

Improving a Blended Learning Model for the “Multimedia Systems” e-course

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Abstract: Existing blended learning models for e-courses should be improved in line with changes in the technology development, new pedagogical approaches, and feedback received from its participants. This paper presents improved model of the blended learning course “Multimedia Systems” designed for students of the undergraduate program in Computer Science at the Department of Informatics of the University of Rijeka, Croatia. In order to ensure usage of modern technologies and enable collaborative learning, new version of didactical model was designed. Individual learning activities were replaced with collaborative ones, performed using Web 2.0 tools and supported with educational recommender system. Analysis of students’ and survey results showed that introduced activities fulfilled their objective, but also that there is a need for emphasizing the advantages of collaborative learning and chosen learning environment in the process of further application of the model.

Key words: E-learning, collaborative learning, e-tivities, Web 2.0 tools, recommender system, ELARS.

INTRODUCTION

E-learning and blended learning (BL) models have been research subject at the Department of Informatics of the University of Rijeka, Croatia (UNIRI) for many years. Special attention was continuously given to didactical aspects and methods of teaching which should motivate students and put them in the centre of the learning process as active participants. From 2014 development of didactical model for realization of e-learning supported by Web 2.0 tools and educational recommender system ELARS [12] started within the research project “E-learning Recommender System” [2]. This didactical model is in line with the model for open and online learning based on social media developed during the FETCH project. The focus is on communication and cooperation of students while performing different e-learning activities or e-tivities by using Web 2.0 tools [9].

An important aspect of our research is the technology used to support learning process. Besides a learning management system (LMS) that still represents the basis for the implementation of e-learning in any form (fully online, blended or enhanced classroom learning), learning environment for developed didactical model contains a set of Web 2.0 tools and own educational recommender system ELARS – E-Learning Activities Recommender System [4]. Variety of Web 2.0 tools included in the learning environment enable realization of e-tivities designed according to different pedagogical approaches (collaborative, problem-based, project-based learning) [5], [7]. Using Web 2.0 tools during e-tivities students create resources (documents, wikis, mind maps, bookmark collections) that are publicly available on the Web and can serve as learning materials for other students [1]. On the other hand, ELARS system fosters personalization in the context of e-tivities included in the e-course learning design by recommending optional e-tivities, possible collaborators (student peers), Web 2.0 tools and offering advice. Used recommendation criteria can include four types of student’s characteristics: learning styles preferences according to the VARK model, Web 2.0 tools preferences, knowledge and activity level [6].

At the beginning of our research, the model was used for two e-courses 'Hypermedia in education' and 'Operational research' designed for senior students in the graduate program in Computer Science major at the Department of Informatics at UNIRI. Experiences gained after completion of qualitative and quantitative analysis of student's results helped us in improving didactical model for different e-courses at UNIRI. This paper presents a new, improved model of the blended learning course “Multimedia Systems”, prepared for students of the undergraduate program in Computer Science and implemented since the academic year 2013/2014. Considering the level of study, this e-course has more face-to-face (f2f) classes and more enrolled students so there was a

need to adapt the model in respect with the number of e-tivities included in the learning design. In addition, surveys that are regularly conducted at the end of the course with a goal to determine the extent to which students accepted the BL model of e-learning and especially which activities and elements of the e-course they consider the most useful for learning, showed that the existing BL model has become "old-fashioned" and needs modernization.

The rest of the paper is organized as follows. Section II presents the design of the blended learning course "Multimedia Systems". Section III gives evaluation results and discussion while section IV brings conclusion and plans for future work.

COURSE DESIGN

Course Objective and Content

The e-course "Multimedia Systems" is taught in the summer semester, third year of studies, with two hours of lectures and two hours of practical exercises per week. The course was given 5 ECTS points [3].

The overall course objective was that students, as future computer science experts, acquire fundamental knowledge about the digitalization of a single media (graphics, text, sound, animation, and video) and integration of these media into a multimedia project. The course consisted of the following topics: Introduction to multimedia, hypertext, and hypermedia, Main concepts of the World Wide Web, Graphics, Sound, Video, Animation, Text, Multimedia projects development. The topics for the exercises were connected with the lectures: Creation of a web site, HTML, CSS, XML, SVG, Image processing (Photoshop), Sound processing (Audacity), Making and processing of a video (Windows Movie Maker), Making animations (Flash), Combining multimedia elements in a web presentation.

The First BL Model and Learning Activities

The course has been taught using Moodle LMS since 2008/2009. It was prepared according to the sequential model of BL with the mixture of not only online and f2f environment, but also of different teaching and learning methods and learning activities that are integrated in the course: f2f introductory class and practical exercises, self-paced learning using online modules in the Moodle (instead of f2f lectures), two exams (mid-term and final), online-tests for self-assessment, forum discussions (revision before exams), and practical assignment (a multimedia presentation in Flash) [3]. The most important grading components were exams consisted of two parts: online theoretical assessment and practical problem solving tasks in the classroom. With exams students could collect 60 points (15 for each part of exams) and 30 points by creating multimedia presentation. The rest up to 100 points students could collect by participating in the forum where basic level theoretical questions were asked using the Moodle Question and Answers forum.

Implementation of BL model was very successful. In the academic year 2010/2011 the course "Multimedia Systems" received a reward as the best e-course at the University of Rijeka. Based on the survey results from 2010/2011 and 2011/2012, it can be said that students accepted the blended learning e-course quite well, but the forum was proven to be the less popular activity. When asked to list the things they would like to change in the model, students mentioned forum with the following reasons: the forum discussions are exhausting, they didn't want to participate, even though they agree that continuous participation on forum is important, they don't agree with low number of points given for the last minute posts [3].

Instead of using forum, we started to combine the LMS with Web 2.0 tools available on the web that would be potentially more attractive to the students and enable collaborative learning. Even more, the ELARS system was introduced as a new modern technology and completely new didactical model for blended learning was built. Additional motivation for these changes was lower average grade achieved by students during

academic year 2012/2013 when the forum was still used. In comparison to the 3.8 (on the scale from 1 to 5) achieved in 2011/2012, average score for that year was 3.56.

Transition to a New Didactical Model

From the very beginning, the course was carefully prepared taking into account the quality of learning materials, teaching strategies, assessment methods, but also availability of modern technologies that can support the learning process. The transition to the new BL model started with the changes in the design of course e-tivities. Forum discussions were replaced with new revision activities before exams. With this change, collaborative learning was introduced to the course learning design since students were expected to revise subject matter in collaboration with their peers. The grading components stayed the same, except points for discussions that were assigned to new revision activities.

As mentioned above, the LMS was an important component of the learning environment, used to organize the course's content, facilitate communication between students and teachers and to deliver online tests. Still, the LMS itself could not support the introduction of e-tivities that will be realized using social media tools and designed according to desired pedagogical approaches [2], [8]. Although the Moodle include some versions of wiki and blog, these tools are less attractive and with less possibilities comparing to those available on the web. As an alternative to tools within a LMS, the third party social tools to foster communication, collaboration and sharing between students were taken into account [5], [7]. Therefore, learning environment was extended with Web 2.0 tools in order to combine problem-based learning with other approaches (preparing and sharing different multimedia content, social networking, reflective learning, etc.) and try to increase students' motivation for participation in revision activities. In addition, the ELARS system was used to foster personalization.

Revision Activities before Exams

Instead of offering the same revision activity to all of the students, several e-tivities were designed. The following Web 2.0 tools were selected for their realization: Diigo (for bookmarking), Flickr (for sharing photos), MindMeister (for mind mapping and brainstorming), SlideShare (for sharing presentations), Wikispaces (for creating wikis) and YouTube (for creating and sharing videos). Tools were selected to allow the revision of subject matter and foster collaboration, but also to suit different students' preferences regarding learning styles according to VARK model that distinguishes visual, aural, read/write and kinaesthetic learning modes [10], [11].

Figure 1 shows learning design of the first part of the e-course for the academic year 2013/2014. Introduction to the course was followed by activities grouped in modules covering the course topics. For each topic, students could read prepared materials in Moodle LMS and solve corresponding self-assessment tests. They also attended f2f practical exercises. Upon completion of the activities from the modules included in the mid-term exam, students were supposed to go through previously learned material to make sure they know it. Therefore, after reading instructions regarding revision, students could choose one of the offered e-tivities and collaborators using recommendations from ELARS system.

During revision, formed groups were expected to create a summary of the content presented in learning materials using different media elements or to bookmark additional learning materials. Offered e-tivities for revision before the final exam were almost the same. The only change was replacement of e-tivity performed using Flickr with the one performed using YouTube so instead of creating graphical representations students were expected to create a short video related to the key concepts from learning materials.

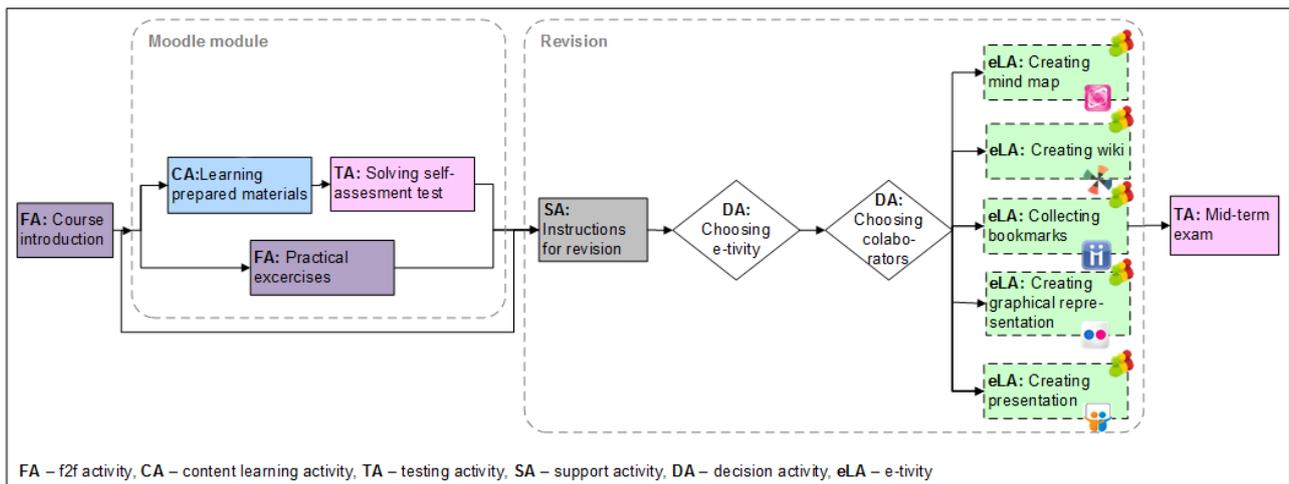


Figure 1 – Learning design including revision activity

EVALUATION

In the 2013/2014 the average grade achieved by students was once again lower than the previous year (it was 3.02). Since described e-tivities were introduced in order to enable students to revise subject matter examined on the theoretical parts of exams, students' results for these grading components were compared. Students' points (out of 15) are shown in Table 1.

Table 3 – Comparison of theoretical assessment results

Academic Year	2012/2013	2013/2014	2014/2015
Mid-term exam	9,71	10,91	10,86
Final exam	9,70	10,87	11,02

During the evaluation of introduced didactical model students' attitudes were examined as well using anonymous online questionnaire in Moodle LMS. The main objectives were to determine the extent to which students are satisfied with the e-course, planned revision activities and the tools used to support them. Results for the academic year 2013/2014 are shown in Table 2 (results for the 2014/2015 are still being collected). The following Likert scale of attitudes was used: 1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree. Questionnaire also consisted a couple of open ended questions for comments and suggestions. From a total of 75, 31 student (41.3%) filled the questionnaire.

In general, students are satisfied with the applied didactical model and they find it effective. In their opinion, learning materials and course activities are well organized and they are satisfied with the way teacher managed the course. Quite large standard deviations for statements regarding usefulness of revision activities and Web 2.0 tools, as well as for provided chance for collaborative learning, indicate that students' attitudes vary. This is evident from number of answers given for each choice as well as from answers to open-ended questions in which some students expressed their satisfaction with organized activities while others consider them unnecessary. Some students mentioned that they would rather revise subject matter individually in order not to depend on the group members who are less motivated to work. However, comparison of points in Table 1 shows that despite the lower course average grade students achieved better results on theoretical parts of exams in the 2013/2014 while in the 2014/2015 result were almost the same as in the 2013/2014 (at the time, average grade cannot be calculated since practical assignments still need to be evaluated). These results may indicate the positive effect of revision activities, recognized also by some of the students. Analysis of course points showed that lower course average grade is due to lower points achieved on the practical

problem solving tasks. Therefore, the model should be enhanced with e-tivities that will support students in revising these parts of course contents as well. Although students find positive the freedom to choose between optional e-tivities for revision, they didn't recognize the usefulness of ELARS system in helping them to choose the e-tivity or collaborators that suit them best. In this case students' attitudes vary as well. Therefore, the purpose of the ELARS system and advantages of collaborative learning should be more emphasized in the process of further application of the model, in order to incite students to perceive benefits of these approaches.

Table 4 – Anonymous questionnaire results

	Questionnaire statements	5	4	3	2	1	Avg	StDev
S1	You are satisfied with didactical model used for this course.	17	10	3	1	0	4,39	0,79
S2	You consider applied didactical model effective.	12	13	4	2	0	4,13	0,87
S3	Learning materials and activities are well organized.	9	11	6	3	2	3,71	1,17
S4	You are satisfied with the way teacher managed course in the LMS.	22	8	1	0	0	4,68	0,53
S5	Revision activities helped you in preparation for exams.	5	12	6	6	2	3,39	1,16
S6	You are satisfied that you had chance to collaborate with your peers during revision activities.	10	7	4	4	6	3,35	1,51
S7	You consider Web 2.0 tools useful for realization of revision activities.	5	9	1 2	2	3	3,35	1,12
S8	You find positive the freedom to choose between optional e-tivities for revision.	20	10	1	0	0	4,61	0,54
S9	You consider ELARS recommender system useful for choosing optional e-tivities.	4	4	9	9	5	2,77	1,24
S10	You consider ELARS recommender system useful for choosing collaborators.	4	8	9	5	5	3,03	1,26

CONCLUSION AND FUTURE WORK

At the University of Rijeka, the research regarding didactic models that rely on social media was focused on development, implementation and evaluation of the novel, contemporary blended learning model. Developed blended model combines various activities for students (e-tivities) to facilitate the achievement of learning outcomes and various technologies to support the process of e-learning. Therefore, it is enhanced with learning environment that includes an LMS, Web 2.0 tools and the ELARS recommender system which provides personalization according to students' characteristics.

During the development of presented didactical model, it was taken into account that the number of activities is not too large. The reason was not to overload the students, but neither teachers because in recent years the number of students increased. This will be the case in the future work as well. Results of conducted research indicate that besides revision activities focused on theoretical assessments, the model should contain activities that could contribute to the better acquisition of practical topics. For those activities we also plan to use approach based on collaborative learning and usage of social media. We consider particularly useful Web 2.0 tools that enable the creation and sharing of screencasts, used for recording of computer screen output. Therefore, in our further research we will try to find suitable tools and design the enhanced version of the didactical model with new e-tivities in order to try to achieve better overall results on the e-course.

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REFERENCES

- [1] Bartolomé, A., "Web 2.0 and New Learning Paradigms," *elearning Pap.*, vol. 8, no. April, pp. 1–10, 2008.
- [2] Hoic-Bozic, N., M. Holenko Dlab, and J. Mezak, "Using Web 2.0 tools and ELARS Recommender System for E-Learning," *Int. Conf. e-Learning*, vol. 14, pp. 207–212, 2014.
- [3] Hoic-Bozic, N., M. Holenko Dlab, and E. Kusen, "A Blended Learning Model for 'Multimedia Systems' Course," in *Advances in Intelligent Systems and Computing, Workshop on Learning Technology for Education in Cloud (LTEC'12)*, 2012, pp. 65–75.
- [4] Holenko Dlab, M. and N. Hoic-Bozic, "Recommender System for Web 2.0 Supported eLearning," in *IEEE Global Engineering Education Conference (EDUCON 2014) Proceedings*, 2014, pp. 953–956.
- [5] Holenko Dlab, M. and N. Hoic-Bozic, "An Approach to Adaptivity and Collaboration Support in a Web-Based Learning Environment," *Int. J. Emerg. Technol. Learn.*, vol. 4, no. 7, pp. 28–30, Dec. 2009.
- [6] Holenko Dlab, M., N. Hoic-Bozic, and J. Mezak, "Personalizing E-Learning 2.0 Using Recommendations," in *Methodologies and Intelligent Systems for TEL (mis4TEL 2014), Advances in Intelligent Systems and Computing*, 2014, pp. 27–35.
- [7] Nikolov, R., E. Shoikova, M. Krumova, and E. Kovatcheva, "Learning 2.0 enhanced by social media tools-implementation and assessment," in *International Conference on e-Learning*, 2014, vol. 14, pp. 213–219.
- [8] Oliveira, L. and F. Moreira, "Personal learning environments: Integration of Web 2.0 applications and content management systems," *Proc. 11th Eur. Conf. Knowl. Manag. (ECKM 2010)*, vol. 2, 2010.
- [9] Rothkrantz, L., "New Didactical Models in Open and Online Learning based on Social Media," in *International Conference on e-Learning*, 2014, vol. 14, pp. 9–18.
- [10] Valcheva, D. and M. Todorova, "Personalized E-courses for students in Computer science," in *International Conference on e-Learning*, 2014, vol. 14, pp. 261–266.
- [11] Zuckweiler, K. M., "Using Emerging Technologies to Enhance Student Learning in the Online Classroom," *Decis. Line*, vol. 43, no. 1, pp. 6–8, 2012.
- [12] "ELARS Home page," 2013. [Online]. Available: <http://elars.uniri.hr/elarsdemo>. [Accessed: 01-JUL-2015].

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