Designing Educational Contents in and for the Electronic Environment

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Abstract. *This paper is a preliminary report on the results of student projects developed within the elective course Computer Assisted Teaching in the Academic Year 2008-2009. The project goal was to create a purposeful opportunity for the students to directly* participate *in the educational system. By the help of information technology, the students developed educational materials in form of tutorials for usage in electronic educational environment. The tutorials' subject matter is various and it is presented in English and in the Croatian Language including all segments of multimedia: text, graphics, animation, sound, video and computer test. The tutorials are formed as standalone lectures independent of a lecturer's physical presence. They are applicable in distance learning and computer assisted teaching for all levels of education.*

Keywords. Mind mapping, educational content, multimedia, electronic educational environment, distance learning, e-learning, computer-assisted teaching, constructivism, information technology.

1. Introduction

In the constructivist philosophical approach to learning, knowledge is obtained by learners, as opposed to instructivist approach, where knowledge is given to learners. Among constructivist and instructivist learning approaches, we uphold the constructivist approach. In constructivism, learners are actively and constantly constructing knowledge because learning is a process of construction [1]. Constructivism emphasizes that the learners should explore, experiment and do research. Therefore, the focus is on learning, as opposed to instructivist approach, where the focus is on teaching.

Since all learners are unique individuals, they all have unique needs. Not all the learners can follow up the demands of the curriculum at the same pace. We have designed interactive educational materials, formed as standalone lessons, independent of a lecturer's presence, where learners have the power to navigate through lesson and follow at their own pace. Since constructivist theory explains learning as a highly individual process, it is important that students can flexibly compose their preferred learning path [2].

This project work was a result of our mentorship and the students' engagement in designing educational tutorials for usage in the educational system. All the students who attended the course Computer Assisted Teaching in the Academic Year 2008-2009 participated in the project. Since the course Computer Assisted Teaching was offered to all MA students at the Faculty of Humanities and Social Sciences that academic year, the spectrum of topics was not limited, but depended only on the students' field of interest and the majors they study. Therefore, the students decided on the subject matter of the educational materials they developed.

2. The project work

The project goal was to create a purposeful opportunity for the students to directly participate in the educational system. The aim was to create multimedia interactive products for learning in the electronic environment. The students designed electronic materials useful for distance learning and computer assisted teaching in educational institutions. The materials are designed by the help of information technology in form of tutorials, containing all elements of multimedia: text, graphics, animation, sound, video and computer test. Many of the students that participated in the project work will become teachers, hopefully, enthusiastic enough to

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incorporate information technology into their teaching. Therefore, this type of activity served them as a useful practice for the future. Most students that participated in the project work left their secondary school benches not so long ago. Therefore, their perspective of education in electronic environment was of great value for us. The students' experience mirrored the needs of young contemporary learners.

There were twelve projects altogether, developed by twelve student teams formed of two to three students. The student teams were not forced or randomly formed, but grouped according to their mutual interests since the students who attend the course Computer Assisted Teaching study different majors. Furthermore, the learning subjects in the educational material also vary (see paragraph 2.4.). Designing an educational tutorial was the final task of each project work. However, several other tasks, that helped the students organize ideas and form the content, preceded. We introduce all the tasks comprising the project work chronologically in the following subchapters. The tasks altogether indicate the structure of the course in terms of practical work, and the structure is supplemented by lectures on e-learning, the usage of IT in the classroom, the usage of multimedia in teaching, mind maps in education, presentation techniques, CMS, pedagogy of education in electronic environment and computer teaching in general.

2.1. Mind mapping and interface analysis

Mind maps are diagrams representing words, ideas, tasks and other items linked and arranged around a central key word or idea and they are used to generate, visualize, structure, and organize ideas [4]. The students initialized their projects by building a mind map, the purpose of which had a dual goal. Mind maps served as a visualization of student project ideas and they were shared among all the participants within the course. By the help of mind mapping, the students produced a sketch which served as an organizational plan in designing the educational content. The structure of mind maps, through its graphically presented components, indicates the stream of mind that led the students build the learning material. Also, while building the structure of the learning material, the students worked on the final interface design, having in mind the navigation through tutorials, organization of information, structure of the

content, implementation of multimedia elements and their timing. There were no limitations or specifications on which software to use, the focus was on the structural presentation of ideas and learning goals.

2.2. Research

The students conducted a research by means of a survey on e-learning and computer assisted teaching. Bearing in mind the educational usage of information technology and the Internet, each student formed their own hypothesis aiming at affirmation of their positive and enthusiastic attitudes towards implementation of IT in the process of education. Furthermore, each team of students formed questions and developed their own survey. The examinees were among their colleagues from the Faculty of Humanities and Social Sciences in Zagreb. A great part of our faculty embraces information technology and uses electronic resources as a part of their curriculum. Over the past years this has been highly supported by a content management system (CMS) called Omega. It is a Moodle platform (Modular Object Oriented Dynamic Learning Environment) by means of which many lecturers conduct e-learning at least to some extent. Most lecturers at the Faculty use Omega mainly as a tool for computer assisted teaching. Moodle platforms are used in elementary and secondary education, too. Therefore, the students wanted to research the potential background for their own teaching and learning materials from this project work. They wanted to find out what types of resources and activities within the CMS bring most advantages to the students.

2.2.1. Survey questions and responses

Twenty students gathered approximately 150 survey replies altogether, the results of which they processed statistically and arranged graphically. In this subchapter we describe the questions that the students asked and the responses they collected via e-mail. The students collected the examinees' responses by means of three different types of questions: multi choice, true and false, and the descriptive type. The questions mostly referred to the usefulness and availability of the CMS resources and activities. For instance, in terms of resources, a highly valuable facility of the CMS is uploading electronic resources and making them available

to all participants of a course at all times. Our students find this possibility most valuable, as reported by the survey replies. Few questions gathered statistical data referring to gender, sex, and the majors the examinees study as well as the number of courses the examinees participated in via Omega. All examinees participated in at least one course via Omega and they all think that lecturers should provide more electronic resources online, including their lectures. Furthermore, the students indicate that they prefer lecturers' Power Point presentations as a learning resource over their personal notes. Students dislike taking notes during lectures and prefer written presentations that some teachers provide via web. When taking tests, 50% of student examinees prefer electronic form rather than oral or written. Also, 50% of examinees prefer electronic communication in student-teacher interaction rather than oral. Using the descriptive question type, the examinees expressed their attitudes towards electronic communication. They find electronic communication more convenient compared to classic communication in class or during teachers' office hours. As reported by the survey replies, electronic communication does not limit the students, or the teachers, in terms of time, space and communication structure. The students often find it stressful to ask questions or comment in front of a large audience, or they simply find it harder to express orally than in writing.

Generally speaking, the examinees have a positive experience regarding the usage of IT in the process of teaching and learning in general and mostly think that all lecturers should be information technology literate and incorporate technology in the process of teaching.

2.3. Term papers and presentations

The students had to turn in a term paper in a form of a comprehensive textual document containing detailed scripts of the tutorials and descriptions of the entire project work and the content, i.e. the subject matter included in the tutorials. Here, the textual information prevails and these documents serve as records of all information included, either in the research, or in the educational content. In the documents it is also indicated for what level of education the content is appropriate for. Furthermore, the students had to design a presentation for class to share their work with their colleagues.

2.4. Tutorials and the subject matter

Tutorials are well-structured programs that take the role of the instructor by presenting information and guiding the learner in initial acquisition [1]. The tutorials were designed in Adobe Presenter as a combination of lessons in the form of multimedia interactive presentations and interactive knowledge tests in the end. Unlike the preceding presentations done by the students in class, the tutorials are formed like standalone lessons also containing a knowledge check in the form of a test that can be taken independently of a lecturer's physical presence. Including all elements of multimedia (text, graphics, sound, video and animation) to form the multimedia educational content [5], the text is used in lesser extent than other elements. Graphics, video and audio prevailed. The most significant feature in most tutorials is narration. Instead of an overload of textual information, almost all student teams used audiovisual narration accompanied by video clips, pictures and animation, which made the tutorials' usage independent of their authors. The students either recorded their voice or used tools for text to speech conversion. This way, the narrator imitates the lecturer not present in the classroom. Content on the tutorial slides is supplemented by a lecturer-narrator telling the lesson and guiding a user through the tutorial. The navigation through tutorials is very simplistic and user friendly. It allows a user to skip slides, to turn the sound off and on, to pause, to stop, etc. At the end of each tutorial, there is a knowledge check in a form of a test containing different types of questions on the content from the lesson; multiple choice questions, true/false, fill-in-the-blank, short answer and matching question. At the end of a computer test, the application offers the automatically generated statistical record of a learner's result.

The students decided upon the subject of the educational content depending on their field of interest and the majors they study. Therefore, the subject matter in the tutorials varied. There were different topics, for example, foreign languages (English and German), art and culture (the application and meaning of colors, Croatian national parks), music (presenting famous singers), sports (presenting famous Croatian athletes), literature (presenting important Croatian writers and poets) and information technology (computer components, Rich Internet

Applications, robotics). We introduce three tutorials in information technology:

Inside-a-computer tutorial is a tutorial that mirrors a workshop that is held at the Faculty of Humanities and Social Sciences in Zagreb in organization of "KSIZ", a students' club at the Department of Information Sciences. The workshop is intended for a broad audience and its purpose is to educate the attendants in computer basics, integral computer components and other elements. The tutorial guides the learner as if he is present at the very workshop. The subject matter in this tutorial is information technology and the content is appropriate for secondary and high school as well as university level of education. Through very detailed narration and good graphical presentation, the authors present everything relevant for the matter.

Tutorial in Rich Internet Applications is appropriate for university level of education. The subject matter in this tutorial is the Internet as Web 2.0. The authors compare Web 1.0 and Web 2.0 in graphical and tabular structures. They define RIA (Rich Internet Applications), its advantages and disadvantages and introduce other relevant terms and features. Before the knowledge check, they include an appropriate video clip The Machine is Using/Us.

Tutorial in robotics also refers to information technology and the content is appropriate for secondary and university level of education. The authors introduce the history of robotics as well as popular and contemporary usage of robotics.

Among other tutorials, there is for instance, a tutorial in English language vocabulary on animals, appropriate for primary education and presented as a combination of pictures, encyclopedic and English-Croatian dictionary entries; a tutorial in machine translation; a tutorial in German language vocabulary; a tutorial in application and appliance of colors, a tutorial in famous Croatian people, a tutorial presenting national parks in Croatia, etc.

3. Evaluation and plans for the future

The students that participated in the project work perceived this engagement as very useful. Many research studies have been conducted to prove that computer based teaching is better than traditional teaching and not as time consuming. The multimedia interactive tutorials are a powerful teaching and learning tool in terms of evoking learners' motivation, as well as

achieving greater attention. When the learners approach the educational content with greater enthusiasm, they gain a great advantage in the process of acquiring knowledge. Introducing information technology into teaching is popular especially with younger learners in primary education. Lauc, Matic and Mikelic [3] did a research in an elementary school comparing the classical approach to teaching with the one in the electronic environment, introducing computer software in a lesson and their results showed that information technology significantly affected the learners' motivation and the final test results in a positive manner. In line with computer assisted teaching raising motivation, the usage of multimedia makes knowledge acquisition more efficient. By engaging multiple human senses within one activity, or one content item, a learner's perception grows.

Furthermore, the automatic generation of test results is a time saving feature for any teacher giving a test. Taking tests electronically, not only reduces, but completely eliminates paper work while checking tests and during other time-consuming calculations [1]. The computer tests also provide instant feedback on the correctness of a user's answer. Szafron et al. [6], in a comprehensive research on interactive story telling emphasize that quick visual feedback is useful just for getting started quickly. However, the students can be distracted from any task that is repetitive or does not grow in difficulty or drops in stimulation level over time.

Another important segment that many students included in their tutorials is humor the purpose of which is also motivation. Since most tutorials are intended for younger learners in primary and secondary education, the students thought that introducing the content in a humorous way will enhance the procedure of memorizing the educational material.

When planning on the usage of the tutorials in educational system, the tutorials, both in English and Croatian, will be offered to the American International School of Zagreb and hopefully placed in their Moodle site to be used in teaching in elementary (grades 1 to 5), middle (grades 6 to 8) and high school (grades 9-12); in English, for various subjects, and in Croatian for teaching the Croatian language and culture. The school accepted our students' work. The introduction of the learning materials, as well as research on its implementation will be conducted in the School Year 2010-2011. Also, this type of tutorials proved as useful with our teachers conducting e-

learning via Omega, for example, in case of a lecturers' absence due to foreign scholarships etc.

4. Conclusion

Our aim was to provide the students with an opportunity to build electronic learning materials, appropriate for computer assisted teaching and e-learning, from their own perspective. During this project work, the students attending the course Computer Assisted Teaching, participated in developing purposeful learning materials to be used in the educational system in primary and secondary schools. Learning tutorials, as the final product, contain many elements, incorporated by the students, that are expected to contribute the learning process by evoking greater enthusiasm and motivation with learners also helping them achieve better results. Such elements, such as multimedia, narration and humor, are of great significance in the process of memorizing information especially with younger learners. In the constructivist learning approach, according to which knowledge is built inside a learner's mind, it is necessary to engage as many senses as possible to participate in knowledge acquisition. Therefore we included all the elements of multimedia; text, graphics, video, audio and animation, as well as computer test to build on a learner's perception in order to make the learning process more efficient.

Except for the learners, introduction of IT in the process of education brings benefits for the teachers, too. For example, time consuming activities, such as calculating test results and other paper work, can be significantly reduced if not completely eliminated by computer assisted teaching.

5. Acknowledgements

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