

# Actions taken to include remote labs in Secondary Education

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**Abstract**—The use of remote laboratories has been received with great interest in secondary schools since these resources are seen as a great chance to convert into practice theoretical contents, especially in areas such as electronics, robotics or control systems. In this publication the benefits from their usage and the rationale for the inclusion of these resources are depicted as well as a description of the actions taken in order to approach Golab initiative to secondary school

**Index Terms**—Remote labs, Secondary Education, electronics, robotics, Golab.

## I. INTRODUCTION

Technology area has a multitude of subjects spread in all courses, both on the stage of Secondary Education and Baccalaureate and it's possibly the area of greatest use of practical resources to materialize theoretical contents. The greater profusion and temporary dedication blocks of contents, in terms of difficulty for students and extension in time, is devoted to Electricity, Electronics, Control Systems and Robotics, which in the case of these two last are in the point of a real revolution with the commercialization of new low-cost open hardware devices. When teaching these contents, Departments of Educational Technology teachers in secondary schools meet the problem that the budget procurement for educational resources are inadequate and virtually relegated to students to develop their practical work at a computer, stagnating in design and programming phases. As continuity, but clearly insufficient, the teacher makes students to work in overcrowded teams, resulting in situations where only the students more interested take advantage of it, increasing the number of students who procrastinate within the team or lose interest and are discouraged and without motivation.

## II. DESCRIPTION OF THE WORK

Given this undesirable situation, there is a complementary solution to motivate and attract students into practice, affecting a minimal cost to departments budgets, such as the use of remote laboratories. Seen and proven the benefits involving the inclusion of remote laboratories as elements of practical support for the course, and without ignoring that students handle real devices in class, teachers proceed to incorporate in the subjects taught by the department schedules a practices program in combined rotation between remote lab usage and practical workshop/onsite laboratory.

## III. ACHIEVED RESULTS AND FOUND ISSUES

Throughout 2014/15 year-course, a one-day conference about remote laboratories was held in Institute Ramiro de Maeztu of Madrid in the framework of the European project Golab with the participation of about 300 students from the centre and more than a dozen teachers from various schools. In 2015/2016 year-course, a program of actions has been drawn up in order to introduce the initiative to other teachers who have shown interest in joining the project Golab. Among these actions, an online seminar is holding, followed by other face-to-face meetings, training sessions and collaborative work between centres about the use of remote laboratories in the classroom.

## REFERENCES

- [1] Go-Lab Project, official website. Online: [www.go-lab-project.eu](http://www.go-lab-project.eu). Last visited January 17th, 2016
- [2] Go-Labs Spain website → Online: <http://www.go-lab-project.eu/call-for-schools/spain>. Last visited January 17th, 2016
- [3] Instituto de Enseñanza Secundaria "Ramiro de Maeztu". Disponible en: <http://www.educa.madrid.org/web/ies.ramirodemaetztu.madrid/>