The organization of classes and assessment system using Moodle

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Abstract - The organization of classes and assessment system on the Personal Computer Applications (PCA) course, in the professional study of electrical engineering at the Polytechnic of Zagreb, is based on the Moodle system. Moodle is widely used open source application designed for e-learning. This system enables students to prepare for lectures and exercises, while emphasis is placed on their independent and individual work. Students have access to all the necessary teaching materials, applications, tasks and direct communication with the teacher even outside the class schedule. The aim of the PCA course is to point out the wide range of possible applications of personal computers, the use of Moodle itself, since it is implemented in the course, may be considered as a part of the teaching course.

Laboratory (and construction) exercises are the practical and individual work of each student and make a total of half hourly rate of the course. As the course is at the beginning of the study, the laboratory exercises include the set of general computer applications a future engineer might need. Certainly, laboratory exercises are a complex form of teaching because, in addition to the readiness of students for the subject of a single exercise, their independent work and understanding of the results are expected. Students preparation for each topic is required.

However, availability of computer applications for work/exercise at home has to be considered. This may be achieved by allowing free applications to students, open source applications or demonstration versions of commercial software packages. Thus, wherever possible, the option of choosing an alternative, free tools is given. PCA laboratory exercises are designed with respect to the above requirements and needs. It requires a certain level of teachers’ productivity within a predetermined time, therefore automated evaluation is preferred.

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The system of classes and assessment for the students and assessment for both the teacher, learning – for the students and assessment – for both the teacher and students. They vary in the availability and transfer of learning (teaching) materials and information, method and time of interaction - communication with the teacher. The manner and speed of assessment and the impact of subjective parameters in the evaluation are also significantly different.

However, through the e-learning system, it is not possible to fully detect the sphere of interest of the students and their motivation. It is very difficult to distinguish and identify the sources of problems encountered in learning, use of instruments and computer applications. Missing component of empathy in communication makes inspiring and motivating students virtually impossible. In these segments, direct contact between students and teachers is irreplaceable.

Combining the advantages of both methods of teaching/learning (e-learning and person to person), both modes of interaction and communication between students and teachers in the teaching process, it is possible to achieve a better effect for the mutual benefit.

The system of the teaching and assessment for the Personal Computer Applications (PCA) course, in the professional study of electrical engineering at the Polytechnic of Zagreb, is based on that ideas. Moodle, licensed and free open source application, is used as a e-learning system on the PCA course. Since the aim of the PCA course is to point out the wide range of possible applications of personal computers, the use of Moodle itself, since it is implemented in the course, may be considered as a part of the teaching course.

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II. MANAGING ATTENDANCE RECORDS AND STUDENT’S ACHIEVEMENTS OVERVIEW

Administration tasks related to teaching are a necessity, although time consuming. Also, there is a need for reducing possible errors if not to the zero level, then certainly to a minimum. Administration tasks imply keeping record of each student’s attendance during exercises as well as keeping track of the necessary conditions that need to be fulfilled so that a student could enter for an exam. The same refers to students’ assessment. Since about 230 students enroll the course each year, this automated management administration shows its importance and advantages. Total time required to execute these types of tasks is reduced and the possibility of oversights, omissions and errors of the teachers are minimized. The ultimate goal of this kind of administration is to have an overview of the achievements, whether cumulative or individual for each student.

The particularity of attendance recording is that some students do not join their group. They attend exercises in one of the other groups, usually with another teacher. With the traditional „pen and paper“ method of keeping
records, that would represent additional work and thus an additional waste of time increasing the possibility of error due to a larger number of intermediate steps. Using Moodle capabilities with respect to the particularities mentioned above, records in the laboratory are made in the form of a quiz. All students present during the lab exercise receive a one-time password from the teacher in order to access the attendance quiz. The quiz is a multiple choice test with just one correct answer. Students have up to 2 minutes to submit their answers. When the test is finished, the password is changed to prevent possible distributing passwords and cheating. The only purpose of the quiz is keeping track of students’ attendance, without any influence on the assessment issue. The question is simple so the students can easily and quickly choose the correct answer. If the student chooses the right answer, they get 1 point for attendance. Figure 1 shows an example of such a question.

Students answers are stored in the database. At the end of the exercise cycle, the review score clearly shows the attendance records (Figure 2). Of course, there is the possibility that a student has chosen a wrong answer. In that case the test shows 'zero' points, as shown in Figure 2. The teacher can delete that student’s attempt from the database and give the student another chance. However, this is not the best solution. A better way for the teacher is to correct the answer manually. If the ‘zero’ grade is detected later, by the time the test was taken it can be checked if the student had actually attended. Moodle offers several ways of verification when attendance is concerned, but this method proved to be the most effective.

Given that the administration of students’ achievements in laboratory requires a plain and unique review in one place, all the relevant parameters are classified as ‘Grades’. Selecting ‘Grade’ for each student displays the interface shown in Figure 3. The way of assessment of student’s work during laboratory exercises will be presented in another chapter. It is possible to export this review in Excel or OpenOffice spreadsheet.

III. TOPICS AND PREPARATION

According to the Bologna process, each ECTS credit which a student receives when they pass, the exam includes a certain number of hours of work at home. Students need to master the use of general computer applications at the beginning of the study because they will probably use them in their private and professional lives, regardless of specific applications important in electrical engineering and will be addressed in special courses throughout the study. Taking these facts in account provides students access to those applications on their computers and at home. They can use them to attend lab exercises, practice after the exercises for exams and later in study or at work, preferably without additional investment in buying the commercial software packages. That is enabled by using open source applications or demonstration versions of commercial software packages.

Moodle allows opening a specific topic in advance, making it visible to students. All topics do not have to be visible in advance. Usually visibility is set in a way that students can see earlier themes, current topic and the first next topic. Information concerning the purpose of the exercise with activities and skills that should be mastered, as well as materials are included. Material required for the preparation of exercises can be found in ‘Resources’. Materials usually consist of an Internet link to the literature and basic notes on the application software that will be used in the exercises. Informations on how and where a student can download it legally and free of charge, are also included. An example of the above-mentioned for two topics is shown in Figure 4.

Combining the above-mentioned principles and features, laboratory exercises enable students to work with applications that cover the following areas, some of them in a couple of exercises:

A. Basic use of operating system

The operating system used is Microsoft Windows 7. It is free and legally available for students through MS DreamSpark program for members of academic institutions. This exercise places an emphasis on working with files and folders and their organization and retrieval, installation and starting user and system applications, uninstalling programs and Windows components and managing peripherals.
B. Office Suite

Word and Excel, from MS Office 2013 package, are used. Since this is not a free software package available to students, as an alternative possibility is offered work in the open source Apache OpenOffice package, which also includes word processing and work with spreadsheets. The aim of the text processing exercise is to master basic procedures which includes working with the application and adapting it to the user, creating documents, text entry and search, text formatting and working with objects and preparation for printing. In addition to the basic operation and the adaptation to the user, the goal of working with spreadsheets is to master cells and worksheets, formatting content, working with formulas, functions and graphs.

C. Flowcharts

This exercise includes working with Visio, form MS Office 2013 package. It is free and legally available for students through MS DreamSpark program for members of academic institutions. The aim of this exercise is to understand what flowcharts are and how to approach to a task or to solve a problem by using flowcharts.

D. EDA (Electronic Design Automation) program

Proteus ISIS package is used. Students can free and legally download demonstration version of the program. The main restriction, in comparison to a full version, is that the clip can not be saved. Of course, there are several more restrictions, but in this course, they are irrelevant. The aim of the exercise is to master the operating principle that can help with later use of other programs for electronic design or with simulation of circuits work.

E. Image processing

GIMP application, available under open source licenses, is used. The aim is to become familiar with the basic operations with the computer processing of images (photos). The exercise covers setting the working environment, retrieving, creating and saving documents, sizing images, work with different formats of images, their features and capabilities as well as the most suitable application. The purpose and the opportunity to work with layers and masks, is also included.

IV. ASSESSMENT – TESTS OF KNOWLEDGE AND SKILLS

In this segment are valid starting points listed in Section II. (reducing the number of intermediate steps and the amount of time spent, reducing the possibilities of teachers omissions to a minimum...). An additional requirement is reducing the potential teachers subjectivity in assessing students’ works. In near future this influence should be reduced to zero. One possible way is the use of fully automated assessment. Of course, automated assessment is not in all cases the most appropriate and does not appropriately reflect student’s level of skill working with a PC application. No less important in the verification of knowledge is to reduce and ultimately prevent the eventual inappropriate actions like copying. Proceeding from the above, the following options are applied on laboratory exercises:

A. Demonstration

The traditional method of verification is the students demonstration of work on a computer. This method is applied in Basic operating system exercise. Students present their skills of operating a computer to the teacher. The teacher manually enters the grade in Moodle.

B. Evaluating submitted works

For some exercises it’s the most appropriate for a student to submit his work to Moodle and the teacher later reviews and evaluates it. This method of assessment is used in the text processing and flowcharts exercises. A module is opened for file submission in Moodle. Students, upon completion of work, submit their documents. The teacher, besides entering the grade (assessment), can enter a comment that will be visible to the student with the grade. Usually, as a comment are entered some notes and observations. This, along with criteria known in advance, makes the grading process more transparent. The student sees what was done well or omitted and can immediately respond in case of teachers oversight.
In this mode of assessment is not possible to use the Safe Exam Browser (details in the following paragraphs) because other (e.g. Word) applications should be opened along with the test. However, inappropriate actions can be made difficult by requiring the understanding of given informations rather than merely stating the facts. Another way is creating a sufficiently large base of questions that are randomly selected, changing the sequence of questions and responses (shuffle within questions, shuffle within answers).

C. Automated assessment

In addition to the significantly reducing the time spent evaluating and the possibility of erroneous results, another benefit is the reduction of the possibility of inappropriate actions during the test. This is made possible by using the Safe Exam Browser from which students access the tests. The window of that web browser opens over the entire screen without any navigational elements. Only permitted actions are solving the test, using calculator and logging off from the computer. Use of this browser disables, among other things, switching to another application, use of copy/paste, use of e-mail client and visiting other Internet sites, such as sites and objects with references to relevant materials.

In this mode of assessment Moodle offers more ways of answering the questions, one of which is in between the other tests used: Multiple Choice (single or multiple answer); Short Answer, Numerical answer (students write in response word, symbols or numbers); Matching (pairing of terms and their meaning or use). After the submission of the test, or when the time expires, students immediately see their score. The score is stored in the database and displayed in an overview as shown in Figure 3.

In this mode of assessment it is possible to analyze students’ scores on tests in a manner that identifies which questions were too difficult or too easy. Questions can then be either reformulated or simply removed - deleted from the database without re-creating an existing test. Figure 5, in the lower right part, displays the analysis of the success in answering each question within a test for the current group of students (students of the academic year 2013/2014). There is also a display of successful answering a question that involves students and other groups (previous years).

V. CONCLUSION

Basic use of computers is not easy to present to the participants who come from different backgrounds. They had different availability of information technology and the Internet, thus varying degrees of knowledge. Their previous interest in the subject can not be ignored as well. The use of a personal computer can not be reduced only to the use of electronic mail, social networking and sharing photos and video content. These are the reasons why the laboratory exercises of this course were designed in the manner described in the paper.

Moodle in being used in PCA lab exercises during the last six years, and the student’s feedbacks are very positive. General impression is that using Moodle in combination with direct teacher - student contact is a good method and it is easy to identify where further focus is needed, on what topics and which students. This approach to the organization of teaching requires a good and thorough preparation materials in Moodle, but it constantly improves exercises, making them better for each succeeding generation.

REFERENCES