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Opinions on "Classroom Response System" by first-year engineering students

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Abstract

The aim of this research is to gather students' opinions about an implementation of Classroom Response System in university lectures. The study covers the thoughts of first-year undergraduates enrolled in an introductory physics course belonging to an engineering degree. The teaching methodology consisted on Concept-Test questions which were answered by all the students using a Classroom Response System, followed by small discussions leaded by the teacher. Opinions were collected through an on-line survey that was delivered to participants at the end of the academic year. The questionnaire consisted in nineteen Likert scale items that covered three categories: the tool, attitudes and learning. A final open-ended question was also added. Data was interpreted using descriptive statistical methods. Findings show that students gave an overall positive evaluation of the tool, as well as to its advantages as an enhancer of: (a) attention, (b) participation, (c) classroom dynamics, and (d) learning, with a special remark on the role it plays on real time self-evaluation of their own learning during lectures.

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Keywords: Science education; Classroom Response System; Clickers; Students' opinion

1. Introduction

Several methodologies are grouped under the name of Interactive Engagement. They were developed with the aim of solving common problems concerning traditional teaching methods where the student role is set to a merely listener. This brings, consequently, that lectures at universities do not produce the learning goals that are presumed

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to achieve (Mazur, 1997). To increase these learning gains, as well as the participation of undergraduates into the classroom environment, a considerable number of new methods have been incorporated into lectures with most of them relying on electronic resources. These methods make use of activities such as group discussions about theoretical concepts, grouped problem solving or electronic devices like Classroom Response Systems (CRS).

Classroom Response System (CRS) consists in small transmitters that allow each student to answer in a short period of few seconds to multiple-choice questions formulated by the teacher. Current systems consist in credit card sized wireless devices powered by batteries. These devices adopt different names within literature, sometimes referred as *'clickers'* or *'personal response system'*. In addition to *'clickers'*, a computer system is also required to record the answers submitted by the students. A common choice is a laptop computer with specific software installed to collect and store the responses. The receiver is a small antenna which is plugged into an USB port. This computer is also connected to a video projector where questions are presented as slides of a presentation, allowing students to receive instant feedback of their responses during class time (Varo, 2014).

Numerous studies have shown that these methodologies may bring benefits toward learning. Chen et al. (2010) found that the rapid feedback obtained with CRS may increase learning. Bunce et al. (2010) recommend this kind of student centered pedagogies to increase attention, as they found that attention is not kept during a whole traditional lecture.

Several student-oriented researches have been done for finding their opinion and attitudes toward CRS. Prather and Brissenden (2009) found that undergraduates thought that this methodology contributed to increase their learning and exam performance, as well as enhanced the participation and motivation during lectures. Students usually give positive feedback about the advantages that CRS brings toward learning (Cortright et al., 2005; Giuliodori et al., 2006). Hoekstra (2008) found that students manifest that CRS helps to decrease the anxiety related to learning new concepts, due to the laid-back attitude adopted in classroom. Anonymity related to CRS has also been covered by literature. Berry (2009) found that students believed that a system where there is no record of individual responses made them more prone to answer to the questions, and on the other hand, while being recorded they sometimes avoided voting rather than giving a possible incorrect answer. As a summary, studies which cover opinions from students state that about a 70% of the undergraduates give positive reviews for the tool when they are asked about the resource itself, on the other hand positive reviews are also found, but with lowest rates, when they are asked about the relationship between the methodology and their learning (DeBourgh, 2008; Patry 2009; Perkins & Turpen 2009; Prather & Brissenden 2009; Nájera, et al., 2010; Varo et al., 2015).

2. Design

This study examined undergraduates' opinion on the use of CRS. Participants were 68 first-year students of an Electric Engineering degree at a Spanish university, where the methodology was implemented in all the lectures of its annual introductory physics course. The data had been collected by surveying undergraduates at the end of the course by using an on-line form hosted at Google Drive platform.

2.1. Teaching methodology

Teaching methodology consisted in conceptual questions embedded in several multimedia presentations that contain the subject contents. These presentations served as both: (a) a script for teacher's development of lectures, as well as (b) a content reference resource for students and for their further studying toward exams. Each session incorporated a number of between 4 and 10 conceptual questions which were related to the contents of the lectures. This methodology had been used in all the lectures of the year, starting from the beginning of the course.

During lectures the methodology followed the next steps: (a) a concept was explained by the teacher, (b) a question was projected on the screen and the teacher read it, (c) students answered this question by using the Classroom Response System (CRS) within an interval of ten seconds in which they could check if their answers were recorded by the receiver by looking at a number list in the screen, and (d) a bar chart was displayed where the correct option was highlighted with a different color. After each question, a small discussion was started where students were asked about their reasoning to reach the correct answer. Finally, the process ended with a small repetition of the contents by the teacher, which was focused on supporting or refuting students' arguments.