

Blended Learning - An Opportunity to Take the Best of Both Worlds

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Abstract— The paper presents theoretical foundations for effective ICT supported learning content development and course design. The practical use of these tools is described in the development of blended learning courses for improvement of computer literacy of unemployed people in Slovenia. The results of the survey about the efficiency of learning within these courses and about user satisfaction in the described courses are also presented. Findings indicate that a great majority of the participants of the courses find blended learning a convenient and efficient approach to learning and that most of them plan to use it for learning in the future.

Index Terms— multimedia learning, web-based learning, blended learning

I. INTRODUCTION

The rapid development of Information and Communication Technology (ICT) as well as recent developments in the field of learning theories are provoking changes in education. The concept of blended learning allows learners to take advantage of both modes of delivery – traditional and e-learning and enables the development of new learning strategies.

An example of a theoretically grounded and practically validated blended learning course is presented in the article. The course was created for projects in the scope of the master project “Improvement of computer literacy of unemployed adults” in the framework of the EU programme PHARE 2003.

The course was developed with consideration to research findings in the field of:

- constructivist learning theories,
- design of web-based and blended learning courses,
- design of web-based learning contents (WBLC) with many interactive and multimedia elements.

A leading advantage of the course was the opportunity of educating a greater number of participants than in a traditional educational setting. The combination of face-to-face, web-based instructor-led, and self-paced activities supported by the Learning Management System (LMS) eCampus and appropriately designed web-based learning materials enabled efficient learning and a good learning atmosphere.

The following section of the paper introduces some theoretical foundations for effective learning content development and course design. Section 3 presents both courses (basic and advanced), alongside justification for some design solutions that were chosen.

Section 4 discusses the results of efficiency investigations with regards to learning and user satisfaction that were collected through an analysis of the reactions and responses obtained from users (e.g. LMS reports, log files, questionnaires) and from summative evaluation (e.g. results of final exams). Finally, short conclusions are drawn concluding the paper.

II. THEORETICAL FRAMEWORK

When implementing an environment for blended learning as well as for e-learning, it is very important to provide technology (e.g. LMS system), learning contents and appropriate support for learning (e.g. administration, management, counselling, evaluation).

A. Design of environment for blended learning course

Blended learning combines multiple delivery media. The original use of the phrase “blended learning” was often associated with linking traditional classroom activities to e-learning activities. However, the term has evolved to encompass a much richer set of learning dimensions: blending online and offline learning, blending self-paced and collaborative learning, blending structured and unstructured learning, blending learning and practice [15].

In this article the term blended learning is used to describe learning that combines face-to-face classroom activities, instructor led web-based learning (WBL), and self-paced learning.

Horton [4] offers the following way of course classification:

- instructor-led (e.g. facilitated) towards learner-led (e.g. self-paced, self-directed),
- synchronous towards asynchronous

This classification does not mean that there are only two options to choose from, but rather a range of possibilities between these two extremes [4]. For example, a blended learning course can change its type from instructor-led to learner-led during the learning process. WBL activities are usually asynchronous. Nevertheless, some activities (e.g. real-time discussions, chat sessions, screen-sharing, online videoconferencing) can be arranged via internet synchronously.

Self-directed learners study in an individual pace. They set their own learning goals and deadlines without any interaction with an instructor. Usually there is no interaction with other learners of the e-course although learners can communicate and collaborate according to their own initiative.

Learning achievements of self-directed learner depends on learner’s self regulated processes. Different categories

of Web-based tools (e.g., collaborative and communication tools, content creation and delivery tools, assessment tools, administrative tools) that are part of computer supported learning environment, can be used to support different self-regulated learning processes (e.g., goal setting, self-monitoring, use of task strategies, self-evaluating, time planning and management, help-seeking) [3]. Nevertheless, this support is better if the course is facilitated.

A course facilitator's tasks are to:

- create a syllabus that lays out the schedule, requirements and activities of the whole course,
- create code of behaviour within the course,
- announce learning goals and expectations,
- follow learners' work and monitor their progress,
- help learners to progress jointly on the right way,
- stimulate a communication among course participants,
- actively participate, promote and lead the interactive discussions,
- provide answers to questions, feedback and recommendations on course activities,
- evaluate and analyze learners' work.

Usually the course begins in a classroom, where learners are introduced to their teacher (e.g. instructor, tutor) and other learners. Face-to-face classroom sessions take part at appointed times.

Schedules for the WBL part of the course should be made on a weekly basis [4, 5]. The schedule determines events (e.g. real-time meetings, videoconferences, chat sessions), readings (e.g. learning contents that learners must read or view) and activities (e.g. tests, intermediate products for a multi-week project). The activities should have deadlines, although learners can complete activities according to their own schedule [4].

For creating e-learning courses and web-based learning contents, researchers suggest the implementation of constructivist and socio-constructivist theories of learning [1, 3, 16]. According to the constructivist theory, articulated by Jean Piaget, learning is an active construction of knowledge. Individuals build knowledge on previously acquired knowledge and experiences. Therefore it is very important to be aware of the learner's abilities as well as his previously acquired knowledge and to stimulate his activity.

According to Vygotsky, the process of learning and cognitive development is dependent on social interaction. Students should therefore collaborate with a teacher and among themselves. Furthermore, learning can be enhanced with scaffolding where the teacher provides supports to facilitate the learner's development. Therefore appropriate blended learning is learner-centric.

B. Design of web-based learning materials

Web-based learning materials are the essential part of a web based learning environment. They should not be just transpositions of traditional learning materials into electronic formats, they should be enriched with interactive tools (e.g. interactive questions, online tasks, online assessments, hyperlinks, and interactive multimedia elements such as simulations, interactive games, interactive video) and appropriately designed multimedia.

Elements of activity increase students' motivation and active learning [1, 3, 16].

Research shows that students dislike reading long texts from the web, long paragraphs and listening to long narrations. Nielsen [12] believes that only 16% of people read web pages word by word. Students probably read educational web pages more carefully, but they are nevertheless particularly inclined towards specially formatted and added comments, such as interesting points, hints and warnings [6]. Furthermore, rational expressions and clear directions are crucial to increase motivation and efficiency of learning.

Different presentation modes are used to cater to students' different learning styles, cognitive abilities and to ensure efficient learning. Presentation of learning material is highly important as it can enhance learning or impede it [7]. The use of multimedia tools must be carefully planned in order to avoid a counterproductive overload of sensory channels [7, 13]. In recent times cognitive psychology has progressed and many of the major findings in this field have been of use in instructional design of multimedia educational materials. Mayer [7] considers that human working memory is limited and that people process visual and verbal information (e.g. narrated and online text) in separate cognitive channels, which then work simultaneously. Considering these theories the following design principles are suggested:

- Multimedia: Use text combined with content-related pictures, when learners have a low level of prior knowledge [14].
- Modality: Present animation and audio narration rather than animation and on-screen text [7].
- Redundancy: Use animation and narration rather than animation, narration and on-screen text [7].
- Coherence: Exclude extraneous words, pictures and sounds [7].
- Spatial contiguity: Present printed words and pictures close to each other [7].
- Temporal contiguity: Present narrated words and pictures simultaneously [7].

When considering the implications of the modality or redundancy principles, it is important to be aware of circumstances that may impact its application. These circumstances can include learner's hearing ability, the capability of learner's hardware to support audio, and whether the physical environment is appropriate for audio. In these situations, learners should choose among animations with online text and animations with narrated text [6]. Therefore in practice, it is not advisable to strictly implement the modality principle.

III. BLENDING LEARNING COMPUTER LITERACY

It seems impossible to learn computer literacy only from web-based learning contents (WBLC). Therefore blended learning can be an appropriate solution. The courses in scope of the Phare 2003 "Improvement of computer literacy of unemployed adults" project were created according to the described theoretical framework.

In learner-centric approach it is very important to consider the prior knowledge of learners. Therefore, groups of students with similar prior knowledge were formed according to the results of the pre-test.

At the beginning learners had their first training in a computer room. The participants were taught basic computer skills, how to use LMS eCampus and how to learn from WBLCs.

The project blended courses consisted of modules. These modules consisted of face-to-face training, where learners learned the basic skills of the module, instructor-led web-based learning and self-directed learning. The instructor-led web-based learning took place at the learners' homes or special public ICT-equipped centres. For motivational reasons, intermediate goals and a schedule defining deadlines for activities, were set up. At scheduled times a tutor was available for immediate additional help and for eventual questions. TutorS moderated group forums. Learners had a chance to communicate with tutors or with each other via forums in the LMS or via e-mail.

Formative evaluation of knowledge was provided as an integral part of the course.

We kept track of the learners' activities and their learning behaviour. For each one we recorded his/her inputs, learning trajectories, number of visited learning pages, time spent in each WBLC and LMS, results of the online assessments, and the number of posts in the forums. We also measured their satisfaction through opinion polls and considered their suggestions for further development and improvement of multimedia WBLCs and the course.

Interestingly, they rarely raised questions or opened discussions in forums, some tutors tried to encourage the collaboration in forums while some did not. The activity in forums was more intensive if the tutor started the debate in the forum.

The courses were designed in such a way that knowledge evaluation took place at the beginning of each module within the learning process (via interactive questions, online tasks and online tests in WBLC) and at its end. Each course ended with the examination. Learners' could achieve ECDL (e.g. European Computer Driving Licence) certificate or national certificate Computer Literacy for Adults that includes similar competencies as ECDL START. The participants could take part in examinations voluntarily.

IV. RESEARCH RESULTS

1113 learners were included in the two projects, in scope of the master project, and were thereby covered by the research. 94 % of the learners participated in the examination. 49% of them obtained national certificate Computer Literacy for Adults, 29 % of them passed 4 ECDL exams and therefore obtained the ECDL START certificate and 10% of them passed all 7 ECDL exams and obtained the full ECDL certificate.

All participants in one of the projects were chosen to fill the questionnaire.

In the questionnaire, learners were asked to express their opinion about:

- advantages and disadvantages of WBL and blended-learning course,
- traditional learning materials and WBL contents,
- traditional learning courses, WBL courses and blended learning courses.

A survey about the outcomes of the above described course was made using a questionnaire, which was given

to the participants at the termination of the course. The questionnaire contained questions about the content and about the learning process of the course.

A. Sample

The questionnaire was filled out by 390 participants. 76 % of them were females.

Their distribution in age groups is shown in figure 1. As it can be seen on the graph, the most numerous is the age group between 41 and 50, which is due to the fact that the preferential target group for the Phare project were unemployed people above the age of 40.

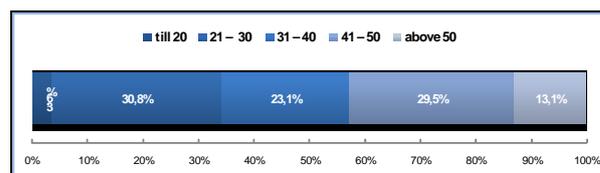


Figure 1. The age structure

More than half of the respondents (52 %) finished general or technical secondary school and 26 % of them finished vocational schools. The rest of the participants have only basic education or higher education (a little bit more than 10 % for both groups).

B. Data analysis

The respondents did not answer all the questions in the questionnaire. In average, 90 % of respondents answered individual questions.

The general impression of the course was very good and the expectations of participants were met to a great extent. This is shown by through the mean score for this question, which was 4.3 on the five point Likert scale. The distribution of scores is shown in figure 2.

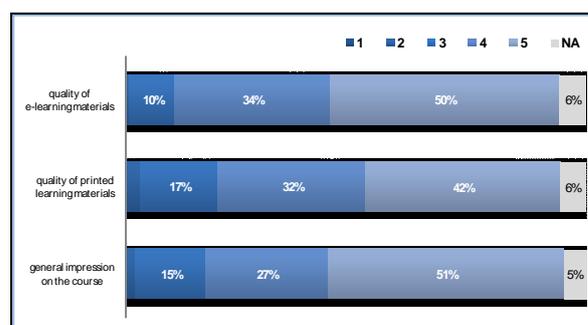


Figure 2. Distribution of scores for selected questions in survey

Participants of the course also assessed quality and applicability of the content of printed learning materials and of WBL materials. They were very satisfied with WBL materials, which got a mean mark of 4.4 (from the 1 to 5 scale), with very low dispersion. Printed learning materials got a little lower mark (4.2).

Participants were asked to comment, which mode of instruction they found most convenient. The questionnaire showed that the majority of them preferred blended learning solutions (71 %). And a traditional teaching approach based on lectures is preferred by 17 % and only independent e-learning is preferred by nearly 6 % of respondents. The results are similar with regards to the

preferred type of learning materials, where e-materials quote somewhat higher than earlier mentioned e-learning solutions with more than 7 %, but traditional printed learning materials are less desired with by 11 %. Blended solutions as a combination of printed learning materials and e-materials are most convenient for more than three quarters of the respondents.

In the self-paced part of the course participants had an opportunity to learn in a traditional way or learn by means of web-based materials. The majority of them (67 %) find computer supported learning convenient, 28 % only partially convenient and only 5 % do not like this type of learning.

Figure 3 shows the results of the enquiries about the reasons for the use of web-based learning materials.

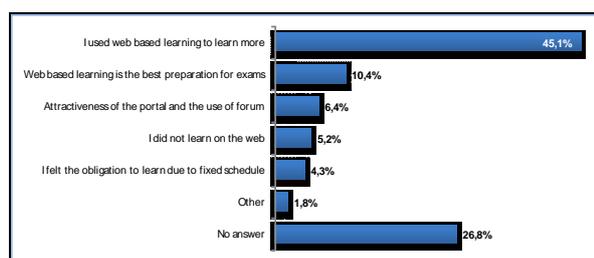


Figure 3. Most important reasons for use of WBL materials

Answers to the question about the most important advantages of web-based learning (which is actually a synonym for e-learning in our context) were given only by 60 % of respondents. Most important advantage for 25 % of them is time flexibility – so they can learn any time they want. 18 % of them find communication with a tutor and with other participants of the course via web based forum, which was available to the participants. 10 % stressed individualisation and the possibility to choose their own pace of learning. Only few respondents mentioned interactivity and multimedia learning materials, which support contemporary pedagogical approaches, and flexibility as regards place of learning.

The question about disadvantages of web-based learning received even less answers than the previous one – only 47 % of respondents answer this question. Between them, 72 % did not see any disadvantage of web-based learning. 5 % were confused because of errors in the materials and because of incorrect answers in the tests and another 5 % meant there was not enough time to do all the exercises and other activities foreseen in the course.

Participants in the course were also asked about their future use of web-based learning facilities. The majority of them (70 %) stated that they would take every opportunity to learn again in this way. To 14 % of respondents it makes no difference whether they learn in traditional or in web-based setting. But only less than 1 % of them would not choose web-based learning in the future.

V. CONCLUSION

Blended learning combines e-learning with traditional classroom training. The combination of self-paced courses, instructor-led learning activities and scalable delivery achieves a flexible, cost-effective training

solution that can reach and educate audience, dispersed in time and space.

We have designed and produced web-based learning materials and organised a blended learning course on computer literacy for a group of more than one thousand unemployed in the northern and central part of Slovenia. The design of learning materials and organisation of the course were based on theoretical foundations, presented in the paper.

Final results of the course were excellent as nearly 92% of participants finished the course successfully with a certificate of European wide qualification. A survey made after the termination of the course showed that participants were satisfied with both types of learning materials, printed as well as e-materials, and with the course as a whole. Most of them preferred blended learning solution and the majority of participants plan to use it for learning in the future.

REFERENCES

- [1] Ardito, C., Costabile, M. F., De Marsico, M., Lanzilotti, R., Levialdi, S., Roselli, T., Rossano, V., An approach to usability evaluation of e-learning applications, Univ Access Inf Soc (2005), Springer-Verlag, 2005
- [2] Chickering, A. W., Gamson, Z. F., Seven Principles for Good Practise in Undergraduate Education, AAHE Bulletin, marec, 1987, available online (12.06.2006), <http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/7princip.htm>
- [3] Dabbagh, N., Kitsantas, A., Using web-based pedagogical tools as scaffolds for self-regulated learning, Instructional Science (2005), 33: 513-540
- [4] Horton, W., Designing Web-Based Training, John Wiley & Sons, 2000
- [5] Ko, S., Rossen, S., Teaching Online, A Practical Guide, Houghton Mifflin Company, 2003
- [6] Lapuh Bele, J., Rugelj, J., Efficient Learning from Multimedia Web-based Learning Contents, V: Méndez-Vilas, A. Current Developments in Technology-assisted Education (2006). Vol. 1. [Badajoz: Formatex, cop. 2006], p. 396-400
- [7] Mayer, R. E., Multimedia Learning, Cambridge University Press, New York, 2001
- [8] Mayer, R. E., The promise of multimedia learning: using the same instructional design methods across different media, Learning and Instruction 13 (2003) 125–139
- [9] Mayer, R. E., The Cambridge Handbook of Multimedia Learning, Cambridge University Press, New York, 2005
- [10] McKenzie, J., Beyond Technology: Questioning, Research and the Information Literate School, FNO Press, Bellingham, WA, 2000, <http://www.fno.org/dec99/scaffold.html>, sep 2006
- [11] Morke, J., Nielsen, J., Concise, Scannable and Objective: How to Write for the Web, 1997, <http://www.useit.com/papers/webwriting/writing.html>
- [12] Nielsen, J., Designing Web Usability : The Practice of Simplicity, New Riders Publishing, Indianapolis, 2001
- [13] Schnotz, W., Bannert, M., Construction and interference in learning from multiple representation, Learning and instruction, 13 (2003), p. 141-156
- [14] Schnotz, W., The Cambridge Handbook of Multimedia Learning, Cambridge University Press, New York, 2005
- [15] Singh, H.; Building Effective Blended Learning Programs, Education Technology, Vol. 43, No. 6, 2003, p. 51-54
- [16] Squires, S., Preece, J., Predicting quality in educational software: Evaluating for learning, usability and the synergy between them, Interacting with computers 11 (1999): 467-483

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