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SENSOR SCILAB 3.0: STUDENTS UPGRADE A PHYSICS LAB USING NEW TECHNOLOGIES

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Student labs of scientific disciplines, in educational practices, aims to build knowledge through recursive reshaping of concepts in a repeated approximation to correct and complete competences of learners. Students, under teacher's supervision, foresee and plan a path of investigation, reflect and make choices, design models and hypotheses and verify them according to collected and processed data, observe unexpected phenomena and modify initial models of the reality [1].
'Sensors Sci.Lab 3.0' is an ongoing project aiming at using the most innovative technologies to help students to realize a complete makeover of the scientific laboratory's instruments.
This can be considered as an instance of a project-based learning educational experience [2], where students are encouraged to pursue medium-term objectives with concrete solutions of authentic problems. This approach, combined with action research, allows students to learn how to manage complexity, interdisciplinarity and teamwork more practically, thus fostering their training in order to support their ability to overcome future challenges.
The main idea of the project is to provide scientific laboratory with equipment, based on microprocessor boards [3],[4] and sensors, assembled and programmed by second, third and fourth years' students of a Scientific High school under the supervision of expert teachers.
Scientific curricula would be deeply updated both in instruments, extremely flexible and suitable to inspire and develop new experimental ideas, and in methodology completely different from teaching approaches based on lectures and passive memorization of formulas. This experience can motovate students to exploit new technologies to perform their tasks more easily [5]. In particular, the Web, full of tutorials and multimedia contents, can support students in analysis and also push them to conceive and compare alternative solutions, to communicate and present their ideas and projects more effectively.
More in details the basic steps which make up the project are the following:
1. Analysis of tools available in the laboratory;
2. Training in the operation of the programmable cards with microcontrollers and microprocessors;
3. Division into working groups for the study of different branches of Phyics;
4. Design and identification of the most suitable devices and technique to realize experimental setups;
5. Realization of accurate multimedia documentation for the execution of experiments with the various devices.
6. Organization of demonstration events on stage to spread the practice of lab equipment and to engage the entire school population;
7. Share all materials developed over time in a cloud platform.
8. Measure and evaluate the impact of the project on students and teachers.

References

[1] M. J. Prince et al., "Inductive Teaching and Learning Methods: Definitions, Comparisons, and Research Bases", Journal of Engineering Education 95 (2), 123-138 (2006).
[2] F. Bouquet and J. Bobroff D. Project-based physics labs using low-cost open-source hardware, American Journal of Physics, 85, 216 (2017);
[3] https://www.raspberrypi.org/
[4] https://www.arduino.cc/
[5] C. A. Petry et al., "Project teaching beyond Physics: Integrating Arduino to the laboratory," 2016 Technologies Applied to Electronics Teaching (TAEE), Seville, 2016, pp. 1-6.

Apply to be
 considered for a student
   award (Yes / No)?

no

Level for award
 (Hons, MSc,
   PhD, N/A)?

MSc

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