Web based E-teacher for history subject in elementary school

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Abstract – E-learning is the growing in modern education. We developed a system of e-learning for the specific subject (history), which we named e-teacher. The aim of this e-teacher is to make teaching and specifically testing and knowledge assessment easier and more objective. System is basically web site, at which students can register and participate in teaching and testing. System consists of number of different types of tests (two-week, monthly, three-months, final test), which on regular time periods make assessment of student's knowledge and their progress. Finally, this platform makes final mark for every student. The system tends to make teaching and testing objective and in a sense force students to study on the regular basis. System can also be used for evaluation of teachers and their work.

Keywords **– E-learning; E-teaching; Modern technology education: Web programming; Evaluation of learning and teaching**

I. INTRODUCTION

E-learning is the educational method developed in the last couple of decades. The term "e-learning" has only been in existence since 1999. when the word was first utilized at a CBT systems seminar. Other words also began to spring up in search of an accurate description such as "online learning" and "virtual learning". Unlike conventional education, e-learning represents application of modern technologies (mostly computers) in educational process [1]. Basic conceptual difference between conventional education and e-learning is the fact that in the former, students and teachers need to be at the same place, at the same time (for example, in classroom). On the other hand, in e-learning, teacher and students could be separated in the terms of time or space, since students can use materials (video lectures, tests and similar) that were prepared by the teachers thousands kilometers away and in significant temporal distances.

Closely related to e-learning is the process of e-testing. In standard testing, teachers through verbal examination, or by use of paper and pencil tests, check level of knowledge of the students. In e-testing, same process is conducted through computers. Shortly, e-testing is implementation of classical paper and pencil testing applied through modern technologies (primarily computers).

Testing theory relies on psychological discipline, called psychometrics. According to psychometrics, not every collection of questions is a test. Every test needs to satisfy basic metric characteristics, such us: objectivity, discriminability, reliability and validity [3]. Furthermore, modern testing theories, such us Item Response Theory, consider process of adaptability of the test to the capabilities of the examinee, which gives more precise measure of the level of knowledge of the examinee.

Considering programming platforms, e-learning and e-testing can be implemented as a simple desktop application. This application can be programmed in any of standard programming languages, such as: C, C++, Java, Python and similar. However, problem with this approach is that application is tied to the computer where application is developed. Further improvement of this approach was invention of transferable memories, such as CD, DVD or flash drives. Mobility of application was extended, but still constrained with physical presence of the transferable memories to the end user.

The greatest development in this sense represents development of the internet. The internet is the global network and application developed for the internet is available at every point of the world, just a single click away. Internet made e-learning available to the bigger audience, and distribution of the learning material and test is much easier and cheaper comparing to classical education or the education based on desktop application.

The aim of this work is to implement e-learning platform in elementary school for a specific subject, which we named e-teacher.

The paper is organized as follows. The second section presents a brief overview of the historical development of e-learning systems. The third section presents the material and methods applied in the realization of the research. The fourth section shows results of research. This section provides an overview of the implemented system, as well as a discussion of individual parts of this system. The fifth section represents the main conclusions of the research, as well as ideas for future work and further improvement of the system. The last section gives the list of used references.

II. HISTORY OF E-LEARNING SYSTEMS

Throughout the modern history, attention was paid to document the principles behind the e-learning systems. Therefore, today we have enough evidence that suggests that early forms of e-learning existed as far back as the 19th century. Long before the launch of the Internet, in order to provide students with education on particular subjects or skills, distance courses were offered. In the 1840's Isaac Pitman taught his pupils shorthand via correspondence. This form of symbolic writing was designed to improve writing speed and was popular amongst secretaries, journalists, and other individuals who did a great deal of note taking or writing. Pitman, who was a qualified teacher, received completed assignments by his students via the mail system and eventually requested additional work also via the same communication channel. In 1924, the first testing machine was invented. This device allowed students to tests themselves. Then, in 1954, BF Skinner, a Harvard Professor, invented the "teaching machine", which enabled schools to administer programmed instruction to their students [7]. However, it wasn't until 1960 that the first computer based training program was introduced to the world.

With the introduction of the computer and the Internet in the late 20th century, e-learning tools and delivery methods expanded. The first MAC in the 1980's enabled individuals to have personal computers in their homes, making it easier for them to learn about particular subjects and develop certain skill sets. Furthermore, in the following decade, virtual learning environments began to gain popularity, with people gaining access to a wealth of online information and e-learning opportunities. By the early 90s, several schools that exclusively delivered courses online, had been set up to make the most of the Internet and bring education to people who wouldn't beforehand have been able to attend a college due to geographical or time constraints. Technological advancements also helped educational establishments to reduce the costs of distance learning, a saving that would also be passed on to the students – helping bring education to a wider audience [7].

In the 2000's, e-learning became popular in various business areas so as to provide training for the employees. New and experienced workers had the opportunity to improve upon their industry knowledge base and expand their skill sets. Individuals were granted access to programs that offered them the ability to earn online degrees and enrich their lives through expanded knowledge. Today, e-learning is more popular than ever, with countless individuals realizing the benefits that online learning can offer [7].

How much such systems have a contribution to the educational process can be seen from the large number of research conducted within the academic community. For example, in one of the works, the authors highlight the benefits of their system in the learning process within the Arab world [8]. Authors addressed their e-learning system that is in use at the university environment and focuses on the Jordanian universities experience in developing e-learning courses. They address the design issues of e-learning courses that can be used to capture the teachers' knowledge. The underlying objective is that e-learning is a key knowledge and major resources for many universities. Therefore, the design of e-learning should be an important part of the university knowledge management process. Teacher's knowledge, should be managed in a way that the university can benefit from it. This is especially important in the case when teacher leaves faculty or when teacher is retired. Hence, intellectual personal knowledge management will be explored through the development of e-learning systems. The potential for utilizing human knowledge in the university environment will optimize the resources and can be of cost effective and quality assurance factors and, provide the university with a sustainable competitive advantage.

In one of the study's authors explores the potential of e-learning methods in conflict situation with mobility restrictions to enhance the educational process and to provide continuous learning for secondary students in Palestine. An interactive web-based application prototype called the Alaws Educational Network (AEN) developed providing a variety of methods for a student-centered learning process including virtual classrooms, a discussion forum and e-training courses. Students and teachers were asked to evaluate different aspects of the AEN in terms of usefulness, self-efficacy, willingness and challenges as indications of their ability and readiness to embrace e-learning. The results showed that both students and teachers have positive attitudes towards the usefulness of e-learning methods but that they might not yet be ready to adopt them. This paper further highlights several challenges to implementing e-learning in public schools in developing countries and discusses the opportunities offered by e-learning technologies in a conflict context [8].

III. MATHERIALS AND METHODS

As an illustration the program for history of the 7th grade in primary school is taken (based on the textbook of history for the 7th grade [2]. Complete material for one semester was separated in ten units, each of which is taught during two weeks. After each period of two weeks, students are tested for their knowledge. Once the second two week period is completed (second unit covered), students are again tested for that two-week period. After four weeks, students are additionally tested with a so called monthly test, which consists of the material covered during the first four weeks (two units). This pattern is followed during entire semester period. Furthermore, apart from two-week and monthly tests, students are tested on the three-month period. Material for this test covers 5 units (10 weeks) and there are two tests of this kind during the semester. Finally, at the end of semester, students take final test, which covers entire learning material for the semester. Tests do not have same number of questions, or same number of points per question. Numbers of questions and points are presented in table 1. As we can see from the table, total number of points at all tests is a 100. We can see that two-week tests have the least number of points per test. The highest significance is given to the three-month tests and the final test [4]. However, in order to get higher grade, one must have some points at all tests. Additionally, system is designed to force students to study continually during entire semester. Based on the number of points, each student gets a grade. This grade is calculated as it is presented in table 2.

TABLE I. POINTS AND TIME DISTRIBUTION OF THE TESTS

Type of test	Time period [weeks]	No. of questions	Points per question	Points per test	No. of tests in the semester	Total number of points
Two-week	2	6	0.333	2	10	20
Monthly	4	8	0.5	4	5	20
Three – week	10	20	1	20	2	40
Final tets	20	20	1	20	1	20
Total					18	100

TABLE II. GRADE SYSTEM BASED ON THE NUMBER OF POINTS

Grade	Points
1	<40
2	40-60
3	60-75
4	75-90
5	>90

The questions for each Unit were created based on psychometrics criteria, and there are 24 questions per each unit, which represents a bank of the questions. System needs to randomly select questions from corresponding unit bank, once the test is requested. Two-week test take questions from the corresponding two-week bank, while monthly test randomly take questions from two corresponding two-week banks. Same pattern is used for three-month and the final test.

For the e-teacher system, we used internet approach, so the web site which could be uploaded on line was used. Specific method used for developing of this system can be separated into the three steps: theoretical background selection, development of the bank of questions and programming implementation.

For the theoretical background, we used test theory, specifically method of representational validity [5-6]. This method was further used for the development of the bank of questions. Furthermore, optional answers to questions were selected in the fashion which cannot be obvious to subjects as incorrect, but somehow possible or recognizable response.

Finally, in the programming implementation, PHP and MySQL for server programming were used. Additionally, HTML and CSS were used developing of the web page.

IV. RESULTS AND DISCUSSION

Based on previously stated criteria, the e-learning system was developed. Starting with opening page, where students can log-in or register if they are not registered yet. As an illustration, registration form looks as in Fig. 1. Once students are logged on the system, the window as it is presented Fig. 2. will be displayed.

There are several buttons presented on this page: the one for the lectures (still not implemented), the button for the tests

and the button for the results. Finally, there is the button for logout from the system. Once the button for tests is clicked, the page as presented in the Fig. 3. will be displayed. At this page, students can select which test they would prefer to start. There are buttons and links for each of the tests, previously explained. Once the student click the one of the tests, test page as presented in the Fig. 4. will opens.

FIGURE I. REGISTRATION FORM

FIGURE II. STARTING PAGE OF THE SYSTEM

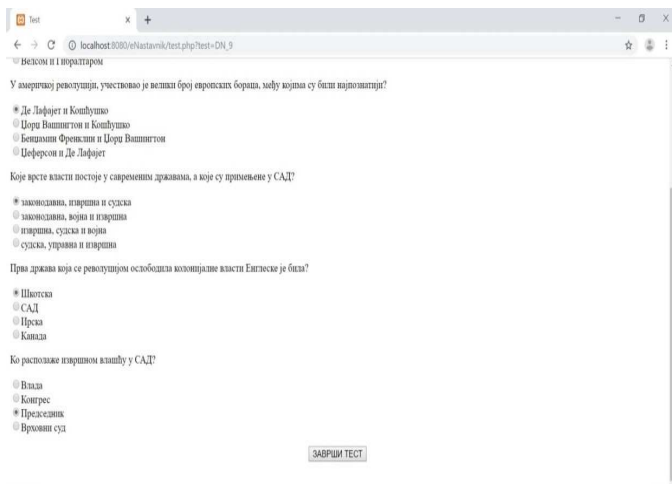FIGURE III. PAGE WITH THE LINKS FOR THE TESTS

FIGURE IV. TEST PAGE WITH FINISH BUTTON

Once student finishes the test, FINISH button is pressed and the results of the test are displayed. Finally, student has a button for the results of the all previous tests where he can see and follow his progress.

The system we developed could be beneficial for several reasons:

- It can be used for objective evaluation of knowledge of students. Marks students get at the test is more objective than the one given by the teacher. Tests are usually more objective than a human being evaluating the knowledge.

- It can be used for the knowledge evaluation on the state level. In this fashion, there will be no more good and bad schools, but rather good and bad students. Mark gotten at schools will be higher represent of the student's knowledge.

- It can be used for evaluation of teachers. If the teacher gives high marks to his students, and they are not that successful at testing, some modification in his work could be suggested by school management.

Finally, there are some shortcomings of this system: lack of oral skills development, testing anxiety, security issues and similar. However, these elements are present in classical education as well, sometimes even on the higher scale, which makes benefit of this system higher comparing to its shortcomings.

V. CONCLUSION

Web-based e-learning systems are increasingly present in the education system both in the world and in our country. the beginnings of the development of such systems and their implementation were at universities. Such systems include both the learning process and the test development process. The implementation of e-learning systems in secondary and primary schools is not so frequent. Created software solution is one of the few applicable in primary education of the Republic of Serbia. Practically with the implementation of the implemented solution, it can be concluded that even in the elementary education, it is possible to use such and similar platforms in older classes. In this way, the computer is brought closer to the students. That the interaction achieved is not negligible is evidenced by research conducted around the world on the same topic. The improvement of the created system as well as its future expansion can be reflected in the implementation of the learning process, practice as well as tests and for other subjects besides history.

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