

Advantages, Structure and Capabilities of the Electronic Assessment System

Mariyana Nikolova¹ and Margarita Todorova²

Abstract - The basic structure, the possibilities and advantages of e-assessment system are discussed in this paper. Architecture of the system for e-assessment is presented in two modules: Database examination system and Database management system. System requirements for e-Assessment are examined as well.

Keywords - Education, e-Assessment, the structure e-assessment system, e-test, type of question, advantages of the e-Assessment.

I. INTRODUCTION

The information society is built on the base of million information systems that realize variety of functions in different fields. The construction, development and operation of these systems require specific approaches and skills to apply the modern information technologies in the particular area. This situation requires individuals to adapt their skills and competencies. Consequently, educational objectives and societal expectations have changed significantly in the recent years. Modern learning settings have to consider learning community aspects as well as learner-centered, knowledge-centered and assessment-centered aspects.

Educational community has also changed and updates the forms of training and testing. The development of a good information system for training and education significantly increases the opportunities for improving the quality of the teaching process. It could work effectively only if all participants in the educational process take part in it, and especially the leading personal.

The assessment is an important component of the teaching and learning processes. It is necessary organizational prerequisites to be created, consistent with the specific school, as well as support the from the management representatives.

Technology can support almost every aspect of assessment somehow - from the administration of individual tests and assignments to the management of assessment across a school, faculty or institution; from automatically marked on-screen tests to tools for students` support and feedback.

In order the technology-enhanced assessment to be

¹Assistant Prof. Mariyana Nikolova, PhD, Department of Computer Systems and Technologies Department, St. Cyril and St. Methodius University of Veliko Turnovo, Bulgaria, E-mail: mnikolova_vt@abv.bg

²Assoc. Prof. Margarita Todorova, PhD, Head of Computer Systems and Technologies Department, St. Cyril and St. Methodius University of Veliko Turnovo, Bulgaria, E-mail: marga_get@abv.bg

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effective, pedagogical applications need to be supported by robust and appropriate technology, within a supportive institutional or departmental context.

II. STRUCTURE OF THE E-ASSESSMENT SYSTEM

The formative e-assessment is understood as the use of ICT (Information and Communication Technologies) to support the iterative process of gathering and analyzing information about process of learning by teachers as well as by learners for evaluating the results in relation to prior achievement and attainment of intended, as well as unintended learning outcomes.

The system for e-assessment comprises two components: an assessment engine and an item bank. An assessment engine consists of hardware and software required for creation delivery of test. Most e-testing engines run on standard hardware so the key characteristic is the software's functionality [7].

There is a wide range of software packages for e-testing. E-assessment system that provides analysis and statistics include many specific software modules. The software does not include pure questions; these are provided by an item bank. Once created, the engine uses item bank to generate a test. Traditional paper-and-pencil testing is similar, but the test is generated from the bank at only one time, when it is sent to publishing.

The creation of the item bank is more expensive and time consuming than the installation and configuration of the assessment engine. This is due to the fact that the assessment engines can be bought "off the shelf" whereas an item bank must be developed for each specific application.

An e-assessment system designed to focus on more sophisticated forms of knowledge requires some sort of interactive activity and a system for inviting students to reason or solve problems around that activity [7]. The structure of the system for e-assessment is presented in Figure 1.

The e-assessment system includes the following modules: Database management system (DMS), Databases examination system (DES) and user interface for teachers, student and system administrator. The basic task of this paper is organization of DES. We suggest it to contain two modules: Storage of questions and Repository of the assessment results.

Storage of questions is the important part of the system. It stores questions that will be use by the students. Construction of an unambiguous, productive and unrepresentative questionnaire is a difficult process. It is very important all possible options to be offered by the teacher [2], [4]. The questions can be used in various tests once created. This requires teachers to add information for each question. Let call this information code.

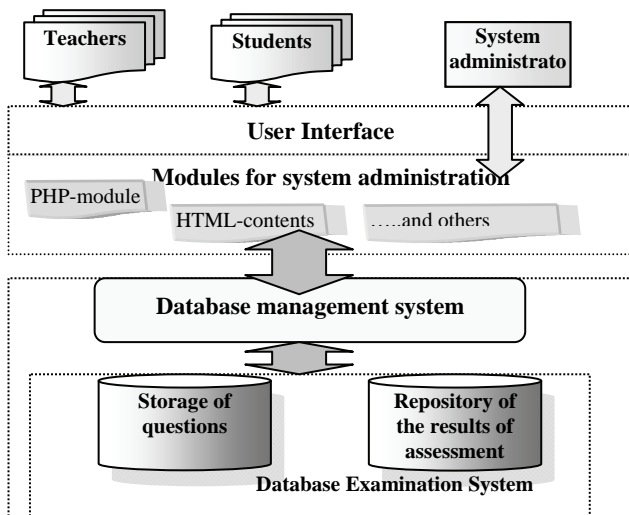


Figure 1. The structure of the e-assessment system.

For each question is entered code by teacher with the information for: **Discipline, Section, Class, Difficulty**.

The types of questions can be very different:

- ✓ **Direct** - they offer the respondent to express his own position.
- ✓ **Indirect** - to the respondent is given an opportunity to express agreement or disagreement with the position of other people.
- ✓ **Questions filters** – They are called so because it is possible to select the respondents according to given indicator. For example - gender, age, profession, etc.
- ✓ **True - false statement** - suggest two mutually exclusive response options (type 'yes-no').
- ✓ **Question-menu** - requires answers when the respondent can choose a combination of variants of answers.
- ✓ **Questions - rocks** – those questions which answer is putting in order something in preliminary determined scale.
- ✓ **The Table issues** - suggest as a response to fill table.
- ✓ **Open questions** - do not contain any version of the response, a respondent answers his opinion in certain place in the questionnaire.
- ✓ **Half-questions** – part of the variants of the answers are preliminary suggested, but the student may write something additional.

There are some special rules for formulation of questions and answers, compliance with which ensures maximum reliability of the answers of the respondents [1], [3].

The most important principles of questions are:

- ✓ Questions and answers must not contain suggestion that one way or another direct to some answers or make them more desirable or more prestigious.
- ✓ Creating artificial opportunity some of the answer to be given more frequently than others;
- ✓ When the question is "closed" (i.e. there are pre-defined options), all possible cases, have to be predicted;
- ✓ Question and all answers must be formulated in an equivalent manner so that various responses to have the same conceptual value;
- ✓ The answers should form a unified scale and relate to one and a same sign;

In education a well constructed survey can be a tool for feedback, which can significantly enhance quality of education. In this case there must be adequate and rapid response as a result of the aggregated answers of students in order to change their approach and training institutional.

III. LIFE CYCLE OF CREATION OF THE E-TESTS

Life cycle of creation of the tests has three phases [5].

I. Preparatory phase:

- Target;
- Design of questions, answers and practical tasks;
- Determination of weights indicator - determining the difficulty of the problem and which part of the material relates;
- Design Test;
- Defining structural variations for different types of tests - linear (conventional), adaptive (in difficulty), interactive;
- Written instructions for students.

II. Operating phase

- Administration of various types of tests - optional version control;
- Providing a test dynamic or static, with the possibility to derive the correct answer, visualization of information relating to the material of the wrong question;
- Navigation.

III. Evaluation phase

- Scoring, evaluation and analysis of results;
- Assessing the quality of knowledge;
- Extraction the necessary data for statistics (for the management of educational process).

The repository of the results from assessment stores (Figure 2):

- e-tests;
- E-portfolio;
- Another type of theoretical and practical examinations

Just like traditional testing, e-Test is a method of assessing learners' ability to meet the required standards. The difference is that e-Tests are extracted from a computer, rather than pen and paper.

In the electronic portfolio (e-Portfolio) [8] the learners could upload and submit except all other information for themselves, also their work – term papers, solved problems and other tasks assigned by teachers. Unlike traditional paper based methods, e-Portfolios provide much richer and varied ways of recording and presenting proofs about their knowledge and skills. Learners can submit a range of file formats including word processed documents, spreadsheets, images, video and sound files. Then the content of an e-Portfolio can be shared with others.

Another kind of examinations that teacher provides could be practical and oral excises, projects, etc.

All that is needed to work with the system for electronic verification and assessment is PC or laptop with Internet access or LAN, where the server of the system is located. No specialist software or hardware is necessary because everything you need may be accessed via the network. Everything is access on the network via a user account, i.e. after registration and granted access to the system for electronic verification and assessment.

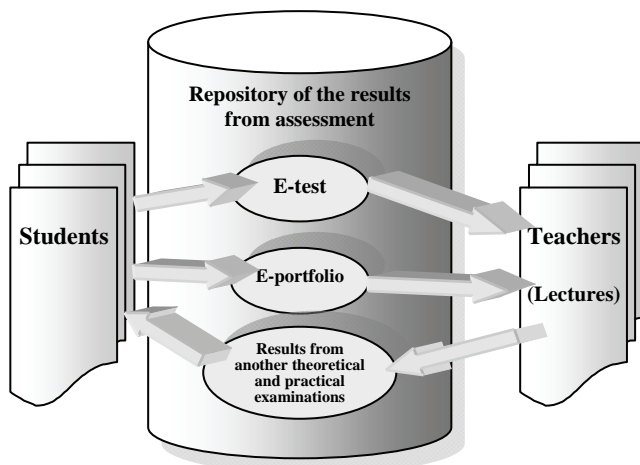


Figure 2. The repository of results from the assessment stores

Link between the teacher and student and Databases examination system

Architecture of the link between the user and database consists of three components: server, browser and client database. Handling and recording data is realized by using scripts that run the (web) server. User connects to the web server using a client browser. The server receives the request and processes it by script.

CGI (Common Gateway Interface) [9] is a specification for the interaction of Web-server with other applications. A typical CGI-program run of Web-server implementation of the task, returns the results to the server and ends his performance.

IV. THE ADVANTAGES OF E-ASSESSMENT

E-assessment is becoming widely used. It has many advantages over traditional (paper-based) assessment. The advantages include [3], [6], [8]:

- **Richer assessment experience** – questions can be made clearer and more detailed through the use of text, sound and video which can aid motivation. For example, e-Portfolios allow the use of digital video, animations, presentations etc to be submitted electronically for assessment.

- **Increased flexibility** – assessment can be provided at a greater range of locations. This means assessment on-demand can become completely achievable.

- **Instant feedback** – results are often available within minutes of taking an e-Test, as well as diagnostic information on a learner's performance, highlighting areas that can be improved upon.

- **Reduce the administration burden** – fewer paper forms to complete, no posting of test papers.

- **Greater storage efficiency** - tens thousands of answer scripts can be stored on a server compared to the physical space required for paper scripts.

- **Enhanced question styles** which incorporate interactivity and multimedia.

There are also **disadvantages**. E-assessment systems are expensive to establish and not suitable for every type of assessment (such as extended response questions).

The best examples follow a Formative Assessment structure and are called "Online Formative Assessment". This involves making an initial formative assessment by sifting out the incorrect answers. The author/teacher will then explain what

the student should have done with each question. It will then give the student at least one practice at each slight variation of sifted out questions. This is the formative learning stage. The next stage is to make a Summative Assessment by a new set of questions only covering the topics previously taught.

V. CONCLUSION AND FUTURE WORK

The term e-assessment is becoming widely used as a generic term to describe the use of computers within the assessment process. Specific types of e-assessment include computerized adaptive testing and computerized classification testing.

E-assessment can be used to assess cognitive and practical abilities. Cognitive abilities are assessed using e-testing software; practical abilities are assessed using e-portfolios or simulation software

Assessment systems may support parts or the entire chain of the assessment lifecycle. This lifecycle includes authoring and management of assessment items, compilation of specific tests, performance of assessments, and compilation and management results.

The use of the different forms of control and assessment of knowledge and the e-technologies give the opportunity for:

- The results of the assessment and tasks performed by students to be saved in e-form;
- Free access to the tests and the results of the assessment process;
- Full and complex analysis of the results from the teaching;
- Opportunity for feedback and adjusting the structure of curriculum and technology training.

In order to be developed a model of an optimal assessment system and the components, their characteristics and structure to be defined. Also an open assessment system may be developed. This system should consist of database with the results from the assessment with the classical and electronic methods, data base with the different types of questions (static and dynamic), mechanism for generation of different tests, according to the complexity, mechanism for access and of the results from the statistical analysis.

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