

## E-TESTING SYSTEMS: POSSIBLE WEAKNESSES AND POSSIBLE SOLUTIONS

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### ABSTRACT

Evaluation is particularly important step in learning and e-learning process. In this paper we analyze e-testing systems as evaluation tools, their advantages and pitfalls. We discuss the ways to use the systems by the students. At the end we propose solutions for some weaknesses of e-testing systems.

### I. INTRODUCTION

E-learning is a process of education in electronic form through Internet network or the Intranet with the use of management system for education.

Complete e-learning process requires various technical and pedagogical methods for computer and electronic education usage, standards for the creation of electronic course and multimedia textbooks. Trained staff is also required for its realisation.

The e-learning cycle model includes four different steps [1]:

Skill analysis - The learning manager analyses the learner's present skills and skills that are set as a learning goal, and obtains the necessary material (pedagogical - content) information. The manager then searches for the related material (registered for the search);

Content development - The developer creates exercise questions and the content structure linked with explanatory pages;

Learning process - The learner engages in learning process suited to the needs and skill analysis, (individual learning for knowledge acquisition, or collaborative learning for workshop-type learning);

Evaluation - The learner carries out exercises and takes examinations using questions designed according to the learning goal. The learning manager makes the evaluation of each learner, using results of exercises and examinations.

Evaluation is particularly important step in learning and e-learning process. In the next chapters we will analyze advantages and pitfalls of e-testing systems as evaluation tools included in different learning content management systems.

### II. LEARNING CONTENT MANAGEMENT SYSTEMS

Classes of online courses take place online through the use of software packages that have special classroom features such as discussion forums, calendars, "chat rooms" where participants can communicate in real time with each other, quiz and polling capabilities, etc. A platform for online courses, represented by a (password protected) web-site containing files such as word processing documents, sound, pictures, videos, etc, allowing students to access them and interact between each other and with the teacher may also be

called an LMS (Learning Management System) or LCMS (Learning Content Management System) [2].

Different LCMS are in use by learning community. Some significant examples are (Fig. 1):

- Moodle - <http://moodle.com/>,
- Fle3 Learning Environment - <http://fle3.uiah.fi>,
- The Manhattan Virtual Classroom - <http://manhattan.sourceforge.net>,
- ATutor - <http://www.atutor.ca>,
- .LRN - <http://dotlrn.org>.

All of them, in one way or another, implement modules that provide possibilities for evaluation of the students.



Figure 1: Different Learning Content Management Systems

### III. E-TESTING

The process of electronic evaluation of students is referred to as e-testing, web testing, online quiz, etc...

An e-test consists of set of questions that could be:

- multiple choice
- true/false
- ordering
- matching
- drag and drop
- essay
- ...

The test could have a time limit or not, even more, every question could be time limited with different time. The question set could be predetermined or the questions could be given depending on the previous answers of the student.

#### A. Advantages of e-testing

Advantages of e-testing over regular testing are numerous. For example, among the possibilities offered by “Moodle” platform are the following:

Teachers can define a database of questions for re-use in different quizzes;

Questions can be stored in categories for easy access, and these categories can be “published” to make them accessible from any course on the site;

Quizzes are automatically graded, and can be re-graded if questions are modified;

Quizzes can have a limited time window outside of which they are not available;

At the teacher's option, quizzes can be attempted multiple times, and can show feedback and/or correct answers;

Quiz questions and quiz answers can be shuffled (randomised) to reduce cheating;

Questions allow HTML and images;

Questions can be imported from external text files;

Quizzes can be attempted multiple times, if desired;

Attempts can be cumulative, if desired, and finished over several sessions.

The other testing systems offer similar possibilities. Prominent example is [etest.ii.edu.mk](http://etest.ii.edu.mk). [9]

E-testing allows evaluation of large number of students which can be very helpful in institutions where student teacher ratio is high.

Additional features offered by e-testing provide learning manager (i.e. teacher) tool for student self evaluation in the process of learning. Also, large set of different type of questions permit more accurate evaluation of the student. The possibility of re-grading the quizzes after modification of some question(s) offers flexibility and quick recovery if some mistake or inaccuracy in given questions is noticed.

#### IV. WEAKNESSES OF E-TESTING

E-testing as well as regular testing has more weaknesses. One of major ones is collecting (printing, saving, etc...) questions by the students and sharing the copies among them. This can happen when the test is set to be taken by the student in unattended (and unsecured) environment (at home, or some other place where student can access the web), and also when the testing is performed in classroom where students are proctored by someone. Although testing in classroom is less risky, there is a possibility to copy (save) the questions from the detailed summary after the test, or maybe even during the test (as the questions are displayed for answering) and then sending the questions by email or saving them on some memory medium.

When the test is given in an unattended environment, students can use the textbook or work with their friends. They can even have someone else take the test.

If the environment (web or application) of the test is not secure enough, possibility of cheating through going forward and backward, delaying the time, accessing other recourses is also present.

But, most important issue is question database. The questions included in e-tests can be taken from question

database. With every test a part of the database is exposed. If students can save this questions they can quickly have the question database (or main part of it) so after that results from the testing will not illustrate the knowledge of the student on the subject, but just on the database.

When dealing with students that have more computer skills (IT students) one should be aware that they could try to attack the database directly using SQL injection, URL manipulation, buffer overflow, remote command execution, weak authentication and authorization, etc. [4]

Students even use other student's account to take the test and gain the questions. This can be account from a student that has recently dropt out of the faculty.

There are cases when student attempts to take a picture from the computer monitor using his mobile phone.

When students have the questions in electronic format then if access to other applications and processes on the computer where the e-testing occurs isn't protected, students may simply search thru the list of questions (as simple as option “Find”), and just see the right answer of the given question.

#### V. POSSIBLE SOLUTIONS

Feeling comfortable about test security usually comes down to feeling comfortable that (a) the person whose name is associated with the test is indeed the person who took the test and (b) the students were not exposed to the test items before taking the test. If that comfort isn't provided through an honour code, it has to be established through the testing procedures. [5]

Testing procedures should include measures that will prevent students to present knowledge that they don't possess.

When the test is given in an unattended environment, the main recommendation is to give the test in the same time for all the students that attend the course, give minimum time for answering the questions and schedule more e-tests during the course so the impact of each of them on the final grade will be minimal. [5, 6]

Classical procedures, used also with “pen and paper” testing include measures taken during the test like

- identification of candidates,
- seating plan,
- record of attendance,
- etc

and measures after the test, like insuring that no unauthorised materials (for example, printouts, e-content) are taken from the (e-)testing location by candidates.

But, the main question is if there is a way to discourage students to make a collection of the questions from the set of questions that the teachers have. One solution already implemented in some e-testing environments is randomizing the question order and the order of answers (for example, [9]). It makes the printouts a lot less useful.

The problem remains if we consider the possibility student to memorize the questions and correct answers. As a drastic example, a student could memorize that the correct answers of some question are those choices that begin with letter “B”, or that correct answer is the choice with the longest text.

Creating larger question banks and giving tests with random subsets is also an effective strategy. If students can only print a small number of questions at a time, they will need to view the test again and again, and then sort the questions to eliminate duplicates. In this way, memorizing the questions will be rather difficult.

Very clear observation made by many researchers (for example, [7]) is that creating a question database is time-consuming. This is the task that nowadays should be done by teachers. Creating only a minimal set of questions could take more than 10 hours work per week. [6]

The question that remains open is how to create a large set of questions.

One direction in which one could look for the solution is the existence of large community of teachers that can use same standard for produced questions. For example, Advanced Distributed Learning (ADL) have offered Sharable Content Object Reference Model (SCORM) which integrates a set of related technical standards, specifications, and guidelines designed to meet SCORM's high-level requirements — accessible, reusable, interoperable, and durable content and systems. SCORM content can be delivered to learners via any SCORM-compliant Learning Management System (LMS) using the same version of SCORM. [8]

In this way, large sets could be easily created but only in languages that are massively spoken and only on more common topics.

The other direction that we propose is use of software for automatic creation (generation) of the questions. The proposed software should be able to produce a large set of questions using files that contain knowledge of a certain domain. These files should contain knowledge in “nonlinear” way, difficult to be memorized by the students. The application should offer different structures of questions and possibility to change the fixed text of the question.

Semantic web technology, OWL (web ontology language) in particular, offers a way of non-linear description of knowledge. Nowadays, OWL files describing ontologies are produced every day for many specific domains. These files can be used as sources for the software than will be produced. The software will extract the knowledge from the file producing a large number of questions concerning the described domain. The questions can be of different type, but more preferably multi-choice and true-false questions, easy for computer grading.

## VI. CONCLUSION

In this paper, e-testing systems as evaluation tools with its advantages and pitfalls were discussed. Some weaknesses of e-testing systems were explained and revealing the question set from question database was indicated as major problem. Large database of questions was pointed as main solution for that weakness. Directions for solving the problem of creation of large question database were given and ideas for new software for automated production of questions were discussed.

## REFERENCES

- [1] V. Nedeva, “The possibilities of E-learning, based on Moodle software platform”, *Trakia Journal of Sciences*, Vol. 3, No.7, pp 12-19, 2005
- [2] S. E. Kameron, “A Review of Free Online Learning Management Systems (LMS)”, *TESL-EJ*, ISSN 1872-4303, vol.7, No.2, M-2, September 2003
- [3] [http://docs.moodle.org/en/Features#Quiz\\_Module](http://docs.moodle.org/en/Features#Quiz_Module), last modified December 2007
- [4] C. C. Lim, J. S. Jin, “A divide A Study on Applying Software Security to Information Systems: E-Learning Portals”, *IJCSNS International Journal of Computer Science and Network Security*, vol.6 no.3B, March 2006
- [5] T. Rocklin, “Computers and testing”, *The National Teaching and learning forum*, vol. 8, no. 5, pp. 1-4, September 1999.
- [6] E. Powers, “In Support of the E-Test”, [http://www.insidehighered.com/news/2007/08/29/e\\_test](http://www.insidehighered.com/news/2007/08/29/e_test), August 2007
- [7] D. Pain, J. Le Heron, WebCT and Online Assessment: The best thing since SOAP?, *Educational Technology & Society*, 6(2), 62-71, (ISSN 1436-4522), 2003.
- [8] <http://www.adlnet.gov/scorm/index.aspx>
- [9] M. Gusev, G. Armenski, Information Technology Interfaces, 2002. ITI 2002. Proceedings of the 24th International Conference on Volume , Issue , 2002 Page(s): 147 - 152 vol.1