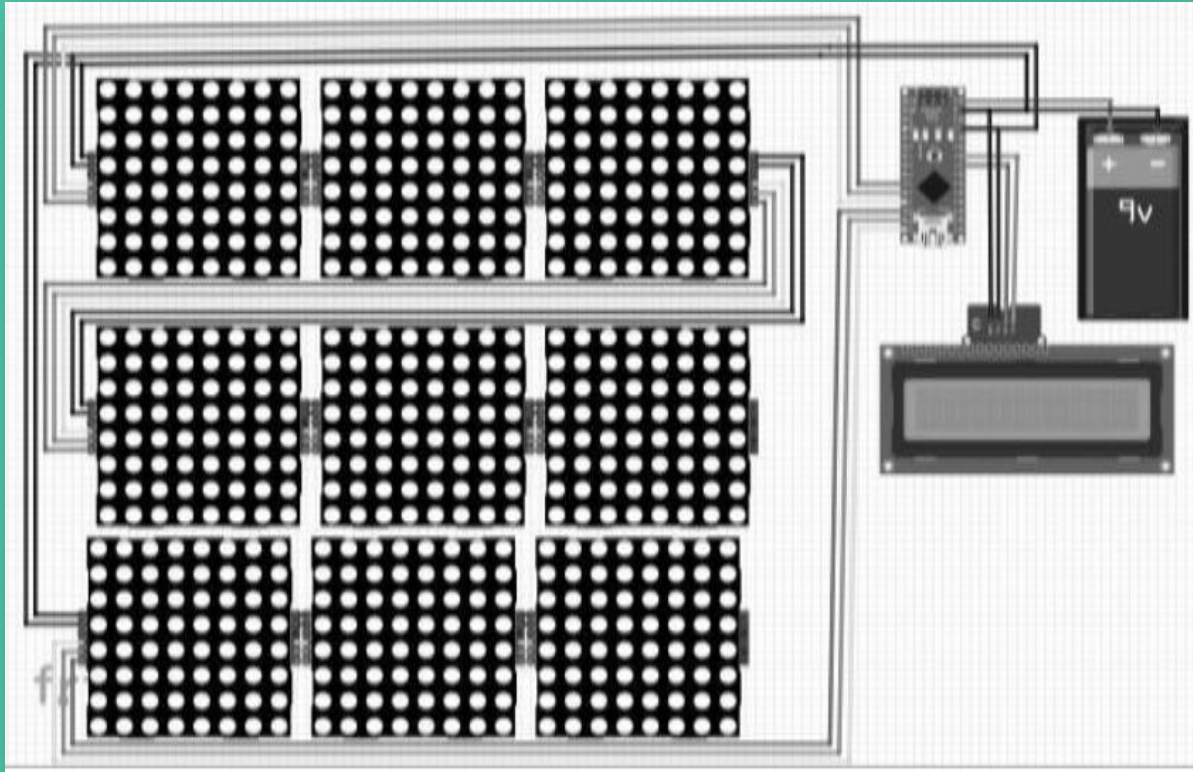


- It's a set of Matrix modules where different kinds of graphs can be plotted.





# DUINOGRAPH STRUCTURE



### Hardware:

- 9 (Nine) 8x8 LED Matrix modules;
- A 16x2 LCD;
- An Arduino Nano;
- Some wires.

### Code:

- They created a library of routines which promotes an interface between DuinoGraph components and the user.

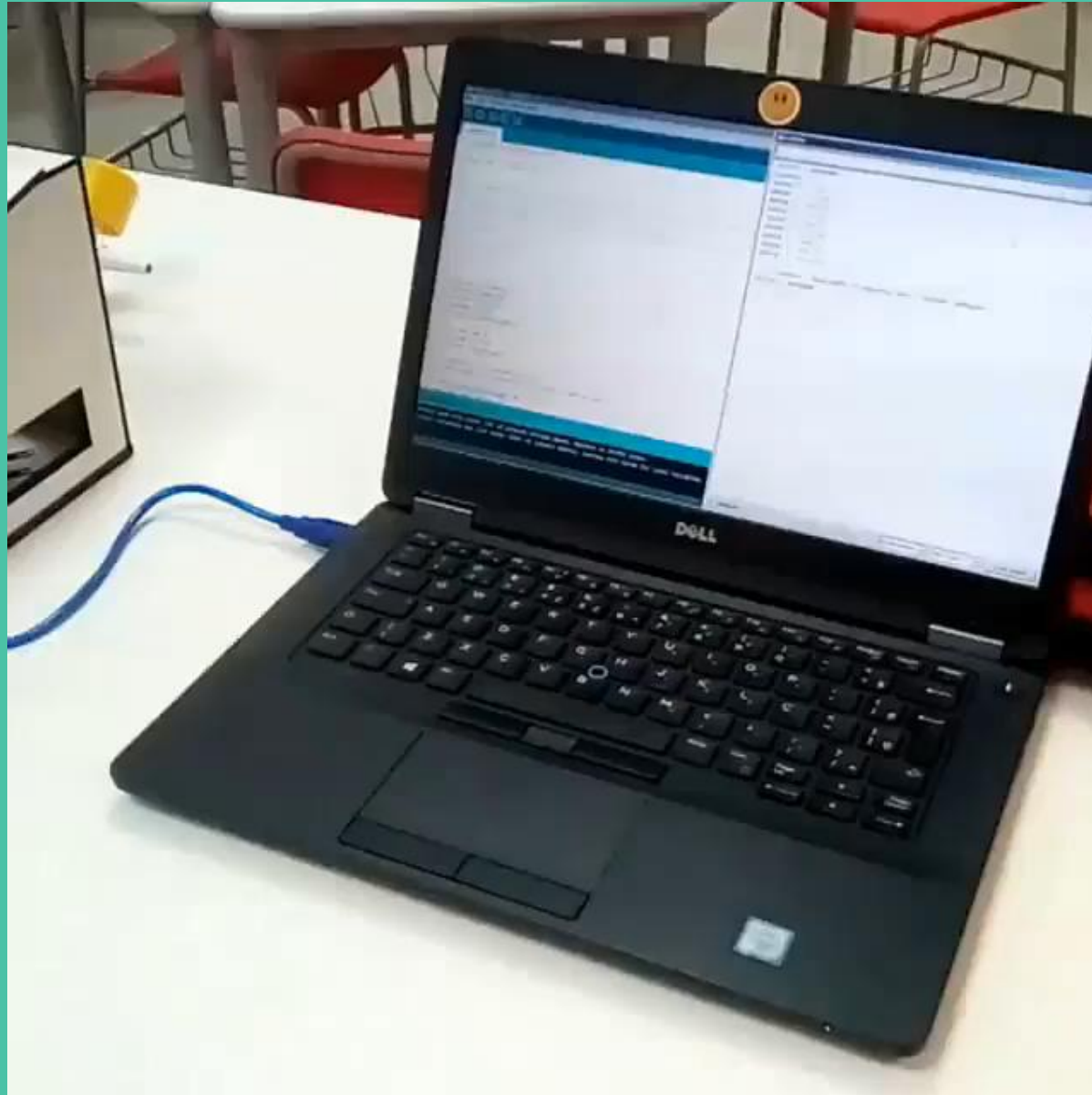
# DUINOGRAPH - APPLICATIONS

The authors developed five possibilities of themes that can be explored with the DuinoGraph environment:

- Graphics of mathematical functions,
- Drawing and animation,
- Logo language (simplified or working with angles),
- 2D cellular automata and
- Manipulation of vectors and matrices.



# Video



CASE STUDY

HANDS-ON WORKSHOP

# STUDENTS ACTIVITIES

# THE STUDENTS SHOULD FOLLOW 4 STEPS

1- ORGANIZE A TEAM;

2- CREATIVELY DESIGN AND BUILD A MOUSETRAP CAR;

3- TEST THE MOUSETRAP CAR IN THE TRACK AND ANALYZE THE RESULTS;

4- IMPROVE THE PROJECT, IF NECESSARY.

# ASSESSMENT OF LEARNING

## 1- CREATIVITY

Did the project implement different elements?

## 2- DESIGN

Are the relationships between wheel sizes and main stem consistent?

Was the proposed model properly executed in the CAD software?

## 3- FEASIBILITY

Is the proposed prototype feasible?

Did the car travel the track effectively?



# THE WORKSHOP



# THE WORKSHOP



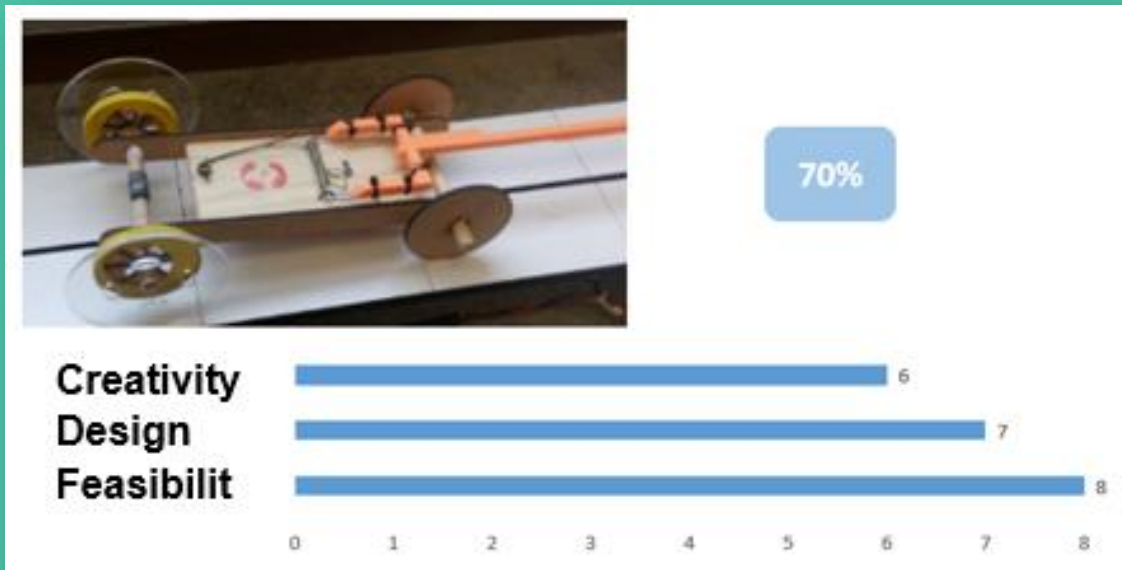
# THE WORKSHOP



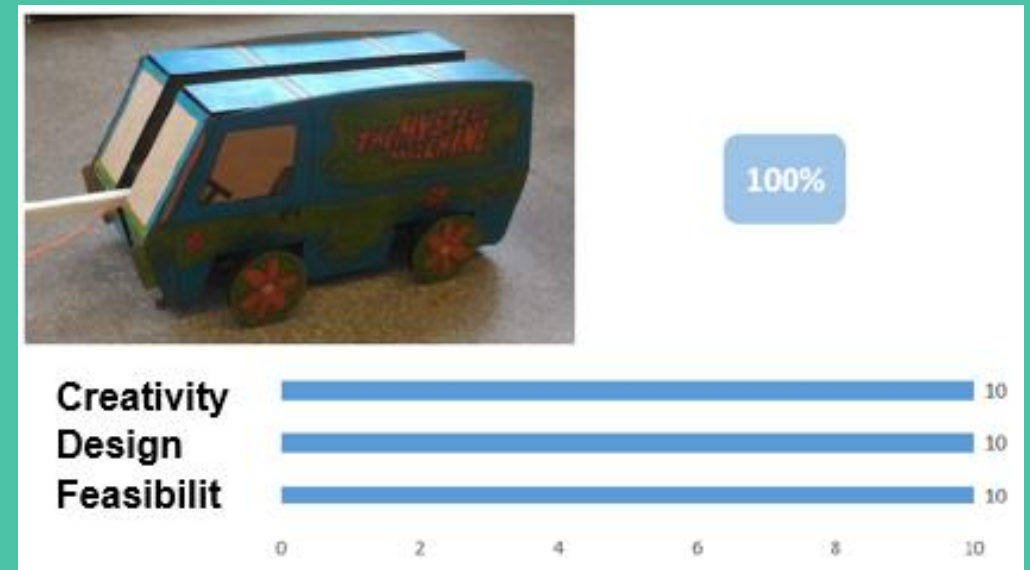
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SENSOR 1	596.00
SENSOR 2	1087.00
SENSOR 3	1480.00
SENSOR 4	1863.00
SENSOR 5	2214.00
SENSOR 6	2575.00
SENSOR 7	2936.00
SENSOR 8	3384.00

# LEARNING DEVELOPMENT

## TWO SAMPLE PROJECTS



Project 1 – Mouse Car



Project 2 – Mystery Machine Mousetrap

# MAIN RESULTS



1- STUDENTS MORE ENGAGED IN THEIR PROJECTS;

2- A MORE EFFICIENT WAY TO ANALYZE RESULTS;

3- MATHS AND PHYSICS CONCEPTS BEING DEVELOPED TOGETHER.

MORE THAN A MAKER CLASS

FOSTERS A CRITICAL AND AUTONOMOUS  
ATTITUDE WITHIN YOUNG LEARNERS



*Jayne (Acre) and Vitória (Ceará)*

*“In the beginning, the process was a little complicated, but the key to succeed was to not give up.*

*We were always looking for something new and different from what we were seeing around us”.*

*Vitória - Ceará*



“HANDS-ON LEARNING IS MORE INTERESTING AND  
SIGNIFICANT”

(PEREIRA AND SCHUHMACHER, 2013).

OBRIGADO

THANK YOU

GRACIAS

MERCI

GRAZIE

DANKE

谢谢

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# QUESTIONS ?

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DE ENSINO MÉDIO

