KNOWLEDGE DEMONSTRATION AND ASSESSMENT SYSTEM "CYBER1"

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Abstract: The article discusses a computer-based system for knowledge demonstration and assessment „Cyber1" created by Z. Munijishvili, T. Munijishvili, and A. Meladze. The system is used at Batumi State University and Ivane Javakhishvili Tbilisi State University. The article describes the functions of the program and shows its advantages in relation to similar programs available on Georgian market. The practice of the educational institutions and our own experience shows:

1. The conditions relevant to the compilation of e-textbooks should be created. Our school should initiate it.

2. To this end, an initiative group should be formed at the school to coordinate the creation of the e-textbooks.

3. The textbooks approved by the school should be uploaded.

Using "Cyber1", teachers enter tests and cases studies into the database for the respective subject. The teacher can create audio, video and graphic files and connect them with tests (case studies), can make edits to the database, arrange tests from simple to complex, determined the number of tests and case studies per content area, duration of the exam and passes the product to the exam center.

If the computer stops working during the exam, the last version of the test is auto-saved and time spent on the test is recorded, and the student continues the exam form the point of interruption and with the remaining time.

Keywords: Computer systems, Accounting, knowledge system, "Cyber1".

Introduction

Demonstration and assessment of knowledge through a computer-based system is the only option for improving a learning process. We researched the challenges of the "Cyber1" system designed to allow demonstration and evaluation of the knowledge and skills through a computer-based system at Batumi State University (BSU) [Munjishvili & Munjishvili, 2011; Munjishvili & Munjishvili, 2012]. Authors of the program are Z. Munjishvili and T. Munjishvili.

There are sufficient number of computer-based programs for the demonstration and evaluation of knowledge available on the market. One of the examples is a computer based remote system "Moodle" developed by Microsoft Corporation. According to our information, higher education institutions in Georgia use Moodle or other locally developed programs for the assessment and evaluation of knowledge. Unfortunately, during the research we were unable to locate and collect information on the programs for knowledge demonstration and assessment developed in Georgia.

Computer systems established at Batumi State University are functionally identical to the Moodle. There are some differences (explained in Table 1).

Demonstration and evaluation of knowledge through computer-based systems is effective in combination with the other methods. Even highly sophisticated computer systems are unable to provide opportunities to demonstrate creativity.

Table 1

Name of the System	Functional Capacity
Moodle	It is necessary to train teachers to be able to create tests;
	If the computer stops working during the exam, the last version of the test does not get saved, only the time spent on the test is recorded (in case of browser issues); the student needs to restart the test.
	The system is not integrated with other components of the study process;
	In a standard configuration, it is not possible to type in Georgian language.
"Cyber1"	It is NOT necessary to train teachers to be able to create tests; The teachers enter tests and cases studies into the database for the respective subject. The teacher can create audio, video and graphic files and connect them with tests (case studies), can make edits to the database, arrange tests from simple to complex, determined the number of tests and case studies per content area, duration of the exam and passes the product to the exam center;
	If the computer stops working during the exam, the last version of the test is autosaved and time spent on the test is recorded, and the student continues the exam form the point of interruption and with the remaining time.
	The system is integrated with other functional blocks of the study process.

Demonstration and evaluation of knowledge through computer-based systems is one of the determinants in the assessment system. BSU is a good example for the creative use of the computer-based systems, where 60% of the student assessment relies on computer-based tests, while 40% on traditional methods of assessment. Computer-based assessment – 60%-70% - is distributed in the following way: 20%-30% two midterm exams, and 40% for the final exam. Depending on the subject, the final exam is a combination of computer-based and traditional method of assessment: usually 20% - computer-based and another 20% graded through a traditional method.

"Cyber1"

Starting from fall of 2011, BSU uses a computer system – "Cyber1" for mid-term and final exams.

Computer system – "Cyber1" uses the database of open and closed test for the exams. The tests should be relevant to the subject area and content. *Closed test* is a test, where a student has to choose one or more correct answers from N number of multiple choice answers. A test is called *open test,* where a student has to answer open-ended questions. The student may need to calculate results, construct a sentence with word forms provide figures. Sentences may include numbers assigned from the accounting system, logistical transaction and etc. It should be possible to use wrong word forms, abbreviations, different forms of the words, as well as typing in necessary alphabets.

Methodological aspects

Methodological aspects of developing the tests are discussed in respective literature thoroughly [Chelishkova, 2002].

Depending on the content area ratio of open tests may be as high as 100%; for example for subject areas as foreign languages, linguistic speech, etc.

Computer program used at BSU allows:

— To administer mid-term and final exams with large number of students in various subjects simultaneously;

— To conduct exams in a subject by student specialization;

— To select maximum three correct answers from multiple-choice question with seven options of answers;

— To write maximum 30 correct answers in open test for each question (this number may be increased in the future);

— To illustrate any test or ask a question using graphic or video representation. At the departments were international students are enrolled, audio player is used for subjects lie Georgian language vocabulary and grammar, Georgian speech and conversation culture. The student listens to the Georgian word, sentence has to select or provide a correct answer;

— To activate or deactivate the bar showing correct answer when a student responds incorrectly;

— To show warning notes when a word is spelled incorrectly or a sentence is constructed with a mistake. For example, the first type would say – you used a word that is not recognized by the system; a student used the word "analysis" instead of a word "debit", the second type - you have not answered all questions. In the first example, the system asks the student to clarify, in the second note it reminds the students about the questions that still need to be answered. If a student provides correct answers points are accrued, if not the system suggests a correct answer;

— To type answers in Georgian or Latin alphabet;

— To administer a test in various languages simultaneously for the same subject (in Georgian, English, Turkish, etc.);

— To type word forms, incorrect forms and abbreviations in the answers;

— To evaluate the question with two correct answers with proportional or full scores;

— To assign values to correct answers in simple and complex tests;

— To formulate the test questions according the content area, discipline and specialization of study;

— To print student lists who take an exam;

— To select relevant tests for each student before beginning the administration of a test;

— To rearrange the correct answers in the multiple choice tests to eliminate the correct responses based on probability;

— To review a report at the completion of the exam;

— To renew the test database in the system;

— To minimize the test review time using the automated scoring system;

— To review student appeals simultaneously with the administration of the test through the second review;

— To record data in an electronic journal;

— To organize electronic reports according to the scores in each evaluation component, as well as final scores for a term.

2012/2013 exams were administered using a computer-based system "Cyber1" at all departments in 81 subjects. Approximately 70% of tests were open and 30% were closed (Table 2).

Table 2

№	Department	2012/2013	
		I term (80 subject)	II term (81 subject)
1	Education and Sciences	2596	1395
2	Social sciences, business and law	1228	790
3	Agrarian technologies and ecology	213	137
4	Engineering and Technology	204	77
5	Tourism	626	435
	Total	4867	2834

Audio questions were used for international students to assess knowledge of Georgian language in the following subjects: "Strategies of oral communication" and "Aspects of Communication in Georgian Language".

Electronic system for planning and managing the learning process relies on the *Information* protection. The databases are protected at technical, programmatic and system level. Special algorithms are used to decode the information in the database.

Discussion

As a result of a universal education, modern teachers have to deal with large numbers of students, with tutorship becoming a problem due to the time frames. Increasing numbers of students have called for a likewise increase of the number of teachers.

Unfortunately, true professionals are not so numerous in any field including instruction. Meanwhile, the inefficient people stand out for their aggressive ways and tenacity. They hold offices and attract the people of the kind. On the face of it, it is a deadlock. Large numbers of students make instruction difficult and, at the same time, increase the number of teachers not all of which are good profeccionals. Therefore, instead of progress, degradation is the ultimate result. There are quite a few certified ignoramuses.

Learning and demonstration of what one knows by means of a computer calls for caution. Computer is no panacea but an element of studying and teaching. "Shota Rustaveli" State University in Batumi, Georgia, exemplifies a creative approach. Mastery of a number of subjects there is assessed by the scale of 100 points, 50 out of which are account for the computer. The final examination results are determined by computer (20 points) and a classical method – (20 points).

It's hard to define what part the computer should play in displaying and assessing the knowledge. We believe that not even the most sophisticated computer can replace an experienced teacher. We are not sure whether the computer would be OK with Socrates and his followers?

We aim at the preservation of the universal education, higher quality thereof, dealing with a large group of students as if there were just a few of them in it, a slowdown of the influx of inefficient teachers and a creation of a comfortable environment for creative instructors and students.

An intellectual system, which would advise a student about the ways and means of making an appropriate decision, assess the obtained knowledge and, if need be, connect him/her with the lecturer is the call of the day.

The electronic systems employed in instruction make up a conglomerate used for mastering, demonstration and assessment of knowledge. Knowledge can be obtained by means of e-books, video lectures and or a combination thereof. There is no shortage of software designed for mastering, demonstration and assessment of knowledge. For instance, the Microsoft developed Moodle software for e-learning with its learning and knowledge demonstration features.

Learning by means of computer systems

In this report we are focusing on learning, namely by means of computer systems. In any syllabus, independent work makes up 60% of overall studies. A student should familiarize oneself with the learned and forthcoming materials, solve tasks, do sums and analyze the issues raised by the teacher.

To this end, a student should obtain the relevant literature in the native language. The Internet is a world library, which makes it possible to publish texts, as well as the graphic, audio and video information relevant to the individual instruction.

An e-textbook should be well-stuctured. Can the ones in all subjects be structured? There is no cut and dried answer. We asked a professor of geopolicits if a task or a test could be formulated in the way to make the appraisal of a student by his/her answers possible? In a couple of days, the professor brought a picture saying that a student was expected to answer the questions: what event does the picture depict? When did it take place? What happened next? The picture depicted crossing of the Alps by Hannibal.

The example makes it clear that merely everything can be structured and that a one can always set a task relevant to the learned material.

We believe that any issue could be depicted in the e-textbook by way of supply of textual, graphic, audio and video information.

There are various kinds of e-textbooks, all across from the most simple PDF to the more complex HTML files with the sophisticated search engines. It's the same with the video lectures: the ordinary 30-60 min. or topical 15 min. lectures, with the video embedded self-verification open and closed type tests.

The e-learning Moodle system is an instance of comprehensive approach to the problem. It involves compilation of e-textbooks and test training. As the practice has demonstrated, compilation of textbooks and creation of a test-base is a laborious task, which calls for specially trained lecturers, especially where the test and task base is concerned.

The IT Internet University [Munjishvili & Munjishvili, 2012] has found an efficient and simple way of compiling the e-textbooks. Those are created in the HTML format, with the duration of a video lecture not over 30 min. Each lecture ends with questions for self-testing. There are but few textbooks containing a combination of the textual, graphic and video information [Munjishvili & Munjishvili, 2011; Chelishkova, 2002].

Studying involves several elements: familiarization, learning, self-verification and getting clarification of incomprehensible issues.

Reading and listening is not enough. Verification of what one has learned is no less important. The instruction involves feedback. A teacher puts questions, sets tasks on a taught issue, verifies the answers, if necessary, re-

explains, points out the reasons behind a student's mistake and, finally, shows how a task should be solved or solves it himself.

Studying by means of an intellectual system will imply: a user starts studying a subject by selecting the relevant level. A subject is taught by means of e-textbook containing illustrating texts, graphics and videos. Self-verification is an integral part of learning. The system offers to describe a typical situation, which has been discussed and controls the description all along. The result of a user's action is automatically compared to the one in the base. In case of an inaccuracy, the system offers to select another way. The user can follow the system's decision-making.

Learning of a theoretical or a practical issue is a multiple process. The final stage is the appraisal during an examination.

The obtained knowledge is assessed by the relevant software, which is an integral part of the intellectual instruction system. The software contains randomly selected exercises and the answers are verified according to the teacher's tasks. There are two kinds of exercises: first - among the likely answers, a student can select more than one right answer; second – a student should enter the answers by way of book entries, calculations or simple sentences in the Georgian language. There may be several answers to a task.

A wrong answer is displayed in the knowledge base.

The is a multilevel knowledge base. In training or an examination, the teacher determines the number of levels. After a training (an examination) the user familiarizes with its process and the substantiation of the answers. According to the result, the system suggests the most acceptable learning strategy.

After acquiring knowledge and students' self – testing directly with the next teacher, extended studies of material generalization, doing exercises and sums should be accomplished through dialogue. We mainly focus on the software computer system for holding trainings. The article further refers to the computer program of "cybertesting" for exposing knowledge and its estimation system with the help of which the vision of updated education system is achieved (the author of the software package: T. Munjishvili, Z.Munjishvili).

The basis for any software computer system is the multiplicity of material, formed through software education method and tasks and exercises, reflected through it. The number of issues is determinative. Probability selection of few issues among others is implemented during the trainings and estimation. Relativity between the methods of exposing knowledge and estimation with traditional and computer programs may compose the following 1:1, 2:1, 1:2, 1:0, taking into consideration the specifics of certain subject. For example, if the general degree for the intermediate estimation is 60 points, then according to the specifics of the subject 20 points with teachers' traditional methods of estimation (essays, coursework, activities, others) and 40 points by software systems shall be determined and vice - versa.

Any problematic issue should be represented as the entire work of theoretical and practical exercises. The basis for studying theory and its estimation is testing system. As commonly known, the tests presently mean one correct answer per N conjectural answers per question. Practically the following relativity between correct and wrong answers is adopted: 1:2, or 1:3, i.e. one correct answer should be selected for 3 or 4 questions. In terms of such testing, the probability of correct answer by the student increases without deep comprehension. The testing process is complicated, if 2 or 3 correct answers should be selected among N conjectural answers and the relativity between the correct and wrong answers is the following: 1:3. The tests where the multiplicity of conjectural answers is given and the correct answers should be selected among them, is called closed types of tests. These are filed in the following way: (Figure 1).
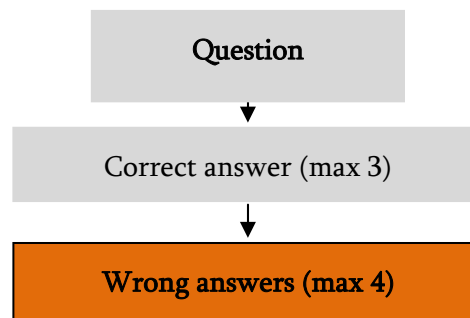
Figure 1. Closed type of tests - structure

The open type of tests is where students are required to write answers and not select them. Here, the number of answers to the task is not actually limited. The answers may be numbers, words, sentences, or their combinations.

Task

The goods have been purchased by credit at GEL 52000 at drawback. The liability should be covered in 30 days. In case of covering the debt in 10 days, the drawback composes 5 per cent. The operation is reflected through pure amount method. The enterprise applies uninterrupted method of stock registration. The buyer did not use the drawback.

Debt: Determine the prime cost of the goods purchased, determine the none-operational income, received through offered drawback, reflect credit debt formation through complicated accounting paragraph and finally reflect covering of credit debt through complicated accounting paragraph.

**Solution**

    52000

    2600

    Debit 1610 52000 K 8190 2600 Credit 3110 49400

    d 3110 49400 Deb. 8190 2600 kr 1210 52000

The first two answers of the task are numbers, while the third and fourth answers represent contestation of numbers and words. Some numbers here are account, while others reflect economic operations. In answers the words – debit, credit – are used in wrong meaning with different alphabetical script (Latin, Georgian).

In foreign language the common form of assignment is represented as a text. In the sentence, there are few words, missing, which should be found by the student. In such a task, there are dozens of answers. The structure of the task (open test) is the following (Figure 2):
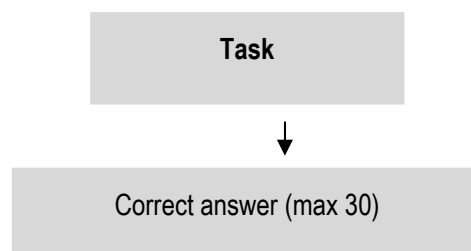
Figure 2. Task structure (open test)

The software system should acknowledge wrong versions in any case and conjugation of the used words, existing in answers, as well as syntax and semantic analysis of the sentence.

Naturally, both tests should be grouped according to the subjects and the number indicated in advance per subject should be accomplished through probability. In this case, the relativity between the number of open and closed tests are essential. The number of open tests should be preferably equal, or maximum twice as much to the closed ones. At the same time, the difference between the estimation points of the open and closed tests is also important. Practically, the point for the correct answer in terms of the closed test should be 4 times less than that for the open ones. The contents of the tests are of great importance. Surface contents of the test is discrediting for exams and education process. Both types of test should be formed of several complications. In training mode advancing from one level of complication to the upper stage should be accomplished with certain criteria.

Conclusion

The software program developed by us and put into operation for further exposure and estimation of knowledge – Cybertesting satisfies all the requirements above. Preparing and holding trainings and exams with "cybertesting" consists of the following stages:

1. Formation of database for tests and organizing dictionary;
2. Formation of assignment for training, intermediate and final test;
3. System functioning: trainings, intermediate tests, final exams;
4. Printing protocol and other information describing the proceeding of examination.

The system is multi languages. The given version includes the realized multi-languages versions – in Georgian, English, German and Russian languages. Encryption of testing and tests with special algorithm is used.

Any task may be illustrated, or published with visual pictures, graphic images or videos. The formation of colloquium and exam assignments together with the duration of exam shall be implemented by the lecturer with the given assignment. The tasks composed on the subject refer to the topics, anticipated by the syllabus. The tasks are composed according to the subjects. For example, the first topic is composed in conformity with the topic of 01001-01030 etc. Let's say, 1 simple task from the first topic should be necessarily submitted among all other tasks presented at the exam, while from the second topic – 1 simple and 2 complicated tasks, etc.

If the formed assignment is designated for the training, then the order number of training will indicate the complication degree of the tasks, designed for the training.

Upon clicking on the respective button of the test window, the system will select the number of tasks per each topic, through probability on the basis of the assignment. Then, the tasks selected from each topic are united, arranged according to probability and delivered to students with the following fields for details: Full name, academic year, group, semester, information about the examination taken: the time allocated per exam, the total number of tasks, among them simple and complicated tasks; maximum points per simple or complicated task. The exam window submits the text of the task, selected through probability, as well as the number of answers and the points attached for correct answers; after that the timer turns on.

In the tasks with open types of tests there are as many fields, as the number of answers is. The fields are enumerated according to the numbers of questions asked. The student should necessarily write the answer in the respective field of the question under the similar number. After answering all questions, the answers are fixed upon pressing the respective button, as the system analyzes the correctness of the answers given and exposes warning notifications. If the task is illustrated with a graphic image or video, then on the right side of the window,

the picture, or video will appear. By clicking on it, the image is enlarged or returns to initial sizes.

The training/exam is ended: as initiated by the student or upon giving answers to all questions or expiration of time limits. In any case, the detailed information about the exam is generated including the following: the points, received by the student, the number of correct, partially correct, or wrong answers and missing tasks, the reason for ending exam. The results of the exams shall be published on the website realized by the RIA Technologies.

Technical basis of the system: Local calculation network, internet, standard configuration computers, while general system software is supported with: WINDOWS XP and further modifications, OFFICE 2007/2010, SQL Server 2005 ვ5SQL Server 2008, WINDOWS Server 2008.

This report depicts the first version of Intellectual system for the obtainment of knowledge, with the textbook given in HTML format. A topic is presented by way of a text, graphics and video materials. The textbook is placed on the FTP server. The training adapted knowledge demonstration and appraisal system we developed is an integral part of the textbook. The system is placed on SQL server and operates by means of the client-server hi-tech.

Exploitation of Cyber1 in industrial terms at Shota Rustaveli State University is implemented with multiuser mode, where client is an Access, and server is SQL Server 2008. Because of some reasons at Tbilisi Ivane Jvakhishvili State University at the facility of economics and business in the subjects of financial accounting exams are held in automatic mode – base and part of the client is Access.

Based on our experience in exploitation of Cyber1 with several modes Cyber2 was realized. Difference between Cyber1 and Cyber2 are following: ranking of the exam task by topics and sub-topics, existing of different points and ranking forms for them, number of topics and sub-topics are not determined, existing of the sophisticated mechanism of defense, existing of the semantic analyzer for sentences in Georgian language. Cyber2 is realized in two variants: multiuser mode and automatic working. Program is written on VB.NET 2010. Server in multiuser mode is SQL SERVER 2008, and in automatic Access.

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