

Boosting students' preparation and automatic grading for laboratory classes via Moodle quizzes

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Abstract – Improving students' learning process is a never-ending task. In the context of the FEELE (DC analysis) course, 1st semester 1st year of the Electrical and Computer engineering degree, we have been implementing a panoply of teaching/assessment methodologies and teaching/self-learning tools over the last few years, aiming at: 1) improving the students' know-how through both group and individual assessments along the semester; 2) stimulating students' self-learning through innovative computer-based tools; 3) distributing, diversifying and automating students' grading along the semester; 4) Autonomous study. This *extended abstract* outlines an initiative coping with all these three vertices. Students must answer (individually) on-line quizzes, via Moodle, to get prepared for the lab class experiments and, simultaneously, enabling their automatic grading. Although a very recent effort, we already got some preliminary feedback of its impact. Our feeling is that the students are now better prepared for the lab classes and finish their experiments sooner, against previous editions. We report the results of a questionnaire-base study to assess the impact of this methodology.

Keywords – on-line quiz, Moodle, automatic assessment, laboratory experiments, teaching and self-learning methodologies and tools.

INTRODUCTION

Teaching electrical circuit analysis to first year students is a challenging task. Along over 20 years' experience in electrical engineering education, we have been constantly dealing with students' difficulties in both theory and practice, concerning DC (Direct Current) and AC (Alternating Current) circuit analysis methods.

At ISEP, the Electrical and Computer Engineering (ECE) degree curriculum features two courses on DC and AC fundamentals, in the first and second semesters of the first year, respectively FEELE [1] and TCIRC [2].

Adapting to a progressive change is the students' societal and educational paradigms, having the Bologna Agreement in mind, we have gradually been diversifying assessment timing/types, along the years [3,4].

Several studies have been performed in order to characterize the habits of Internet/ICT use by higher education students. One such study conducted in Portugal by Babo *et al* [5] showed that most students access the Internet several times a day (in different places), and they are connected, on average, 1-3 hours. They also found that students who spend more time online are the ones that are enrolled in courses on "technology". The main reasons why students use the Internet are: i) to research on work/study, ii) accessing to documents available in the teaching platforms (Learning Management System – LMS) of the institution (typically Moodle) and iii) e-mails exchange [5]. In this context, we have recently introduced **Moodle Quizzes**, with the main objectives of stimulating students to (better) prepare lab classes and to improve the assessment process and promote autonomous study.

This *extended abstract* outlines the first outcomes of this experience.

DESCRIPTION OF THE QUIZZES

The objective of each quiz is to make sure the student gets properly prepared to perform the lab experiments, querying about fundamental concepts, terminology and methodology, and requiring the students to perform the theoretical analysis and get analytical results, for the same circuits they will implement and measure in the lab.

Each quiz has an average of 12 questions and takes an average of 40 minutes to complete (two hours limit). Due to size restrictions, we refer the reader to the example in [6].

FINDINGS

In order to sample the students' opinion about the Moodle Quizzes, we asked them to answer a questionnaire with 22 questions [7], of which the first 4 aim at characterizing the respondents: *age*, *gender*, *number of registrations* in the FEELE course and *how long* (hours) the student takes to prepare the PL classes (estimate, in average), 15 are "closed" questions, associated with a *Likert* scale (1 to 5) where 1 corresponds to *totally disagree* and 5 to *totally agree*, and finally 3 "open" questions inquiring about positive and negative aspects of the preparation of the laboratory classes via the Moodle quizzes.

So far, 126 students answered the questionnaire (out of a total of 265), in which 78,6% are attending the course for the first time. The questionnaire was anonymous and available on-line. Students were invited to respond both by e-mail and personally (at PL classes).

In the analysis of the “closed” questions we consider that students agree with the *statement* if they choose the values 4 and 5 (*Likert* scale). From the analysis of the closed questions, we can conclude that:

- 83,4% prepare PL classes in a regular basis;
- 75,6% find it easier to prepare the lab classes via Moodle Quizzes than in the “traditional” way;
- 88,2% consider that the preparation of the lab classes in Moodle boosts their learning process;
- 81,1% prefer preparing lab classes using Moodle.

In what concerns students with more than one registration (in the course), in previous editions only 35,7% of them considered to prepare the lab classes and 25,0% stated they did not prepare lab classes (1 and 2 of the *Likert* scale); 39,3% selected Level 3 of the *Likert* scale, which indicates that they occasionally prepared the laboratory experiments.

It is also worth mentioning that, considering the information that has been gathered in the Moodle platform to date, 91% (242 out of a total of 265 students) are preparing the laboratory work regularly and 74% (196 students) prepared all lab classes so far.

We also asked all members of the FEELE teaching team (including ourselves) to answer a specific questionnaire. Considering teachers' reports of the previous edition of the FEELE course (last academic year), it was found that on average only roughly half of the students did prepare lab classes, which matches students' responses to the questionnaire (64,3% chose 3 or under 3 in the *Likert* scale). In general, all teachers considered students to be better prepared for the lab classes, carrying out experiments with more confidence and ending them earlier than students in previous editions of the FEELE course.

CONCLUSIONS

Although this is just a preliminary study, our initial findings are favorable, considering both the students' and the teacher's feedback, which motivates us to foster this methodology. In fact, Moodle Quizzes “force/induce” students to prepare lab classes, with the following pros:

- lab classes run better, both for students and for teacher; students get more motivated/added-value out of lab classes, since the prior analytical and simulation work is likely to (better) match experimental results;
- it is likely that students make a better use of the test/measurement equipment (e.g. selection of the functionalities, probe terminals, measurement range);

- students' team work is leveraged, since quizzes stimulate cross-check of analysis/results among the team members, prior/during lab classes.

Also, importantly, Moodle Quizzes turn the teachers' job of assessing students a lighter and more reliable task, by automating scoring and subsequent database registration of students' grades. Thus, we intend to investigate how this methodology can be extended to cover all lab scripts preparation/assessment.

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