

Pedagogical Innovations to Enhance Student Learning in Physics Labs

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ABSTRACT

In this communication we show how different innovative teaching practices have been implemented in lab matters. In order to make the most of lab work we have adopted different pedagogical approaches which combine traditional and innovative activities and resources. Pre-lab activities (seminars, simulations, self assessment tasks, videos) have being designed so that the students are better prepared when tackle the tasks in the real lab. Face-to-face lab is usually carried out in teams of 2-3 members and peer-tutoring is used in some cases. The use of computer facilities increases as lab work is more complex and the students are better prepared. The results of all these changes are analyzed from the point of view of the students. In order to get students' opinion, a survey was completed by the students in the last course at the physics degree. Globally they consider the received training as satisfactory, but pinpoint different aspects as final exams o heavily time consuming reports as needing a revision.

Categories and Subject Descriptors

J.2 [Computer Applications] Physical sciences and engineering - Physics

General Terms

Measurement, Documentation, Experimentation, Security

Keywords

Pedagogical innovation, Physics lab, Science degree, Peer tutoring

1. INTRODUCTION

The laboratory work is crucial for the learning process in scientific careers [1-2]. In the lab the students can realize the practical implications of their theoretical studies and test their conceptual understanding and knowledge of the subject. At the same time they get used to the scientific way of thinking and procedures through very different activities: observing new phenomena, measuring different variables, solving new problems and applying their knowledge to establish the relationship between the data.

The special characteristics of the tasks carried out in the lab make it an optimal scenario for the application of learning methods fully centered in the student [3-4]. It is widely admitted that "laboratory work is an active learning activity which is consistent with student-centered strategies based on constructivist learning-teaching approach" [5-6]. It also promotes creative thinking and problem-solving ability [7] and should confront the student with new challenges if they "focus on providing physical experiences that induce cognitive conflict and encourage student to develop new knowledge schemes" [8]. In the lab team work is even more valuable than in usual classrooms, because it adds new stimulus to understand and interpret the phenomena.

The structure of Physics studies at the University of Salamanca has recently changed as a consequence of the Bologna Process. A great effort has been done to emphasize the importance of lab work in the curriculum. Laboratory matters are costly both in material and human resources [9] so a deep reflection has been carried out about lab curriculum and the corresponding learning methods.

In this communication we show how different innovative teaching practices have been recently implemented in physics lab subjects at the University of Salamanca. An innovation project has been carried out in order to analyze the pedagogical results of the experience from the point of view of the students. To gather student opinion, a survey has been designed and was completed by the students in the last course at the physics degree. The results of this survey are analyzed.