



Automated Knowledge Management through E-Testing

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ABSTRACT

With the increase in the pace of technological progress in modern professional education, the organization of automated control of educational achievements becomes popular.

The purpose of the work is to analyze computer testing software. The article presents software systems designed to develop test tasks and conduct control and assessment work using computer technology. The process of design tests taking into account the instrumental capabilities of electronic systems is disclosed, comparative characteristics of the main functions of the programs under consideration are presented. Software packages, including My TestX Pro, IREN, SunRav Test OfficePro and others provide a wide range of electronic tools for creating tests that meet modern educational needs. They allow you to organize both local and network tests of different levels of complexity. Tests include several types of questions, including music files, images, and videos.

Key words: computer testing, automated testing systems, electronic software, software, automated assessment of educational results.

1. INTRODUCTION

According to the requirements of regulatory documents in the modern educational process in a higher educational institution, innovative electronic technologies should be used [1]. To implement an effective assessment of the educational results of students, modern assessment systems should be applied [2]. Currently relevant are electronic testing systems that provide the ability to:

- use of the developed test for both control and self-control of knowledge [3];
- implementation of multimedia technologies in the testing process;
- use of various types of questions;
- intuitive user interface;
- storage of test results [4].

The automated assessment allows students to instantly get test results and quickly correct their mistakes [5]. The learning process becomes more intensive and allows you to quickly achieve the planned educational results.

The article presents an analysis of several software systems for conducting computer testing in a professional educational institution [6]. When creating an electronic test, developers take into account:

- friendly interface to the subject;
- the possibility of initiating dialogue from the respondent [7];
- self-regulation of the pace of testing;
- the ability to return to previously missed issues [8];
- adaptation of the measure of the difficulty of tasks in relation to the capabilities of the subject [9];
- automatic recording of results;
- formation of a test protocol.

The use of computer technology in the process of assessing student achievement provides:

- reduced opportunities for cheating;
- automation of control functions and increase teacher productivity [10];
- the possibility of increasing the number of control measures for control and self-control [11].

The capabilities of modern computer testing should allow the teacher to make the most objective assessment of the results of the student's educational activities, and the student to conduct a self-assessment of their achievements in order to timely correct errors and quickly form competencies.

2. THEORETICAL FRAMEWORK

Automated testing systems are an extensive class of programs that allow the development of electronic tests.

Among them:

- My TestX Pro;
- IREN;
- SunRav Test OfficePro and others.

My TestX Pro is a system of programs for creating and conducting computer tests, setting grades on a given scale, collecting and analyzing results. The program My TestX Pro

allows consists of three modules:

- testing module;
- test editor;
- test log.

This program is available as an installer and as an archive [12]. In the testing module, students pass the test. Test module file name: MyTestStudent.exe. Creating a test is carried out in the module "test editor". File Name: MyTestEditor.exe [13]. The editor allows you to build the order of tasks, set a time limit, rating scales, and others [14].

Centralized reception and processing of results are carried out in the module "Test Log" (server). To send and receive results, the TCP / IP protocol is used. The name of the text editor file is MyTestServer.exe. The program supports ten types of tasks [15].

The program can support several types of testing modes, which are independent of each other [16]. The wide range of configuration options allows you to effectively solve a variety of tasks [17].

My TestX Pro organizes both local and network testing. During network testing, its results can be transferred over the network to the "Log" module, sent by e-mail or to a web server using the POST method [18]. The program provides for the creation of stand-alone tests - programs that contain one test and the settings of the testing module in one executable ex-file.

IREN (Interactive Remote Education Network) is an interactive distance education network. The IREN program includes 5 types of tasks [19].

The program provides for the creation of tests in the form of stand-alone executable files (allows students to undergo testing without using the Internet and without storing the results) [20]. This mode is used for self-students.

SunRav Test OfficePro - software that allows you to create tests of different levels of complexity [21]. It allows you to control both online and without Internet connection [22]. The program includes:

- tMaker - a program for creating tests with the ability to answer using images, animations, audio and video clips [23]. The program is suitable for users with any level of training. It is possible to import tests created in a text editor or spreadsheet editor;
- tTester is a testing program with a simple and intuitive interface. The program settings provide ample opportunities for maximum individualization of the test [24];
- tAdmin is a program that allows users to manage and process the results of an electronic test [25]. It is possible to create a response matrix.

In addition to the fact that SunRav Test OfficePro allows you to use 5 types of questions that can be arranged in different sequences, it makes it possible:

- integration of tests into electronic textbooks (tests can be an integral part of the training manuals created in the SunRav BookOffice \$ program

- launching external programs (while passing the tests, the student can open any other programs from the toolbar).

Table 1 presents the comparative characteristics of the main functional capabilities of the considered programs.

Table 1: Comparison of the functionality of software systems

Criterion	Software package		
	My testX pro	IREN	SunRav Test OfficePro
Database coding	+	-	-
Ability to return and correct errors	+	+	+
Grading system	points	points	points and per cents
Ability to mix questions	+	-	+
Variety of Question Types	-Single choice; -Multiple choice; - an indication of the truth or falsity of the statement; - establishment of the sequence; - establishing compliance; - manual input of numbers and text; - choice of place in the image; - rearrangement of letters; - filling in the blanks; - questions with audio and video content	- selection of one or more answer options; - to establish; manual input; - to streamline; for classification	- single choice; -Multiple choice; - open question; - conformity; - ordered list

Also, in the educational process, the software packages Net Test, ACT-Test, TestMaker are in demand.

Net Test software package is intended for mass testing. It automates:

- The process of selecting questions from the database;
- time-limited testing;
- processing of results and their presentation;
- analysis of the results (the most difficult questions among students).

The complex consists of two programs:

- server;
- client.

The server version allows you to create and edit tests, as well as complete control of electronic testing. The client program is launched from the student’s work pages.

Each question of the test can be accompanied by illustrations of any size, format BMP, GIF, GPG, formatted text RTF, sound files WAV. The number of asked questions is not limited.

TestMaker program allows you to create high-quality tests and provides a wide range of test features in combination with a simple and intuitive interface. Testing can be either group, centralized, or individual.

ACT functional elements include:

- test constructor;
- test task wizard;
- database of test items;
- adaptation mechanism;
- mechanisms of comparison and classification;
- administrator.

The adaptive test environment test constructor differs significantly from the TestMaker constructor.

3. RESULTS AND DISCUSSION

If you compare TestMaker and ACT, then the test database is created in TestMaker using the file folder, in ACT - using the drive, the test database is diagnosed in TestMaker by viewing the list of questions, in ACT - using diagnostics, test generation in TestMaker - a command in the File menu, in ACT - in a menu on the designer panel.

Test design in both programs is carried out with almost the same set of operations.

The difference is that for the TestMaker complex, operations are performed using one window with a small number of special-purpose tools [26]. Designing a test in ACT involves creating a separate window for each operation. ACT and TestMaker are the most affordable domestic developments for use by educational institutions.

Testing in TestMaker with the open form of questions is carried out in the editor window with two lines “Value”, where the condition without a keyword and “answer” is recorded.

Where the keyword is recorded, it is possible to deviate the wording of the keyword from the original. In the ACT-Test, in the open form of the task, its type is selected at the first step of the algorithm and conditions are entered at the third and fourth steps. The open, extended form of the task in TestMaker provides for the use of an editor window with two fields “Value” and “Answer”. In ACT, select the task type in the first step and enter several task values with the “add” command in the fourth step of the algorithm.

In a closed-form in TestMaker, an editor window with a line where the condition is written. In the options field, the icon indicates the correct one. In ACT-Test - choosing the type of task at the first step of the algorithm and entering the conditions at the third and fourth steps. To complete the

“Matching” task in TestMaker, an element in the right field is activated to enter a pair of elements in the upper line.

In ACT-Test, select the type of task at the first step of the algorithm and enter the conditions at the third and fourth steps. Sequencing is performed in TestMaker as well as in an expanded open form.

In ACT-Test, select the type of task at the first step of the algorithm and enter the conditions at the third and fourth steps. Text is introduced into TestMaker through the “Static Text” command; in ACT-Test, the introduction of the algorithm in the third and fourth steps.

The ACT software package allows you to design tasks and tests using multiple windows, which on the one hand increases the amount of developers’ work compared to constructing in TestMaket, and on the other hand, it provides a friendly developer interface with the program and better control over tests. Designing tests in ACT has three difficulty levels, four input fields for the task content following the form, and a step-by-step algorithm.

For students, tests were developed according to a certain criterion using various software tools. They performed assignments for one semester of study. A survey was conducted among the developers, which made it possible to identify the most relevant software solutions.

Figure 1 shows the survey results.

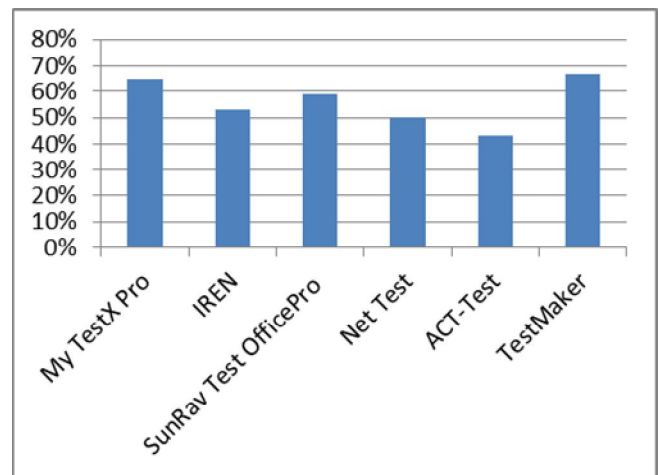


Figure 1: Results of statistical processing of data from a survey of developers’ test

The survey results showed that all programs have approximately the same values, but TestMaker is of most interest. According to the developers, its functionality allows for a qualitative verification of the achievements of students in higher professional educational institutions.

4. CONCLUSION

Modern test designers are universal programs for testing students' knowledge. Programs provide the ability to develop an unlimited number of tests. Various types of questions are

supported, including with WAV, MID, RMI music files, GPG, BMP, ICO, EMF, WMF images, AVI videos. The topics, questions and answers are exported to files of various formats. The use of software systems designed to develop test tasks and carry out control and assessment work allows for the on-line verification and self-verification of students' educational achievements, timely adjustment of the learning process and improving its quality. The variety of software systems allows you to choose the most suitable option for students, equipped with a sufficient number of functional capabilities.

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