SSC20-WP1-25 Introduction of space projects in public elementary school at Mogi das Cruzes, Brazil

Sandro Shoiti Sato
sandrosato@se-pmmc.com.br

Débora Soares Alves Teixeira
deborateixeira@se-pmmc.com.br

Vanessa Rodrigues Barreto Aguilar
vanessaaguilar@se-pmmc.com.br

Lidia Hissae Shibuya Sato
shibuya@ita.br

INTRODUCTION

In 2014 efforts on teaching robotics for children at public elementary school started in the city of Mogi das Cruzes, São Paulo (Brasil). With this initiative, students of some elementary school were presented to technology and science and this work shows some of the results in two of these schools.

This work aims to show the positive impacts of involving children and teenagers in topics involving Science, Technology, Engineering and Mathematics (STEM) and having as a background the applicability of their projects in space projects.

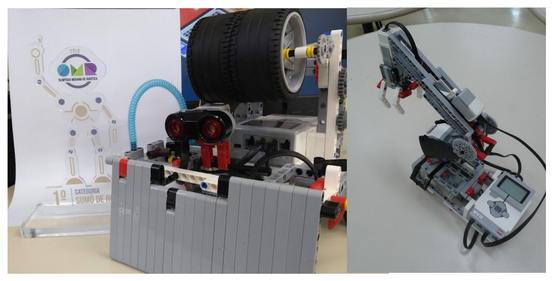
2015 Classroom at Jair Rocha Batalha, the first group

2015 - 1st Municipal Robotics Fair

THE START

In 2015 at Jair Rocha Batalha Elementary school, that attends children from 6 to 11 years old, robotics were applied as an optional course at the school and students were grouped and incentivated to develop small rovers to play sumo with robots. With this classes students were incentivated to work with prototipes, programing language and engineering concepts. Also they were introduced to work in groups, learning to think in a “system way”.

2017 - 1st Robotics Olimpic (*Olimpíada Mogiana de Robótica*)



2018 Winner robot and a Robotic arm example

PROTOTYPES & COMPETITIONS

At Jair Rocha Batallha students were incentivized to present in local science fair the results of their projects and also to take part of local competition. The competition purpose was to develop a sumo robot with a defined dimension and mass and with autonomy. In 2017 the students from the school won the first and second prize in the Municipal Robotics Olimpic.

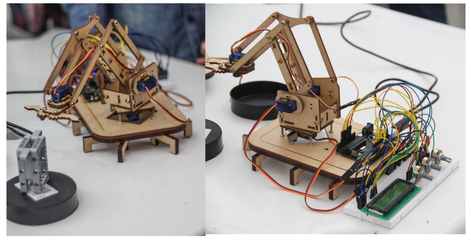
2016 - 2nd Municipal Robotics Fair

STEAM AND TEENAGERS

In 2018 at CEMPRE Benedito Ferreira Lopes, that attends teenagers from 11 to 15 years old, students were presented to robotics and programming courses, as part of their regular grade.

Students were challenged to develop projects in a project based learning way. To do so, they were introduced to programming language using Scratch and arduino (also sensors and actuators).

The groups presented in the Municipal Robotics Olimpic two projects: one with agriculture background to monitor the humidity of the soil; the second one was a robotic arm that can be used in many applications, such as industry and space. They were responsible for the integration, assembly and test (and coding) of the these projects, with supervision.



2018 - Arduino based Robotic Arm

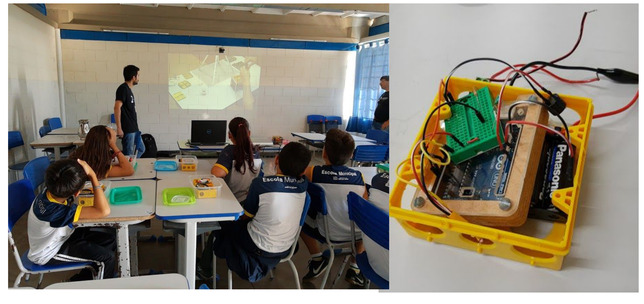
THE CUBE DESIGN COMPETITION

The postgraduate students from the National Institute of Space Research (INPE - Instituto Nacional de Pesquisas Espaciais) created in 2018 the Cube Design (link). A competition to motivate graduation students do develop a CubeSat and high schoolers to challenge themselves to develop a space artifact.

In 2019 some students from CEMPRE Benedito were selected to participate of the 2nd CubeDesign. The mission for the schoolers was to develop a mockup (structure) to accomodate a payload, within a certain dimension and a certain budget. This mockup was launched from a high of 6 m and during the falling and landing, the payload measured the impact when touching the ground. The mockup was scored according to its mass, volume, final cost (lower cost, higher score), project planning and performance during launching and landing (lower impact, higher score)

In this competition, CEMPRE Benedito Ferreira Lopes was the only public elementary school, and they were granted with the 3rd place in their category.

2019 - Training at school and 2nd CubeDesing at INPE - 3rd place



2020 - A one day course about CubeSats with CubeDesing organizers

CONCLUSION

The introduction of STEAM using real projects, in space context, within children and teenagers had a good feedback, and two perspectives can be seen:

For students, this new entire world was so amazing that they are motivated to study more, to know more to develop new robots, new products in engineering.

The purpose of implementing STEAM was achieved once it was possible to identify natural skills in system thinking and problems solving and challenge students to do more.