

Project Teaching beyond Physics: Integrating Arduino to the Laboratory

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Abstract—This work reports a joint project executed by the Department of Electronics of a Federal Institution in Brazil and a high school. During the second semester of 2015, we accomplished a set of Physics experiments in the areas of Optics, Thermodynamics, and Waves. The Arduino platform was necessary for some of the experiments. Two hundred students from six classes took part in the activities. A post-course survey indicates that students appreciated the project, with more than 90% of them answering that experiments were “interesting” or “very interesting”.

Index Terms—Arduino, data acquisition, Physics teaching, laboratory.

I. INTRODUCTION

Over the years, research works have demonstrated the importance of experimental activities for Physics teaching [1-2], specially when integrating computational tools. This work reports a joint project executed by the Department of Electronics of a Federal Institution in Brazil and a high school. The project goals were: to contribute to students' success and to stimulate the interest for STEM (Science, Technology, Engineering and Math) subjects, particularly for Electronics and Computing, by using the Arduino platform [1-2].

II. DESCRIPTION OF THE WORK

This work involved a set of 11 laboratory sessions during the second semester of 2015. Optics, Thermodynamics, Waves and a session about photovoltaic energy were the subjects. Each class group was split into 6 smaller groups in the Physics laboratory located at the school. Some experiments dealt with demonstrations and some involved active participation of the students. They changed some firmware parameters for the Arduino platform. Each experiment included a guide with the practical procedure and the relation with theory. A report should be delivered in the following class. We tried to keep experiments and theoretical classes at the same pace. Students answered a post-course survey. Summarizing the results, 96% enjoyed the classes; 93% reported experiments as “interesting” or “very interesting”; 91% recommended the project to be continued. Regarding Physics, 75% considered it as “interesting” or “very interesting”, however 82% think it is a “difficult” or “very difficult” subject. In the same survey, we included some open questions. Spontaneous answers from students show that the long-established teaching based on theory in the black board has little appeal for students. New approaches like using Arduino to conduct experiments should be tried.

III. RESULTS

From students' answers, we argue that this project opened new horizons for students, however it has not changed their perception about Physics, that continues to be seen as a difficult subject. In the Brazilian curriculum, Physics is a very demanding and long subject, and, unfortunately, usually approached with theoretical classes only. Physics should be seen as directly related to technological advances and giving an opportunity for practical work with Arduino can contribute to improve success rates in Brazilian schools.

REFERENCES

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