

WEB Exams – Knowledge Testing Using Educational WEB Collaboration System

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Abstract. Web Exams is a project which was created to make practice, knowledge checks and exams easier, faster and less expensive. The only thing required to use the full power of it is a Web browser which supports frames and JavaScript. Interface is straightforward and simple, which facilitates interaction between a teacher and a student.

Keywords: distance learning, web exams, open source.

1. Introduction

“Educational Web Collaboration System” is a system (see [2]) developed by students of the Faculty of Mechanical Engineering and Naval Architecture (FSB). It consists of different program modules (see [5]) for students’ education and distance learning. Some of them can be used as professional applications by technical offices and for scientific purposes. Common System requires freely available, open-source software (Apache, Php/MySQL) and runs on both Windows and Linux platforms.

The program differentiates two categories of users. Teachers (Fig 1.) define classes, questions, exams and have access to a full statistical review. Teachers control which questions can and which can not be seen by students.



Figure 1. Teachers’ topics

Students (Fig 2.) have the authorization to practice, test their knowledge and write exams which they were authorized to. The program will recognize their category and put them in the adequate interface.



Figure 2. Students’ topics

To date the program has been tested with multiple groups in various courses on the FSB in Zagreb and in the Mathematics department of the University of Osijek.

2. Teachers' interface

The teachers' interface consists of several hierarchically organized Web pages:

- For managing courses and themes inside them.
- For editing and managing the questions of exams or practices (Fig 3.). Except a simple HTML editor, a more complex one (FCK editor 3.7) can be included (see [4]). There are two types of questions. In the first type, several answers are presented and a student has to select the correct answer (or more answers). In the second type he/she is required to write the correct answers in. If a question has a time limit, a clock will show when the time has expired.

Classes and themes Questions Exams Activate exams Statistics Log off

Class: AIS
Theme: strukture
Category: Exam
Choose whether this question is for practice, knowledge check or exam.
Type of answer: Choose the answer
Time limit: 0
Enter time limit for this question (considered only if the approach to the exam is quest. by quest.)
Importance: 3
No. of points: 7
Question body:

```
<p>Zadan je programski Java kod:<br/>
<font face="Courier New">int lista [] = {3, 6, 9, 12};<br/>
for (int i=0; i< lista.length; i++) {<br/>
    tijeio petlje:<br/>
}</font><br/>
Ako se žele ispisati svi elementi polja, onda:</p>
<p><code>System.out.println("Broj: " + lista[i]);</code><br/>
System.out.println(lista[i]);</code></p>
```


Presented answers (only for "choose the answer" type of question):
Every ont presented answer put in new line. Don't write any bullets or numbering

Figure 3. Editing the question

- For managing exams (Fig 4.). The interface is similar to the one used for managing the questions. The exams or knowledge tests are performed using the questions base. The questions database can be continuously updated, new questions added and existing ones changed. The place of appearance can also be changed. In the case of a question “drained” after several appearances on exams, the processor can move it to the group ‘practice’ or ‘knowledge checks’.

The exam is created by selecting question from the database. Each exam gets its own unique number. The corresponding web-exam is accessible to the student who applies for it, by assigning the ID number.

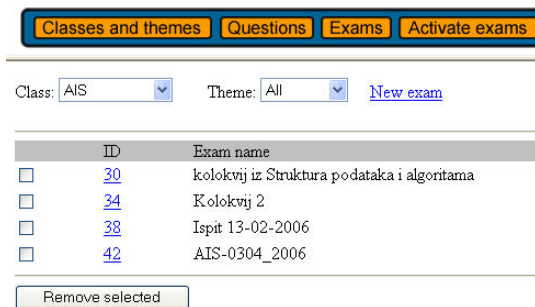


Figure 4. Managing exams

- For assigning exams to students (Fig 5.). Once assigned, the exam is visible to the selected students only. In particular year, each student belongs to one group.

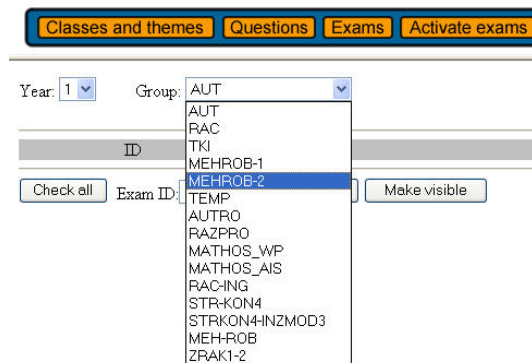


Figure 5. Students' groups

- For statistical report of written exams (Fig 6.): percentage, grades and full review of a written exam.

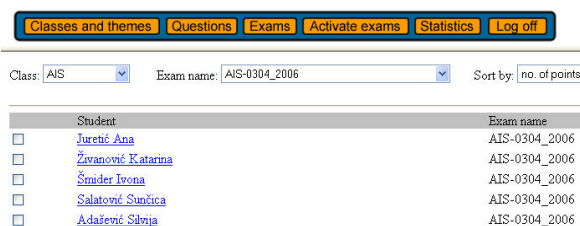


Figure 6. Exams results

3. Students' interface

The students' interface consists of several hierarchically organized Web pages:

- For exercising on questions. To begin a practice session (Fig 7.), students select a proper course and a theme.
- For knowledge checks. The students have possibility to test their knowledge before an exam.
- For showing the list of activated exams that students may solve. The exams are solved like knowledge checks. Once started, the exam can not be interrupted.

The students' interface is quite simple. He/she is able to practice and check knowledge or to have an exam.

If student wants to do a Practice, he/she chooses a course and a theme inside it. Then the question with the offered answers (or the text input field) appears. If the answer is correct, program increases the correct answers counter and offers the next question. If the answer isn't correct, student is offered to solve the task again or to see the correct answer. At the end of the test, student gets the information about how many answers were correct and how many were wrong.



1. Practice problems (with stat)

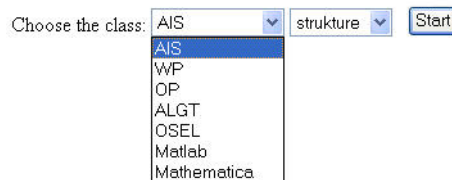


Figure 7. Practice

When taking a Knowledge check, student gets a complete test with time limitation like when taking an Exam, but doesn't have an option to review which answers were correct and which answers were wrong. The only information that student receives after taking the Knowledge check is the number of correct and wrong answers, and the grade which he/she would get if he/she was taking the real Exam. In this way, after taking the Knowledge check, student can decide whether to apply to a real Exam or not. Usually, the tasks in the Knowledge checks are similar (but not the same) to the ones in the Exam. The real-life experience shows that the Knowledge checks are very useful because students do not apply to the exams unless they are convinced they know enough to pass.

Finally, when the students are ready for the exam, they apply for it, and a teacher (based on their application forms) assigns them to the corresponding Web-exam. Exam can be taken in the appropriate computer-classroom. After signing in (entering the username and password), student can see the Exam.

After the approval given by the teaching-assistant, student can open it by hitting the “Start” button. Only one assignment at the random order is shown (Fig 8.), so the probability that the two neighboring students get the same assignment at the same time is rather small. Of course, all students get the same questions in the exam, but the questions are shown at the random order. Also, the offered answers are given in the random order. It means that if the correct answers for one student were 'b' and 'c' they could be 'a' and 'd' for another one.

Once sent answer can not be reviewed and changed, cheating is made almost impossible.

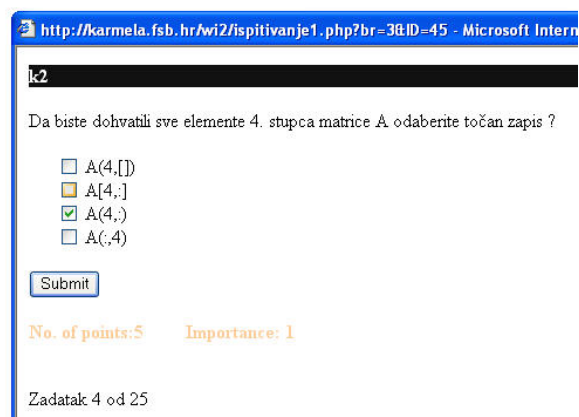


Figure 8. Question example

Each question is assigned to a certain number of points and importance factor. In that way it can be regulated that student can not pass the exam if he/she doesn't know the basics (importance) or didn't collect enough points.

At the end, a statistical report is created. It shows not only results for individual students but also the information about success of the students on each question. That helps the teacher to get the insight to the topics that are not well accepted by students so he/she could explain it better in the future.

4. Conclusion

WEB exams are a module in “Educational WEB Collaboration System” which is growing and developing in a university environment (see [3]). Considering its inclination towards general applications, it can easily be used in both ground and middle level education. The heart of the system is a web application called Scriptrunner, which allows editing and remote execution of computer programs written in various programming languages, and the creation of interactive e-books (in HTML or even PDF) that can contain ready-to-run programming examples.

WEB exams are a logical continuation of this kind of remote, digital learning. This module is developed for the on-line creation of exams by professors and knowledge checks (both free and on exams) for students. Exams are created from a base of questions,

and the questions are created with a special editor. Answers to questions can be given by writing text or by selecting one or multiple predefined answers. Answers are scored on a two-fold criterion, and they can also have a time limit. Creating protection is also built in. Results of an exam are available immediately, on-line, and the statistic includes both students and questions, which enhanced the education process.

Web-exams are integrated unit easily expandable with new additions: student polls and questionnaires, tests for different competitions.

At the same time, it is a module easily mountable in digital books and course books where, except the knowledge transfer and each user's freedom to start examples with their own inputs, it also offers testing of knowledge gained.

A big advantage of this approach is that students do not need any software installed at client side - they need only Web browser. Writing tutorials, writing and execution of program code, writing exams and testing knowledge, for all this is just needed internet connection and user who has requests and wants results immediately. In that sense, Web-exams represent novelty in the world of Internet.

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