

# SW3A: Web-Based System for Academic Assessment and Follow-Up

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**Abstract** - This work presents the development of a Web based system for Academic Assessment and Follow-up which is being developed for allowing educational institutions to manage both the application of evaluation processes of the teaching activities and the pedagogic follow-up of their courses. This system will make it possible to collect the students' opinion about the disciplines, teachers and other subjects related to teaching. This system will also make possible to publish to the Internet the data related to the lessons plans, grades and class attendance of the offered disciplines. These characteristics are created to help Course Councils in developing evaluation processes and planning activities in order to assure the quality of teaching. The system is being developed to be distributed under a GPL license.

*Key Words:* Quality of teaching, Academic Evaluation, Web Systems, Free Software.

## I. INTRODUCTION

The web technologies are more often being used in educational institutions. This work describes the development of a system (named as SW3A) that will allow the educational institutions to manage, through the Internet, both the application of evaluation processes of the teaching activities and the students' pedagogic follow-up. The proposed system will allow the publishing of data related to the teaching plans (syllabi), grades obtained in the applied evaluations and the students' attendance control for each of the offered disciplines.

The characteristics intended for the system must help the Course Councils to develop evaluation processes and planning activities to assure the quality of teaching. The system is being developed using only free available web technologies and will be made available to educational institutions under a GPL license [1].

### *1. Intended system characteristics*

SW3A is based on a methodology proposed by some faculty members from UNESP - Campus of Guaratinguetá [2]-[3] and it is composed by two subsystems: Academic Evaluation Web System (named as SWAA) and Pedagogic Follow-Up Web System (named as SWAP).

### *1.1 Academic Evaluation Web System*

The assessment of the quality of teaching in university courses has always been an issue of great interest [4]-[5]. Coherent with this idea, the SWAA subsystem objectives to collect the students' opinion about the disciplines, the teachers, and about other subjects related to the teaching. From the statistical analysis of these data, it is expected that the teachers, the course coordinators and the institution's administrators can trigger actions to improve the quality of teaching. The SWAA is structured in two modules: "Student" and "Coordinator".

The student module corresponds to a web page specific to each student, built dynamically from a set of questions registered previously by the course's coordinators. The evaluation process aims at acquiring the students' perceptions [6]-[7] on several aspects of the disciplines they have been enrolled in. For this purpose, the student module web page presents a course evaluation questionnaire, from which the student's opinion about the academic activities will be collected.

The coordinator module can be used by teachers, courses' coordinators and institution's administrators. It allows the courses' coordinators to register the evaluation questionnaires which will be used by the student module. It also aims at dealing with the collected data and producing the evaluation graphics (one for each discipline) that will be made available to the corresponding teachers, to the courses' coordinators (for all the disciplines of the coordinated course) and to the institution's administrators (for all the disciplines of all courses).

### *1.2 Pedagogic Follow-Up Web System*

SWAP aims at making available the information needed for the students' pedagogic follow-up. The information provided by SWAP subsystem is of great importance for the teachers, students, courses' coordinators and institution's administrators, as it includes relevant elements for the quality of teaching assessment. The SWAP is composed of two modules: "Grades and Absences Management" and "Control of Teaching Plans".

The "Grades and Absences Management" module allows the teachers to publish in the Internet the results of the applied evaluation and the students presence control, for

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each discipline. It also aims at making it easy to send e-mail messages to the students. At the end of each academic year, the information provided by the teachers can be used directly by the institution to update the academic databases.

The “Control of Teaching Plans” module allows to register the teaching plan for each discipline, in which it will be informed the total number of hours dedicated to each syllabus topic. After teaching a specific topic, the teacher must introduce this information in the system. This information is also related to the “Grades and Absences Management” module, so that the registering of a topic, associated to the students’ presence or absence in the corresponding class, can be an important element in the follow-up of the learning process, allowing to relate the evaluation results to the corresponding topics and the dates in which these topics were covered.

## II. SYSTEM ARCHITECTURE

Figure 1 presents the hardware structure adopted for the system.

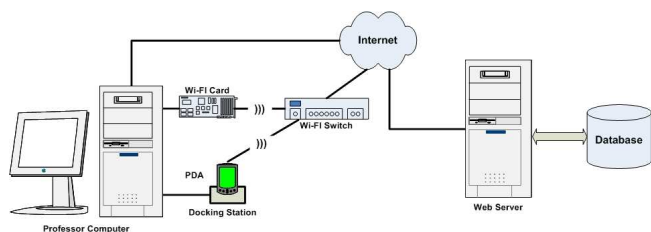


FIGURE 1  
SYSTEM STRUCTURE

It may be observed that the teacher’s workplace will be composed by a computer with access to a wireless network and a PDA (“handheld”) connected to this computer. The computer must have access to Internet and the PDA will communicate with the computer through the synchronization base or by means of a wireless network. The teacher can use the PDA in the classroom to register the students’ presences in the class, as well as to register the teaching plan topics which have been covered. These data must be typed directly to the web server, if a PDA is not available. The data manipulated by the system will be stored in a database using a DBMS (Database Management System) accessed directly by the web server.

Figure 2 presents the system’s software architecture.

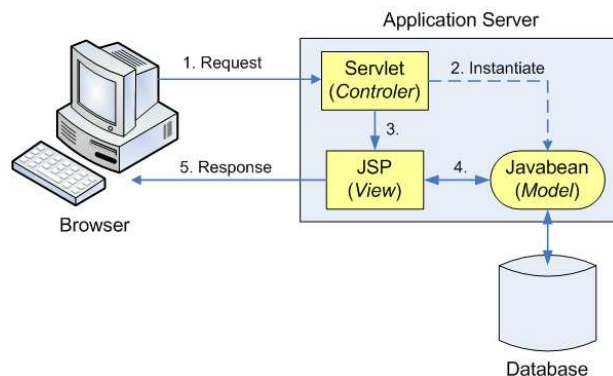


FIGURE 2  
SYSTEM'S SOFTWARE ARCHITECTURE (MVC ARCHITECTURE)

The SW3A is being developed in Java language [8], using the MVC (Model-View-Controller) architecture. In applications based on the MVC standard, the control flow is mediated by a Controller. The Model represents the state or the logic of an application. After the operation of the Model, the control is resent by the Controller to the suitable View, which is determined by the Controller through a XML mapping file. Java web applications built under a MVC architecture use, in general, Servlets and JSP. SW3A uses PostgreSQL [9] as the DBMS, Apache [10] as the web server and Tomcat [11] as the web container. MVC architecture is being implemented using the Struts framework [12]. The Hibernate tool is being used to implement ORM (Object-Relational Mapping) object persistence mechanisms [13]. UML diagrams, describing the system modeling, can be found in [14].

## III. CURRENT DEVELOPMENT STAGE

The SW3A current development stage is presented below. Figure 3 shows the application’s initial screen, from which one has access to all the SW3A modules.



FIGURE 3  
SW3A INITIAL SCREEN

### 1. Academic Evaluation Web System (SWAA)

This subsystem intends to provide an assessment of the teaching activities, based on evaluations done by the students of each attended discipline. The creation of an evaluation

process must start with the register of an empty questionnaire. Once the questionnaire is defined, the next step is to register the questions (Figure 4).



FIGURE 4  
OPTIONS FOR QUESTIONS REGISTRATION

After the questions registration, the next step is to compose a questionnaire from the registered questions (Figure 5).

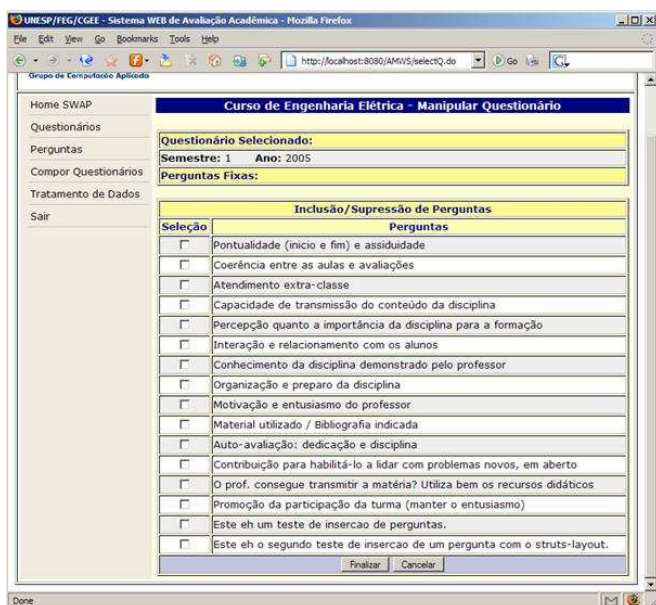


FIGURE 5  
QUESTIONNAIRE COMPOSITION

The result of this step is a complete questionnaire ready to gather data. So, the course's coordinator must make it available on the web. For this purpose, the option "Questionários" (see the left menu) must be selected.

An evaluation questionnaire will include essentially closed questions, since this type of question is more suitable for the statistical treatment. However, at least one open-ended question must be included to obtain the students' opinion about some aspects of the discipline under evaluation which have not been foreseen in the closed questions. So, an evaluation will include quantitative and qualitative data [15]. The closed questions must be formulated in order to allow the attribution of a value for

each evaluation item (factor), in accordance with a Lickert kind scale.

The methodology used for the treatment of the closed questions is similar to the one adopted in the System for Supporting the Research and Evaluation of Indicators (named as SPA), adopted in other projects [16]-[17]. The SPA system allows both the data processing to characterize the samples and the establishment of performance evaluation indices for the considered factors. By means of this system, it is possible to calculate performance indices in relevant organizational factors, with the attribution of points to the answers in an ordinal scale of five positions (by default). A "Factor Performance Index" value is calculated from the points attributed, in terms of the frequency of the observed answers. The works [18]-[19] were important to determine the relevant factors and elaborate the SW3A questionnaires.

Figure 6 shows how a questionnaire is presented to a specific student. Note that, the disciplines in which the student is enrolled are presented in the columns and the corresponding evaluation questions are presented in the rows.

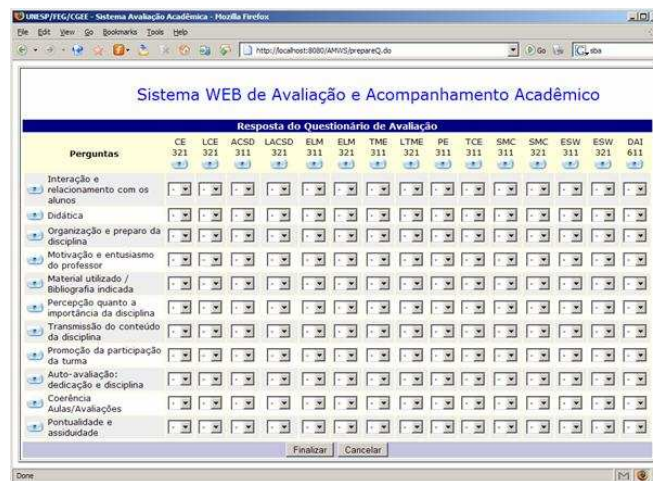


FIGURE 6  
A SPECIFIC QUESTIONNAIRE

After the statistical treatment of the collected data, the courses' coordinators may build different graphical representations for the results. For example, Figure 7 presents a graphic resulting from the analysis "About the Courses", which illustrates the students' participation levels from different courses in the evaluation process.

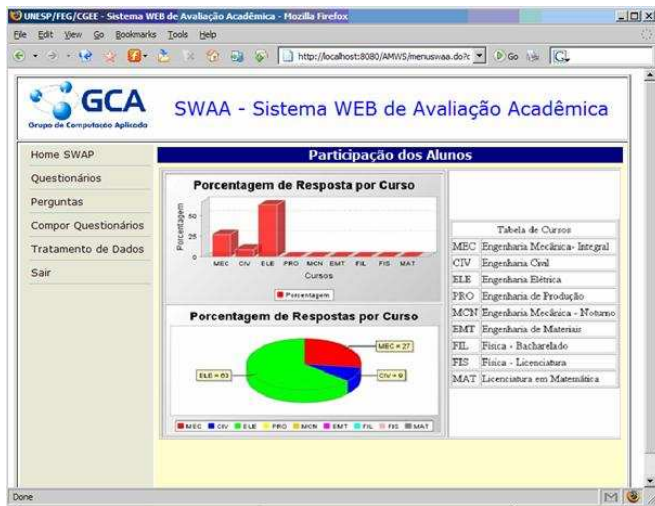


FIGURE 7  
STUDENTS' PARTICIPATION LEVELS

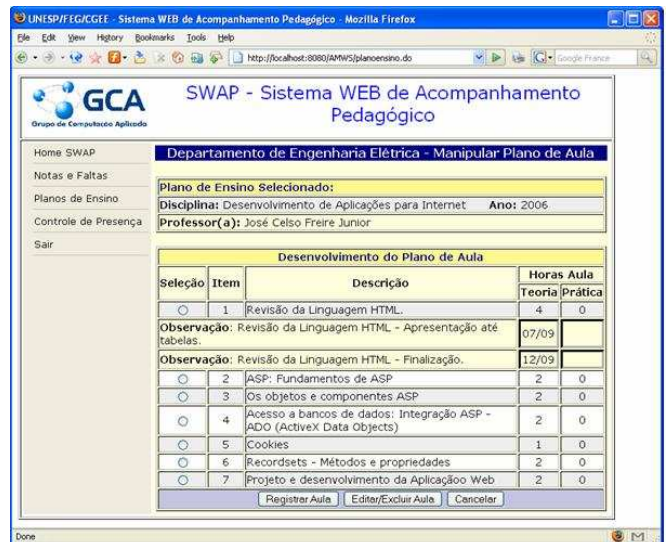


FIGURE 9  
CLASS PLAN REGISTRATION

## II. Pedagogic Follow-Up Web System (SWAP)

SWAP includes two main modules: “Control of Teaching Plans” and “Grades and Absences Management”, which are shortly described below. The “Control of Teaching Plans” module must be used for the registering and manipulation of teaching plans, which corresponds to include, edit or delete specific syllabus topics (Figure 8).



FIGURE 8  
TEACHING PLAN REGISTRATION

This module also allows to register class plans, related to a specific teaching plan. In this case, it is possible to register when each of the topics foreseen in the teaching plan was covered. To register a class plan, the teacher must indicate the subject covered in that class (the name for the subject will be suggested by the system), the date in which this subject was covered and the number of classes used to cover it (Figure 9).

After recording a class, the teacher can register which students were absent in that class. The teaching plans can also be monitored through a PDA. This function was developed using the MIDP/J2MW [20] technology. In this case, only the most important pieces of information within a teaching plan are represented in PDA, due to its limited screen size. With the PDA the teacher must, at first, choose one of the currently taught disciplines, and then, to select a topic to be covered. The system will show the description of the topic and its associated schedule. After the confirmation of the topic, the system will display a screen so that the appropriated registrations can be done.

The “Grades and Absences Management” module allows the teacher to register the grades obtained in the assessments undergone by the students as well as to report monthly the total number of class absences for each student. This module will only be used whether a PDA is not available to the teacher to accomplish that directly in the classroom.

This module is based on a spreadsheet which has been developed using exclusively HTML and JavaScript. Figure 10 illustrates a spreadsheet used to register students' grades.

FIGURE 10  
A GRADES SPREADSHEET

When the “Grades and Absences Management” module is invoked by a teacher accredited by SWAP, the teacher’s name and all disciplines that are currently under the responsibility of this teacher are recovered from the academic databases. Then, the teacher must select one of these disciplines so that the system can recover the data related to it and build up the corresponding spreadsheet. Note that there are separate spreadsheets for “Grades” and “Absences” (see tabs in Figure 10).

The SWAP spreadsheets include resources which are normally found in mathematical spreadsheets, such as the possibility to define formulas in the cells (for example, to calculate the average grade in a grades spreadsheet, or to calculate the absences percentages, in an absences spreadsheet). Beyond the available spreadsheet resources, this module has a toolbar allowing a number of operations, such as: to publish the spreadsheet content in the institution’s Intranet, to save the spreadsheet content in the academic databases, to print a spreadsheet, to copy a selected spreadsheet content to the clipboard, to transfer the clipboard content to a spreadsheet, to insert a new column in a spreadsheet, to delete a column from a spreadsheet, and to send e-mail messages to a number of students selected from a spreadsheet, among others.

#### IV. FINAL CONSIDERATIONS

This work has presented SW3A, a web-based tool which is being developed to support two very important educational questions: the assessment of academic activities and the students’ follow-up. Normally, such questions are decisive to assure the quality of teaching.

Related to the assessment of academic activities, SW3A allows that an evaluation questionnaire about the disciplines, the teachers, and other subjects concerned to a course be defined by the Course Coordinator and submitted to the students through the Internet. A statistical treatment of the collected answers can produce valuable data for the teachers

to enhance their professional performance, and for the coordinators to take actions to improve the quality of teaching.

With regard to the students’ follow-up, SW3A allows the Course Councils to monitor the development of the teaching plans in order to guarantee the precise syllabus fulfillment. Besides, the system also helps teachers to publish on the Internet both the academic evaluation results and the class attendance control. These functionalities, besides making easy the administrative tasks, can also be important issues to foster high-quality teaching.

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