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Author: Prof. STEFANO CARTOCCI
ITIS Antonio Meucci, Italy

Prof. ALESSANDRO FORTUNA
ITIS Antonio Meucci, Italy
Prof. Cristina Meringolo
ITIS Antonio Meucci, Italy
Dr. Germana Galoforo
Italian Space Agency (ASI), Italy
Dr. Monica Monici
Università degli Studi diFirenze (UniFI), Italy
Dr. ALEANDRO NORFINI
Kayser Italia Srl, Italy
Dr. Michele Balsamo
Kayser Italia Srl, Italy
Mr. Antonio Bardi
Italy
Prof.Dr. ANGELA MARIA RIZZO
University of Milan, Italy

STUDENTS IN SPACE RESEARCH. THE INVOLVEMENT OF HIGH SCHOOL STUDENTS IN THE XENOGRISS EXPERIMENT

Abstract

The XENOGRISS project won the Italian Space Agency (ASI) - Youth ISS Science 2019 call and was conducted on the ISS in December 2019 during the "Beyond" mission. Xenogriss, which had both scientific and educational purposes, was designed and presented jointly by researchers from the Universities of Milan and Florence, a group of students from the high school ITIS Meucci in Florence and their teachers. The students were involved in the study of growth and regeneration of Xenopus Laevis tadpoles in weightlessness. With the university researchers, they addressed the biological aspects of the experiment: assembling the aquarium for tadpoles, chosing their feeding, studying the literature for the definition of the experiment requirements, the post-flight analysis of samples and data processing. The students were also involved in the technological aspects concerning the refurbishment of the experiment hardware. This paper is focused on this part of the work, which was very demanding for the school team. Being an educational experiment, ASI made available the basic hardware (Biokon container, XEU aquarium, power battery), produced by Kayser Italia and used in a previous experiment on the ISS. The students designed and implemented the control system of all the functions required by the experiment, under the guidance of their teachers and the technicians of Kayser Italia. An important problem was the duration of the power supply batteries contained in the basic hardware: a series of three 1.5V-3500 mAh AA batteries was the only energy source available for the experiment. The system was required to keep the tadpoles alive for over a month and monitor their growth through images taken by a camera and stored on an SD card. For this purpose, a shield card was designed, controlled by a commercial card commonly used in the educational field, which allowed the management of all the units of the system: peristaltic pump,

light source, camera, memory card for saving photos, temperature recording. In addition, through a development environment commonly used in teaching microcontroller systems, the software for managing the entire system was developed. The system worked effectively throughout the experiment duration on ISS. An HW-sleep mode of the electronic boards kept the batteries efficient, even after return to Earth. For the students, the project was an extraordinary opportunity to enter the scenario that the ISS represents for science, technology, international cooperation. They were able to experience innovative teaching and expand their professional and team-working skills.